# MANY0402A.00
# Airmaster S1 hardware installation guide

Version 1.2



**safety warning!**

**Do not operate the Airmaster S1 until you and all personnel concerned have read and understood this installation guide.**

Important notes

Installation and startup may only be done by trained personnel according to safe engineering practices and with the observance of all relevant local health and safety requirements and regulations.

A requirement of fault-free operation and fulfillment of any rights to claim under guarantee is that the documentation is observed. In case of doubt please contact CMC.

This document could be subject to changes. Please contact our factory in case of doubt in order to ensure that you have received the latest version.

Signs:

Hazardous or harmful situation
Possible consequences: Slight or minor injuries.
Possible damage to the unit and the environment.

Electrical hazard:
Possible consequences: Severe or fatal injuries

UL

Specific for the American (US) market

# Table of contents

# 1. Introduction

The Airmaster S1 is an industrial controller
This hardware installation guide is a guide for the hardware related items. Please read the software specifications file for information on how to work with the unit.

The application area is restricted to machines that comply with the European machine directive 89/37/EEC and the EMC directive 89/336/EEC. The application area is located in electrical driven compressors and dryers in an industrial environment. Please contact CMC for appliance in other machines.

The Airmaster S1 does not need to comply to the European Pressure Equipment Directive 97/23/EC, because no parts are under pressure, and the Airmaster S1 is not a safety component.

The Airmaster S1 is a component, which can't operate without other components. However, it is not a safety component, and it is not a machine.

The controller is to be used in a standard industrial environment. The controller may only be used in places without an explosion risk. So it may never be used where explosion-proof equipment is required. This controller may not be used for maritime purposes. It may also not be used in any way as part of an assembly that could be used for military or terrorist use.

The Airmaster S1 base unit without additional protection is to be used in areas of pollution degree 1 or 2. Of course the user can add additional protection for higher pollution degrees.

The installation of the controller must be made in accordance with the applicable national and international standards and regulations.

For the American market UL508 is applicable, in accordance with the NFPA.

National and international directives and standards can change in time. Please check them at a regular basis, and make modifications to your equipment where this should be necessary.

# 2. Models

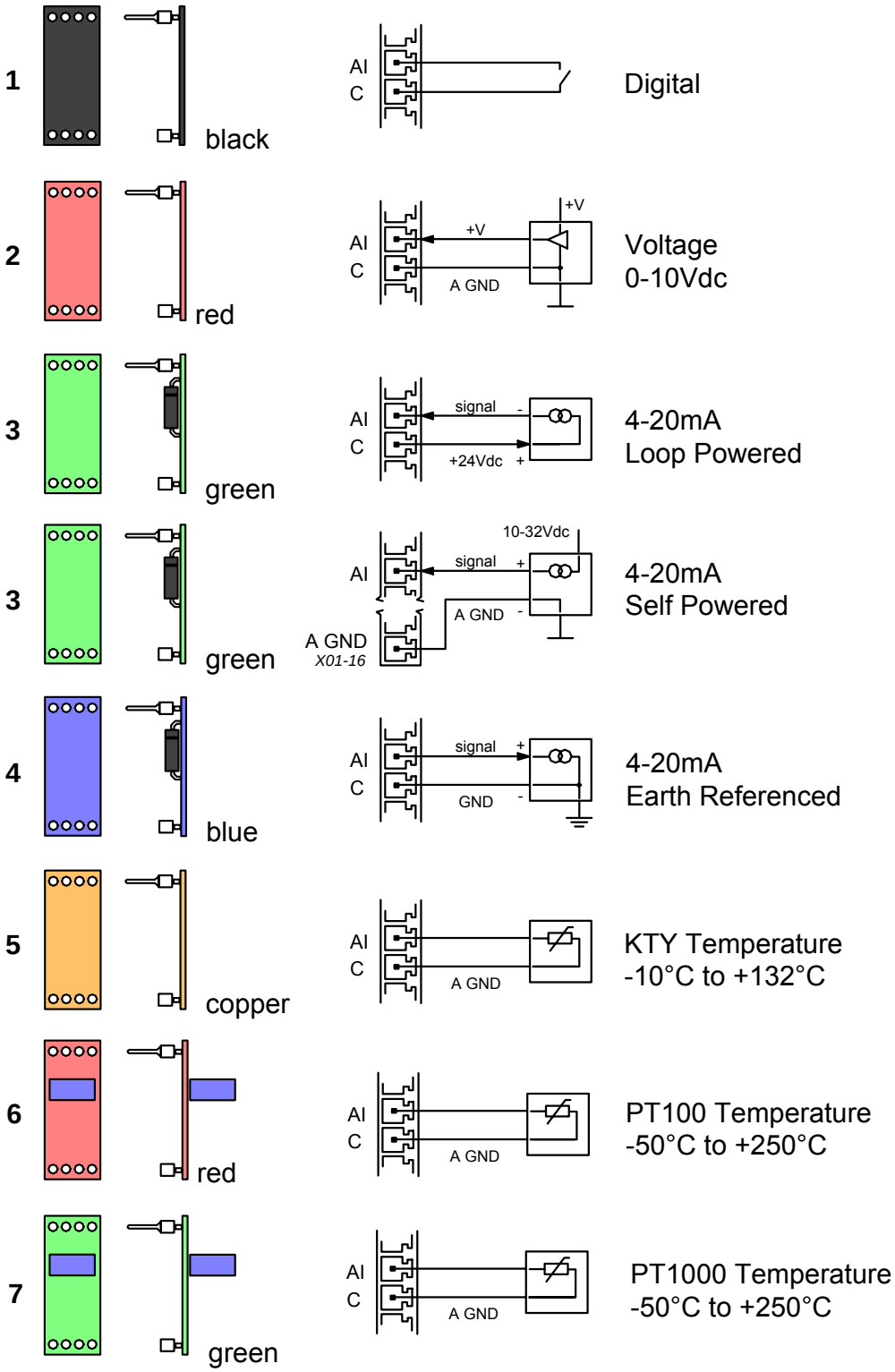
## 2.1 Basic versions

There are 2 basic versions available of the Airmaster S1. The following table indicates the differences. The analog conditioning modules (see further) must be added to the basic version.

| S1 | Inputs | | Outputs | | | Communications | |
|---|---|---|---|---|---|---|---|
| | 8 x Digital | 3 x Analogue | 4 x Relay | 6 x Relay | 4-20mA | RS485(1) | RS485(2) |
| S1 - 10 | ✓ | ✓ | ✓ | | | ✓ | |
| S1 - 20 | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |

Model Reference Number: S1-*xx*-3*yy*
- *xx* = configuration option; 10 or 20
- *yy* = ACM selection
  - *for example* S1-10-350 =
  - AI1 = (3) 4-20mA (fixed)
  - AI2 = (5) KTY temperature
  - AI3 = (0) no ACM fitted

## 2.2 Analog conditioning modules



# 3. Technical specifications

## 3.1 General technical data

| | |
|---|---|
| Display | Backlit LCD symbolic/numeric |
| Indicators | 2, LED |
| Buttons | 7, tactile response |
| Processor | 16bit ST ST10R272 |
| Flash EPROM | 256 Kbytes (max.) |
| Non Volatile RAM | 128 Kbytes (max.) |
| A to D Resolution | 10bit (1/1024) |
| D to A Resolution | 10bit (1/1024) |

| | | |
|---|---|---|
| Supply input | 24Vac (±20%) | 24VA |
| Analog Inputs | 3 standard | |
| Digital Inputs | 8 standard | |
| Analog Outputs | 1 optional | |
| Relay Outputs | 4 standard | 6 maximum |
| | *(consult CMC for combination availability)* | |

| | |
|---|---|
| Construction | Stainless steel front plate, steel anti-corrosion coated rear enclosure |
| Mounting | 134mm x 84mm rectangle panel aperture, up to 2.5mm plate |
| Dimensions | 144mm x 96mm x 62,8mm |
| Connections | PCB mounted, Phoenix compatible |
| Conformity | c UL us CE |

## 3.2 Temperature range

| | |
|---|---|
| Operating temperature | 0°C to +55°C |
| Storage temperature | -25°C to +75°C |
| Relative humidity at 40°C (non condensing) | <95% |

According to:

Operating tests at -10°C and +65°C
- IEC 68-2-2 B Dry heat, 4 days
- IEC 68-2-14 Nb Cyclic, 6hrs/cycle, 5 days
- IEC 68-2-3 Ca Damp heat steady, 40°C, tbd R.H., 10 days
- IEC 68-2-30 Db Damp heat cyclic, +50°C, variant 1, 2 cycles
- IEC 68-2-1 A Cold, 4 days

Storage tests at -25°C and +75°C
- IEC 68-2-1 A Cold 6 days
- IEC 68-2-14 Na Change of temperature, 3hrs/temp, 2 cycles
- IEC 68-2-2 B Dry heat 6 days

### 3.3 Resistance to vibration and shock

Operating

IEC 68-2-6 Fc Vibrating, 10-150Hz, 2g, 10sweeps/axis

Not operating (storage and handling)

IEC 68-2-6 Fc Vibrating, 10-150Hz, 1g, 5sweeps/axis
IEC 68-2-27 Ea Shock, 15g, 11ms, 3 shocks/axis
IEC 68-2-29 Bump, 10g, 6ms, 500 bumps / axis

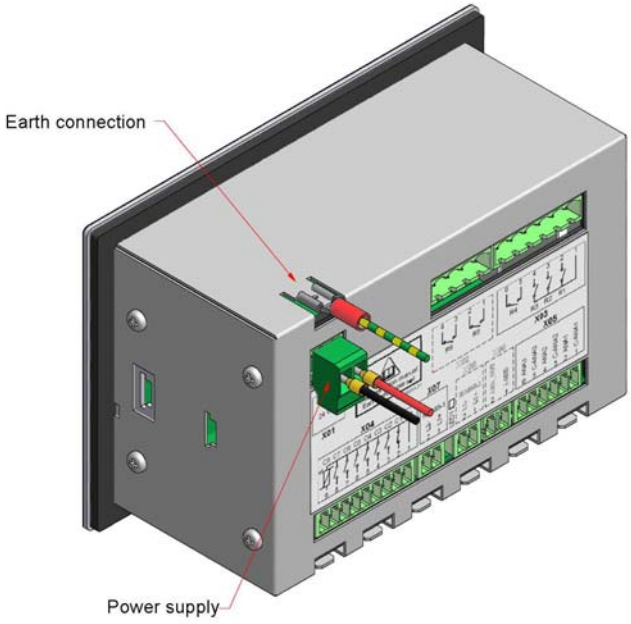
### 3.4 Protection degree

Backside: IP20
Fascia: Designed to conform to a front fascia protection rating of NEMA12, IP65, when installed correctly as detailed within an enclosure that conforms to this rating

## 4. Safety

The Airmaster S1 is a class I equipment in which protection against electric shock does not rely on basic insulation only, but which includes an additional safety precaution in that accessible conductive parts are connected to the protective earthing conductor in the fixed wiring of the installation in such a way that they cannot become live in the event of a failure of the basic insulation.

The Airmaster S1 must be earthed.
See drawing below (indicated with the yellow/green wire)




In the event that the Airmaster S1 is used to switch circuits with a voltage of 42,4V peak or more, the danger of electrocution exists and therefore protection measurements have to be made for avoiding this situation.

If only low voltage limited energy circuits are connected to the Airmaster S1 it is still necessary to earth the unit to fulfill the electromagnetic compatibility demands.

The enclosure must be earthed at all times.

Low voltage (low current, limited energy) wires must be separated from the power wires.

CMC disclaims any warranty in case the Airmaster S1 has been opened or repaired by an unauthorized person.

# 5. Electromagnetic compatibility

The enclosure is an important part of the protection of the electronics against electromagnetic interference. Also the radiation of electromagnetic energy is shielded by the enclosure. Therefore it is necessary to earth the enclosure with a very short wire to the nearest earthed metal part. We advise a maximum length of 20cm. Use a stranded wire with at least a section of 1.0mm$^2$.

The electromagnetic compatibility of the unit cannot be guaranteed when the unit is opened.

The use of shielded cables, especially for analog inputs and digital communication is highly recommended in order to have a correct EMC installation.

It is the responsibility of the user to design the machine or installation to which this equipment is to be fitted according to the rules of a good EMC installation.

| | |
|---|---|
| Susceptibility | IEC 801-2, EN61000-4-2 level 4, 8kV discharge<br>IEC 801-3, EN61000-4-3 level 3, 10V/m electric field<br>IEC 801-4, EN61000-4-4 level 4, 4kV transient on supply<br>IEC 801-5, EN61000-4-5 level 4, 2kV surge on supply (L-PE) |
| Emissions | CISPR 22, EN55022 class A industrial radiated<br>CISPR 22, EN55022 class A industrial conducted |

# 6. Installation

This part is necessary for the designer willing to use the Airmaster S1. It shows how an S1 can be integrated into an electrical circuit. Chapter 8 “Putting into operation” gives some directions that should be known in production. We strongly advise to use these assembly instructions.

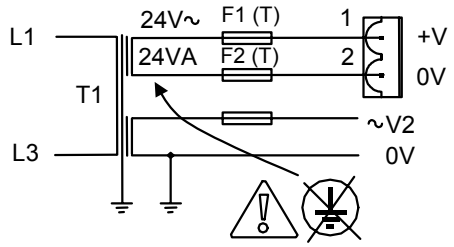
## 6.1 Cable connector types

The cable connector must match with the connectors populated on the Airmaster S1. Please refer to appendix 2 for more information.

## 6.2 Power supply and fusing

Power supply and fusing is an important part of the installation. An AC voltage is required. The maximum variation on the 24Vac is +-20%.

| | |
|---|---|
| **UL** | **Only for use in Class 2 Circuits**<br><br>The input voltage ratings for UL are:<br>Class 2 or LV/C, 24 V ac, 50/60 Hz<br>“The input circuitry of these devices have to be supplied from:<br>a) A Class 2 transformer in accordance with UL1585, or<br>b) An isolating device such that the maximum open circuit voltage potential available to the circuit is not more than 28.8 Vac and the current is limited to a value not exceeding 8 amperes measured after 1 minute of operation, or<br>c) A suitable isolating source with a maximum open circuit voltage potential of not more than 28.8 Vac in conjunction with a fuse in accordance with UL248. The fuse shall be rated max. 1,6 A and be installed in the input circuitry of the device in order to limit the available current.” |




F1, F2: 1,6A T (Time lag, slow blow) fuses

**Note:** 24Vac controller power supply input must be floating, DO NOT EARTH

Connector X01

| Pin | Name | Function |
|---|---|---|
| 1 | SUPPLY | Supply input: AC |
| 2 | SUPPLY | Supply input: AC |

| | min | typ | max. | dim |
|---|---|---|---|---|
| **AC input voltage** | | | | |
| AC input voltage | 19.2 | 24 | 28.8 | Vac |
| AC input frequency | 50 | | 60 | Hz |
| Recommended 24Vac transformer | 24 | | 500 | VA |
| Dropout at input | | | 10 | ms |
| | | | | |

**General**

The selection of the transformer must be in accordance with the applicable national and international standards and regulations. Changes in time to these standards are always possible. In case of doubt please do check them.

Examples:

**For the American market (UL)**

The selection of the transformer must be in accordance with the transformers mentioned in the UL508(A) standard. This means that they have to be UL506 or UL1585 or UL1310 approved (depending on the type).

The transformer or supply must be an UL Listed type or an UL recognized type. An UL listed device in general does not need additional temperature measurements for compliance, and is therefore recommended. An UL recognized transformer needs additional temperature measurements by UL.

*- 24Vac supply input:*

A control transformer (UL506) in LV/C configuration or a Class 2 transformer (complying with the requirements of UL 1585) must be used for the 24Vac power input of the Airmaster S1. A not inherently limited transformer shall be provided with additional over current protective devices in accordance with the manufacturer's instructions for the component.

*- Digital outputs with relay contacts*

The contacts of the Airmaster S1 relays must only be used in conjunction with a control circuit transformer (Class 1, UL506), except if a voltage less than 30Vrms is used with a limited energy rating. In the last case a Class 2 transformer is also allowed.

The secondary circuit of the control transformer may NOT be grounded; else the Airmaster S1 controller will be damaged.

A suitable UL508 branch circuit protection must be provided on the primary side of the transformer. A supplemental fuse (in accordance with UL248 series) with a rating of 1,6A 'T' type (slow blow) is obligated for the secondary side. In case of doubt please contact the transformer supplier.

Please consult the text of the UL508A and/or UL508 standard for more explanation regarding this item.

**For the European market (CE)**

The transformer or power supply must be in accordance with the current applicable European directives (e.g. Low Voltage Directive and EMC directive). This means that it must conform to the EN61558 standard (partly supersedes the older EN60742 standard) for the particular application. Also applicable are EN60204 (Safety of machinery - Electrical equipment of machines) and EN60950. A CE marking must be on the device.

The Airmaster S1 is a class I equipment in which protection against electric shock does not rely on basic insulation only, but which includes an additional safety precaution in that accessible conductive parts are connected to the protective earthing conductor in the fixed wiring of the installation in such a way that they cannot become live in the event of a failure of the basic insulation.

In the case of a proper grounding or earth connection an isolating transformer can be used. However, if the chance exists that the earth connection can be disconnected when the equipment is under voltage, a safety-isolating transformer must be used. Note that for EMC reasons an earth connection is obligatory.

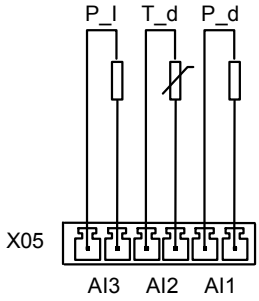
The transformer or supply must be suitable for use in a standard industrial environment.

## 6.3 Analog inputs

The first analog input is a fixed 4..20mA input.
The two other analog inputs are definable using plug-in analog conditioning modules (ACM's). (Any combination is possible)

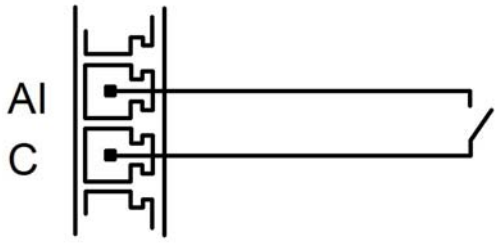
It is strongly recommended to use shielded cable for analog inputs. Use the fastons near the analog inputs for connection of the cable shield. Shielding connections must be as short as possible. Avoid long "pig tails", as this will reduce EMC performance.

| | | | |
|---|---|---|---|
| Connector X05 | pin 1 | C-ANA1 | Analog 1 common |
| | pin 2 | ANA1 | Analog 1 input |
| | pin 3 | C-ANA2 | Analog 2 common |
| | pin 4 | ANA2 | Analog 2 input |
| | pin 5 | C-ANA3 | Analog 3 common |
| | pin 6 | ANA3 | Analog 3 input |



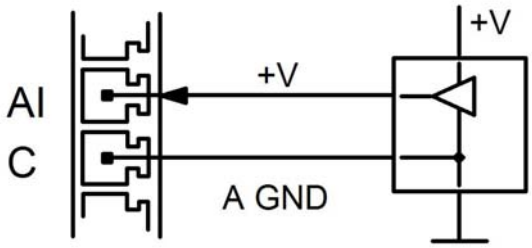

### 6.3.1 ACM type 1: digital input on analog connector

The analog inputs can act as a digital input when an ACM type 1 is used. The contact is connected between the common (C) of the analog input, and the analog input. A voltage free contact must be used.




### 6.3.2 ACM type 2: 0-10Vdc voltage input

A 0-10Vdc voltage can be used where the source is closely located to the basic controller. Use earth-shielded cable no greater than 2m in lengths. Note that a 4-20mA is a much better choice regarding EMI and distance.

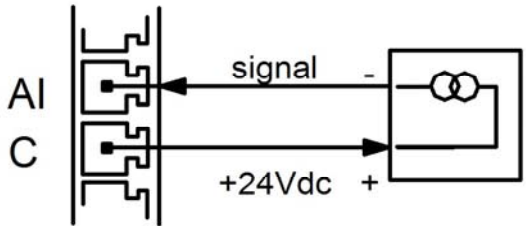



+V means a positive voltage to analog ground (A GND). The signal voltage can be different from the supply voltage of the external sensor.

### 6.3.3 ACM type 3: 4-20mA input (standard)

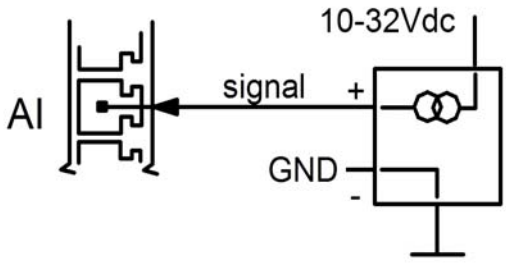
***4..20mA loop powered***

This configuration uses the available 24Vdc source on the base unit. No additional power source is necessary. This configuration is recommended.



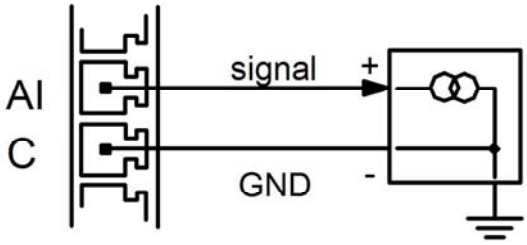

***4..20mA self powered***

In the self-powered configuration the sensor uses an external DC power supply source. For reference with the supply, the GND must be connected to the housing of the Airmaster S1.



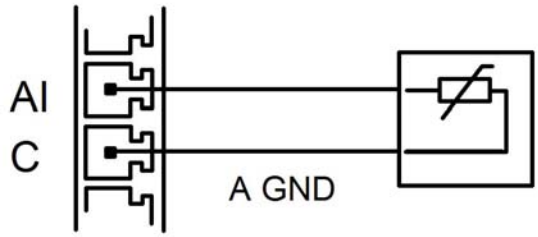

### 6.3.4 ACM type 4: 4-20mA earth referenced (special type)

This ACM can be used with a special 4..20mA current sensor
(with GND connected to ground).



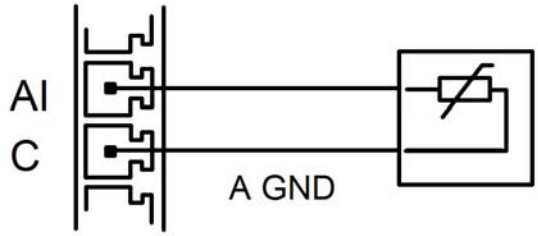
### 6.3.5 ACM type 5: KTY temperature sensor (-10…+132 deg C)

A KTY temperature sensor is a semiconductor sensor. The standard sensor type that is used is the type KTY10-62 or KTY10-6 or KTY11-6 variant.




### 6.3.6 ACM type 5: RTD temperature sensor (-40…+150 deg C)

A RTD (resistance temperature detector) temperature sensor is a semiconductor sensor.




### 6.3.7 ACM type 6: PT100 temperature sensor (-50…+250 deg C)

A PT100 temperature sensor can be connected to the base unit, but only for very short distances (2 meters). If accurate measurements must be made it is much better to use a PT1000 temperature sensor. You can run 10 times further with your cable for having the same error due to the wire resistance as with PT100.

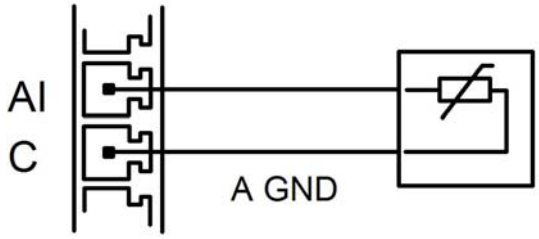
PT100 temperature sensors have a resistance varying with the temperature. When the temperature is 0°C (32°F) the nominal resistance is 100 ohm. At 200,4°C this resistance is raised to 176,0 ohm.

Use PT100 sensors with a mean temperature coefficient $\alpha$ of 0.003850 $\Omega\Omega^{-1}°C^{-1}$. In case of doubt please contact your sensor supplier. (reference: IEC Publication 751)

The wires to a sensor must be as short as possible and with a big enough section in order to reduce the wire resistance error.

The wires of a PT100 sensor of the same color have to be kept together if the sensor has more than 2 wires.

Connect the shielding of the sensor cable to the earth faston connector of the S1 unit.




### 6.3.8 ACM type 7: PT1000 temperature sensor (-50…+250 deg C)

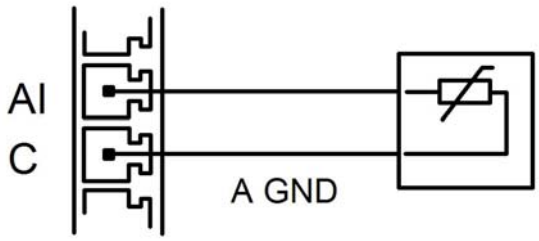
PT1000 temperature sensors have a resistance varying with the temperature. When the temperature is 0°C (32°F) the nominal resistance is 1000 ohm. At 200,4°C this resistance is raised to 1760 ohm.

Use PT1000 sensors with a mean temperature coefficient $\alpha$ of 0.003850 $\Omega\Omega^{-1}°C^{-1}$. In case of doubt please contact your sensor supplier. (reference: IEC Publication 751)

The wires to a sensor must be as short as possible and with a big enough section, to reduce wire resistance errors.

The wires of a PT1000 sensor of the same color have to be kept together if the sensor has more than 2 wires.

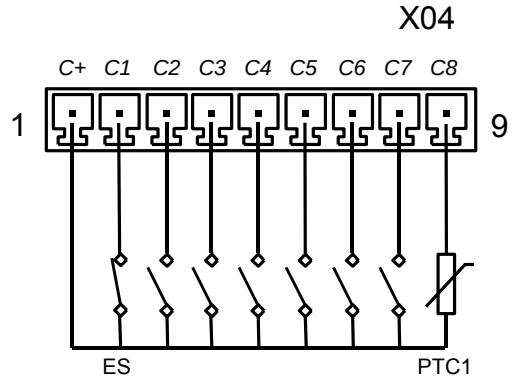
Connect the shielding of the sensor cable to the earth faston connector of the S1 unit.



## 6.4 Digital inputs

There are 8 digital inputs on the S1 unit: 1 for the emergency stop button, 6 general purpose and 1 PTC input.

Connector X04




| | | |
|---|---|---|
| pin 1 | C+ | Common |
| pin 2 | C1 | Input 1 |
| pin 3 | C2 | Input 2 |
| pin 4 | C3 | Input 3 |
| pin 5 | C4 | Input 4 |
| pin 6 | C5 | Input 5 |
| pin 7 | C6 | Input 6 |
| pin 8 | C7 | Input 7 |
| pin 9 | C8 | Input 8 |

Common Terminal

| | |
|---|---|
| Voltage | 24VDC |
| Sink Current | up to 200mA |

Digital Input 1 (Emergency Stop)

| | |
|---|---|
| Sink Current | 10mA max |
| Resistance closed contact | < 3 ohm |
| Resistance open contact | > 750 Kohm |

Digital Inputs 2 to 7 (general purpose)

| | |
|---|---|
| Sink Current | 10mA max |
| Resistance closed contact | < 13 Kohm |
| Resistance open contact | > 750 Kohm |

Digital Input 8 (PTC thermistor)

| | |
|---|---|
| Sink Current | 1.4mA |
| Resistance closed contact | < 750 ohm |
| Resistance open contact | > 4000 ohm |
| Conformity | IEC 34-11-2, VDE 0660 |

Note: all resistance are inclusive the resistance of the cabling.

### 6.4.1 The emergency stop contact input

The contact, which is connected between the first digital input and the common digital inputs supply terminal, is also feeding the internal relays of the Airmaster S1. As soon as this contact opens, all relays are de-energized. In this manner, when an emergency occurs, all outputs become non-active without intervention of the microprocessor or software. This contact must be normal-closed, which opens in case of emergency stop.

Contactors, relays or other output devices connected to the relay outputs of the Airmaster S1 must also be disconnected by another contact on the emergency stop button.

Special precautions must be foreseen that no over voltage is applied to the emergency stop contact input.

### 6.4.2 The contact inputs

The Airmaster S1 can read the status of all contact inputs. Over an open contact a minimum voltage of 18Vdc is maintained. When the external contact is closed a minimum current of 5mA runs through the contact. This is intended to prevent contact oxidization errors.

### 6.4.3 The PTC input

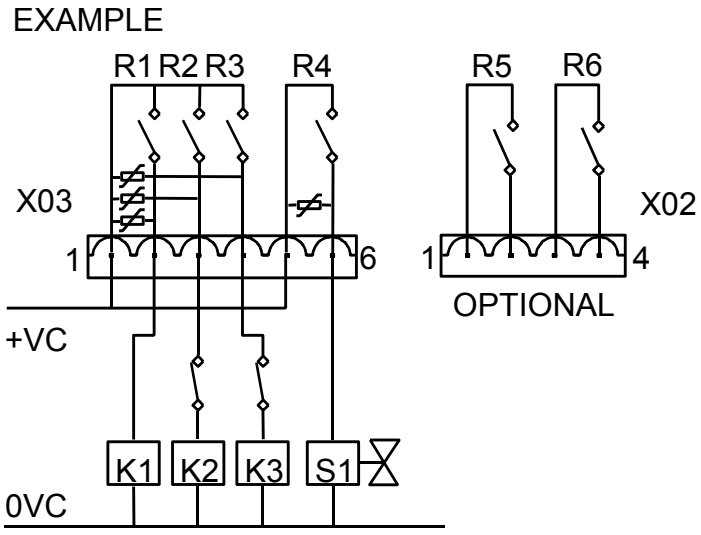
The last contact input can be used to indicate the status of a Positive Temperature Coefficient thermistor (PTC). The characteristic of the input is according to IEC 34-11-2, VDE 0660.

Do not apply an external voltage on the PTC input, as this will damage the unit.

The PTC input can also be used for switching contact inputs. If used in this way attention to the type of contact must be made, as the closed circuit current is low and may not penetrate oxidization. Use with gold flashed contacts in enclosed or sealed devices.

## 6.5 Relay outputs

The Airmaster S1 has 6 relays.




| | |
|---|---|
| Switching Voltage (max) | 240Vac / 24Vdc |
| Continuous Current (max) | 8Aac / 8Adc (resistive load) (*) |
| Breaking Capacity (max) | 1800VA (cosØ=1) / 150W dc |
| Switching Rate | 300 ops/min (no load)<br>30 ops/min. (rated load) |
| Mechanical Life | 10M ops |
| Contact Life @ load | 100K ops (cosØ=1) |
| Operating Time | 10ms max |
| Release Time | 10ms max |
| VDR Rating (R1 to 4) | 300Vac / 385Vdc |
| Maximum current pin 1 | 12Aac or dc (15A peak for <3s)<br>for UL: 10A @ max. 240Vac |

(*) See Appendix 3 for UL508 ratings.

| | | | |
|---|---|---|---|
| Connector X03 | pin 1 | C-R1,2,3 | R1,2 and 3 common |
| | pin 2 | NO-R1 | R1 normally open |
| | pin 3 | NO-R2 | R2 normally open |
| | pin 4 | NO-R3 | R3 normally open |
| | pin 5 | NO-R4 | R4 normally open |
| | pin 6 | C-R4 | R4 common |
| Connector X02 (optional) | | | |
| | pin 1 | NO-R5 | R5 normally open |
| | pin 2 | C-R5 | R5 common |
| | pin 3 | NO-R6 | R6 normally open |
| | pin 4 | C-R6 | R6 common |

The normal open contacts can be used for voltages up to 240Vac or 24Vdc.

The minimum load is 100mA at a minimum switching voltage of 5Vdc.

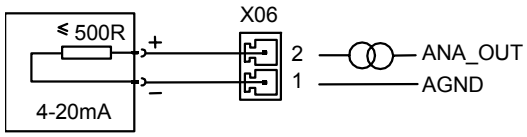
Although the first 4 relays have VDR's on board in order to reduce the spikes due to the opening of the relay contacts, the customer must also use a snubber circuit in order to reduce the spikes at the load side. For the other relays the same rule is applicable.

Do not exceed the maximum voltage and current.

In case of a non-resistive load on the relay contact, a derating is necessary of the maximum current.

## 6.6 analog output (optional)

The analog output can be used for the speed control of a variable speed drive with a 4 to 20mA input. It can also be used to repeat analog inputs as 4 to 20mA signals.




| | |
|---|---|
| Output Voltage(no load) | 24VDC |
| Output Signal | 4 to 20mA |
| Resolution | 0,020mA |
| Maximum Load | 500 ohm |
| Error | ±1% typical, maximum ±5% FS |

| | | | |
|---|---|---|---|
| Connector X06 | pin 1 | AGND | Analog GND (-) |
| | pin 2 | ANA_OUT | Analog output (+) |

Can also be used to energize a remote relay with a 24VDC coil and an initial switch on current ≤ 20 mA.

## 6.7 Communication

There are two communication ports available on the Airmaster S1. One port is optional.

### 6.7.1 RS485 port1 (standard)

115,2k baud (max.), CMC systems solution protocol
Connector X07

| Pin | name | Function |
|---|---|---|
| 1 | L1+ | RS485 L1+ |
| 2 | L2- | RS485 L2- |

| | | |
|---|---|---|
| RS485 Cable | 2 x 0.5mm² to 1.0mm², twisted pair, earth shielded UL2092 style or equivalent | |
| RS485 Distance | 0.5mm² to 0.75mm² | <= 500m (1650ft) total length |
| | 0.75mm² to 1.0mm² | <= 1km (3300ft) total length |

### 6.7.2 RS485 port2 (option)

There is one optional RS485 port 2 with connector located on X08.

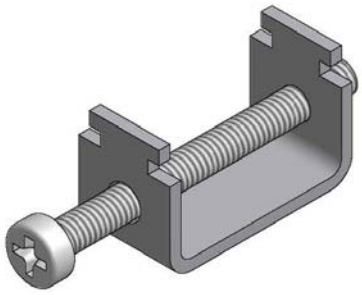
| Pin | name | Function |
|---|---|---|
| 1 | L1+ | RS485 L1+ |
| 2 | L2- | RS485 L2- |

| | | |
|---|---|---|
| RS485 Cable | 2 x 0.5mm² to 1.0mm², twisted pair, earth shielded UL2092 style or equivalent | |
| RS485 Distance | 0.5mm² to 0.75mm² | <= 500m (1650ft) total length |
| | 0.75mm² to 1.0mm² | <= 1km (3300ft) total length |

# 7. Mounting of the Airmaster S1

The Airmaster S1 must be mounted in a front panel, enclosure or housing, which must have a suitable protection degree for the electronics. The dimensions of the apertures in the panel are given in appendix 1.

The unit can be mounted with the two mounting brackets.



The panel, enclosure or housing must have a suitable protection degree for the electronics.

At the rear of the unit there must be enough space for cabling and connectors.

Lack of space between the unit and other devices in a switchbox could damage the Airmaster S1.

The rear of the S1 unit should be protected against condensation. Condensation is allowed at the front of the S1 although direct water injection should be avoided.
The rear of the S1 must also be protected against ingress of dust or other particles.

For a good visibility of the display direct sunlight on the S1 unit must be avoided.

Do not push on the screen as this could result in damage of the window and/or display.

**UL**

The Airmaster S1 has an enclosure. However, for an end product this is not enough. The OEM customer must protect this controller with an enclosure conforming to the UL50 standard as this is mentioned in the UL508 standard.

# 8. Putting into operation

Do not put the controller into operation if you have not read and understood this installation guide.

Connect or disconnect connectors only when no power is applied.

It is not allowed to plug in any connector before connecting safety earth. Also disconnecting safety earth is only allowed when all other connectors are plugged out. See also chapters Safety and EMC.

Connect safety earth first and disconnect safety earth last.

Please refer to the “Airmaster S1 software specification” for more information about the interaction with the user after putting the controller under power

# 9. Configuration

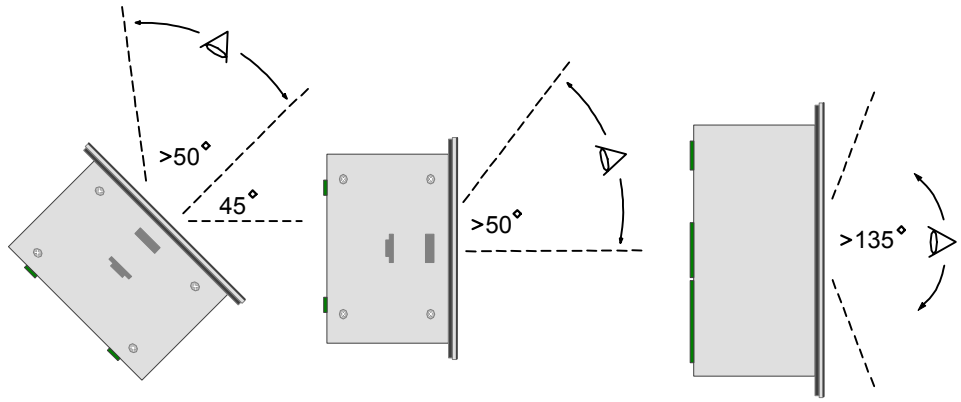
No configuration necessary. The type of analog input conditioning cards are placed on the right position depending on the specification file.

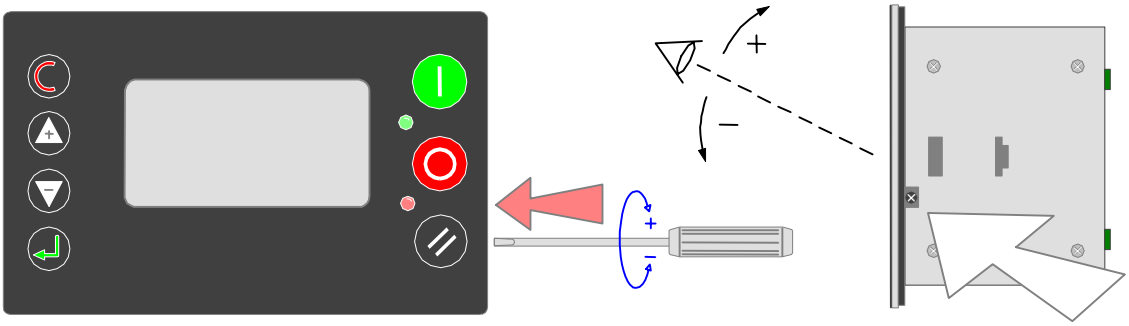
It is not allowed to plug out analog input conditioning cards, otherwise permanent damage could occur.

# 10. Adjusting

The only possible adjustment is the contrast of the display. In the factory this is already adjusted to its best position. When another contrast is necessary the 200 degrees trim potentiometer can be used.
From the display side, the trim potentiometer is located on the right side of the S1.

No high pushing pressure is allowed on the trim potentiometer, otherwise damage could occur. If operator feels that the trim potentiometer is at one of its ends, do not try to move it further, otherwise damage will occur.



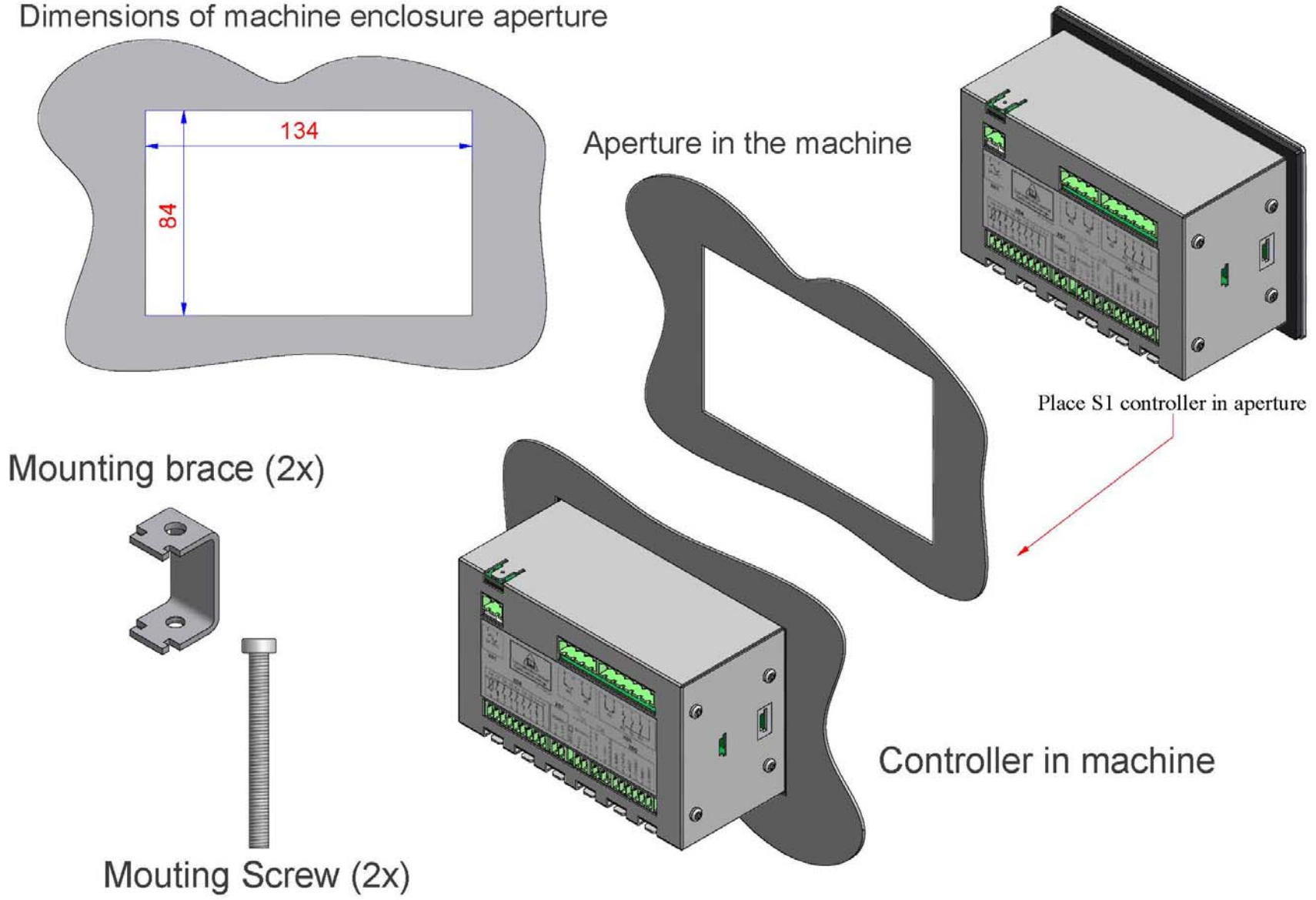




# 11. Trouble shouting

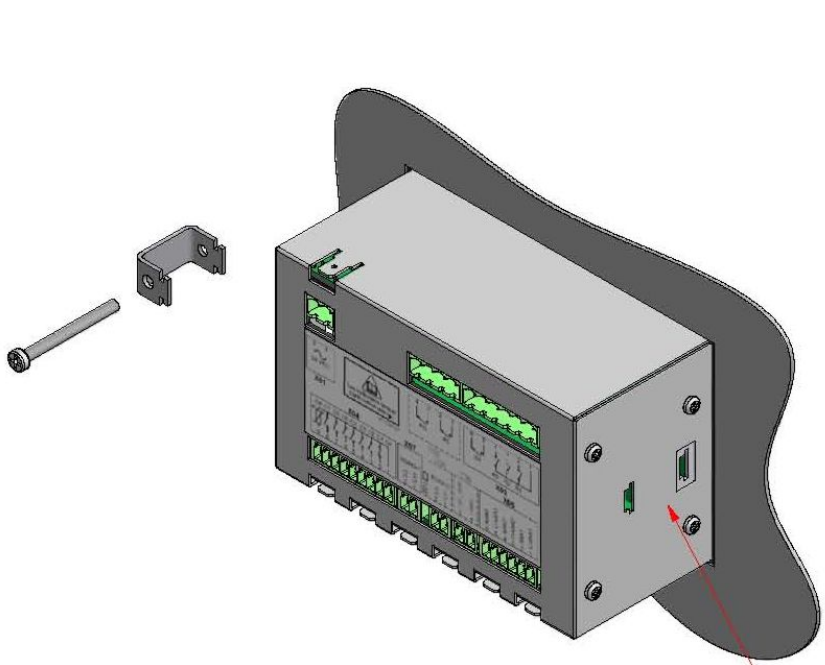
The software has many diagnostic capabilities. These will not be explained in this document. Please refer to the “Airmaster S1 software specification” for more information.

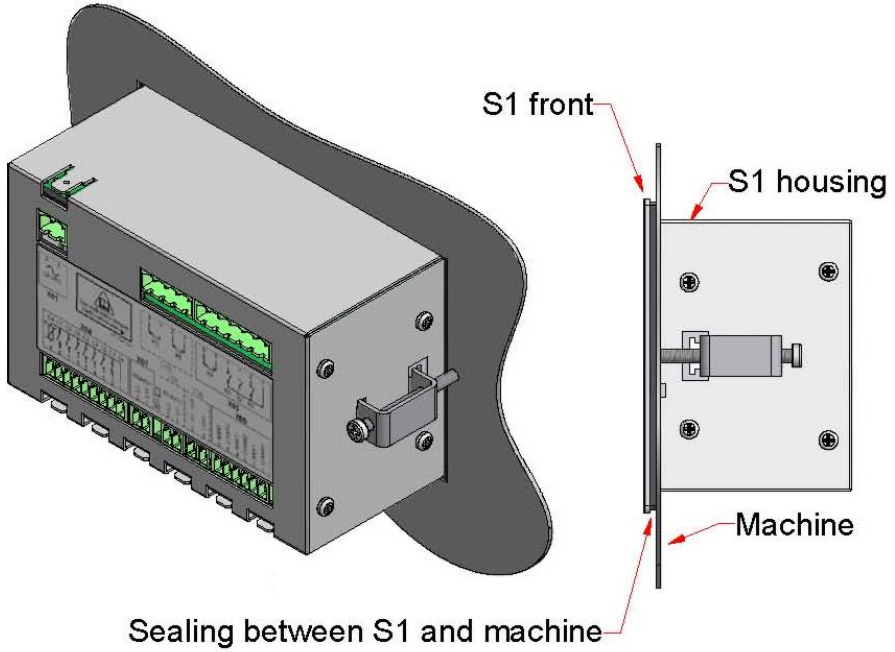
In case of a problem with a controller under warranty please follow the procedure, which can be asked at simple request.  Try to add as much information as possible regarding the fault and the circumstances of occurrence.

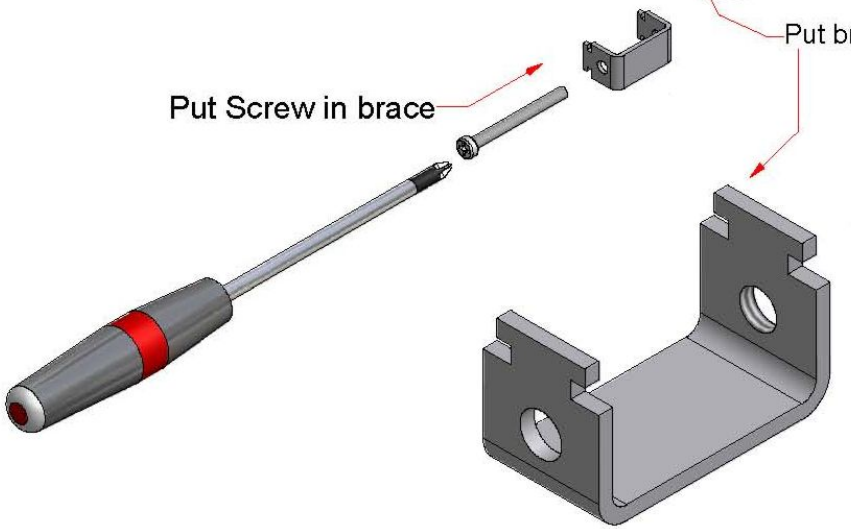
# Appendix 1: Dimensions and mounting of the S1 controller

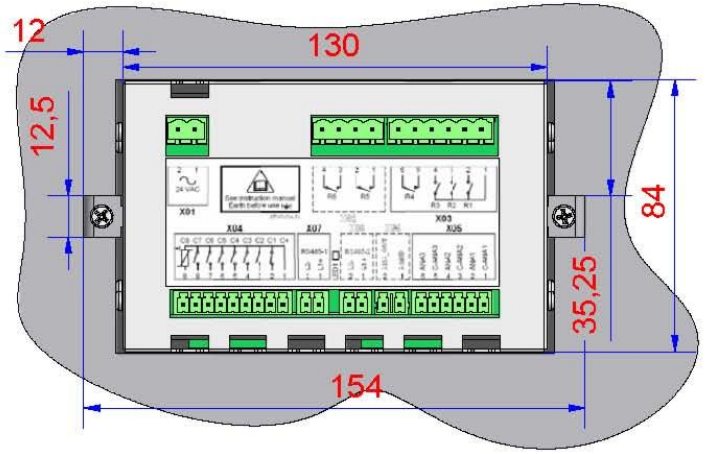


# S1 mounted in machine

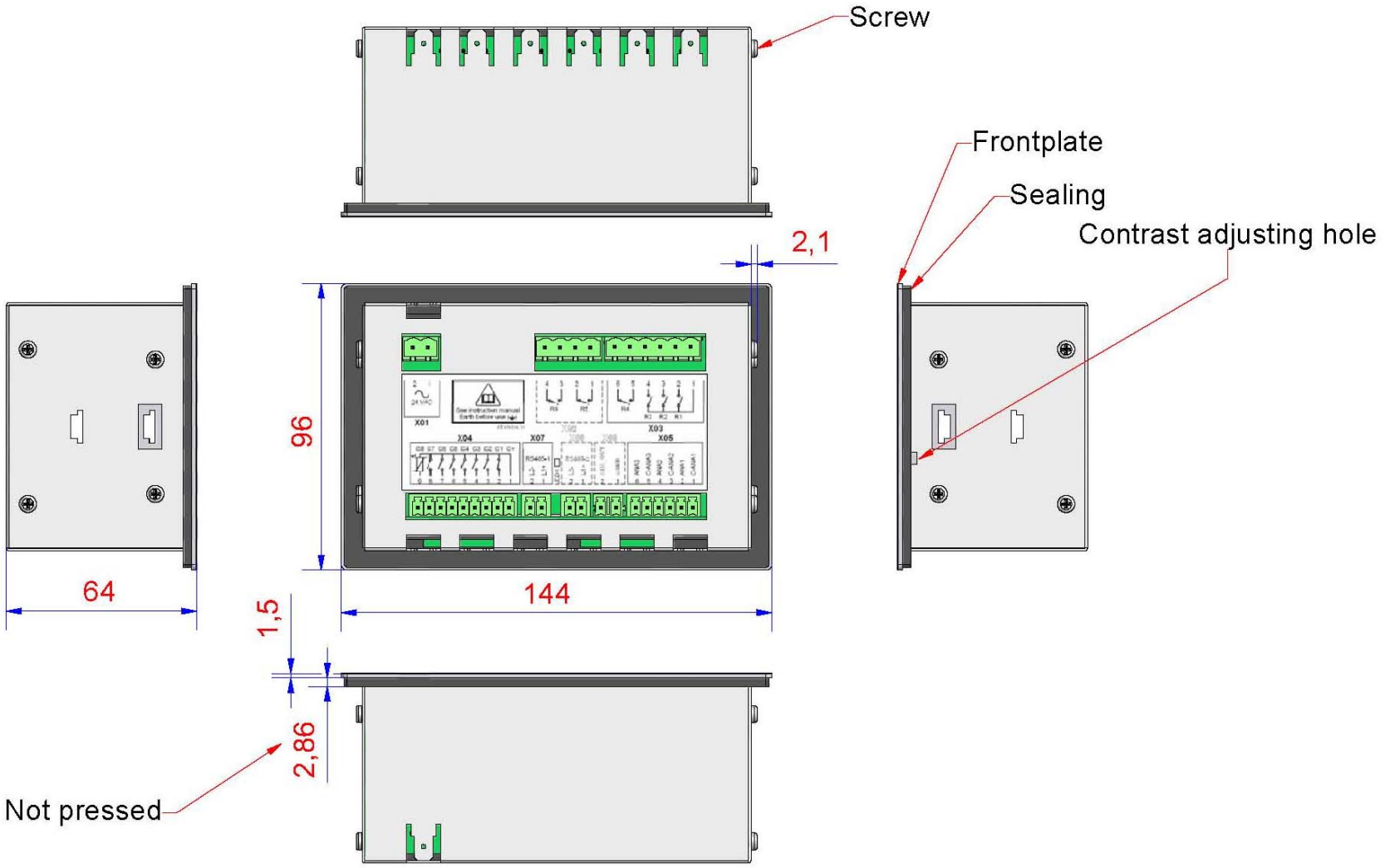




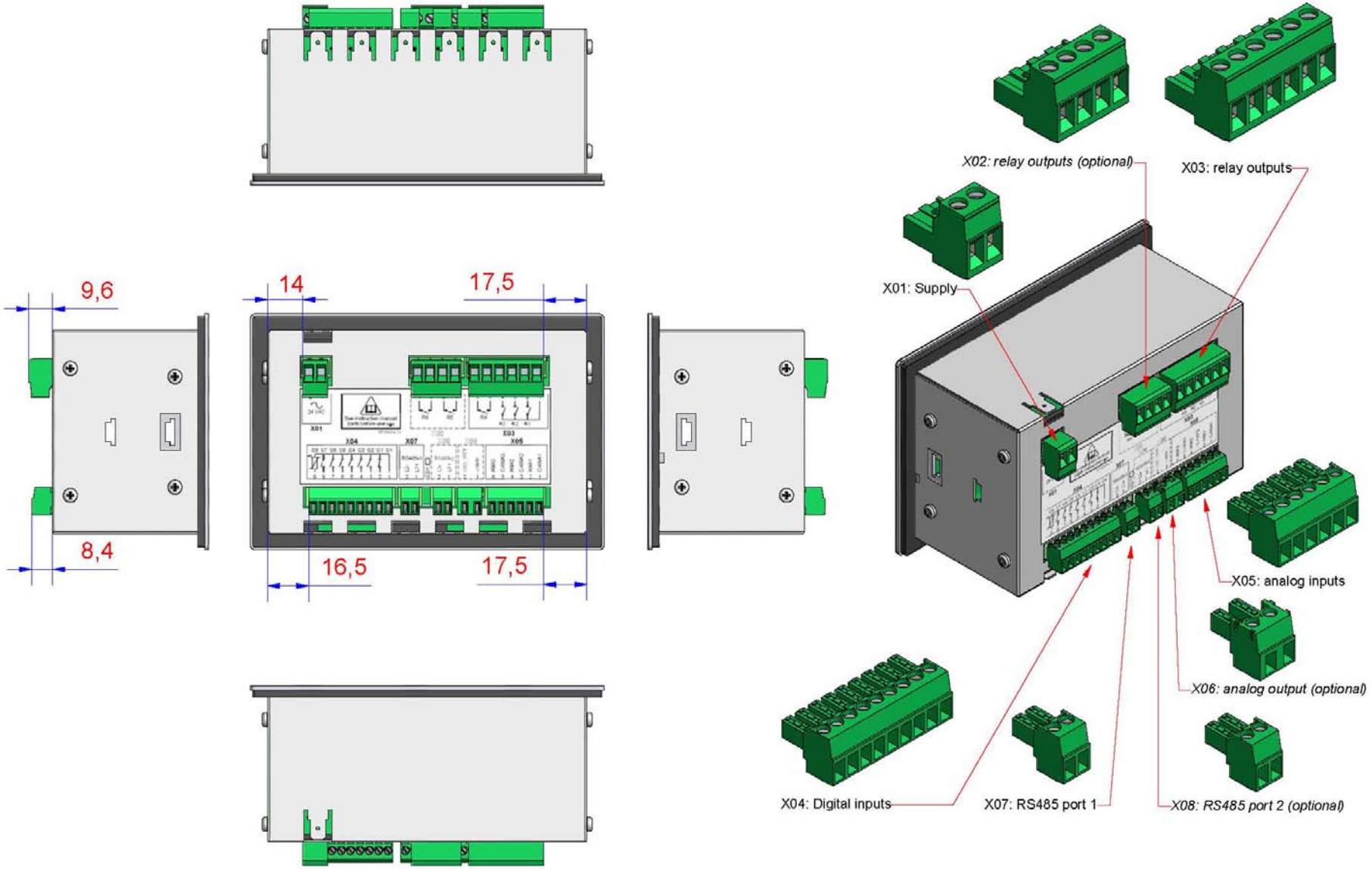



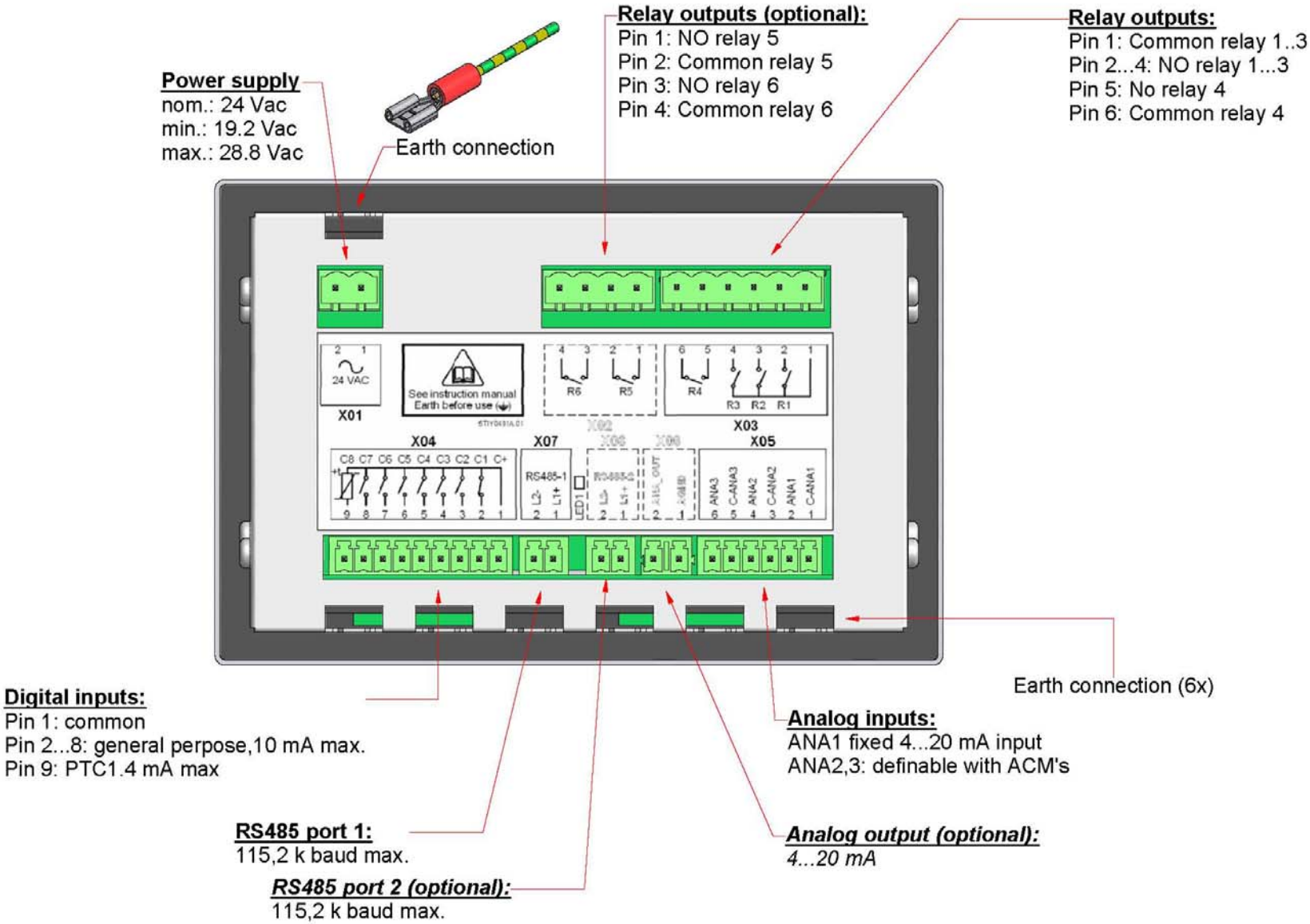
# S1 dimensions without connectors



# S1 dimensions with connectors



# Appendix 2: connectors for machine wiring



## Connector X01: Supply

Connector type: 2-pole Combicon with 5.08mm (0.20”) pitch.

| Pin | Name | Function |
|---|---|---|
| 1 | SUPPLY | Supply input: AC |
| 2 | SUPPLY | Supply input: AC |

Cable harness plug: Phoenix Contact type MSTB2,5/2-ST-5,08 or compatible.

## Connector X02: relays (optional)

Connector type: 4-pole Combicon with 5.08mm (0.20”) pitch

| Pin | Name | Function | Comment |
|---|---|---|---|
| 1 | NO-R5 | Relay 5 normal open | (Optional VDR) |
| 2 | C-R5 | Relay 5 common | (Optional VDR) |
| 3 | NO-R6 | Relay 6 normal open | (Optional VDR) |
| 4 | C-R6 | Relay 6 common | (Optional VDR) |

Cable harness plug: Phoenix Contact type MSTB2,5/4-ST-5,08 or compatible

## Connector X03: relays

Connector type: 6-pole Combicon with 5.08mm (0.20”) pitch

| Pin | Name | Function | Comment |
|---|---|---|---|
| 1 | C-R123 | Relay 1,2,3 common | With VDR 300VAC/385VDC; I<12A |
| 2 | NO-R1 | Relay 1 normal open | With VDR 300VAC/385VDC |
| 3 | NO-R2 | Relay 2 normal open | With VDR 300VAC/385VDC |
| 4 | NO-R3 | Relay 3 normal open | With VDR 300VAC/385VDC |
| 5 | NO-R4 | Relay 4 normal open | With VDR 300VAC/385VDC |
| 6 | C-R4 | Relay 4 common | With VDR 300VAC/385VDC |

Cable harness plug: Phoenix Contact type MSTB2,5/6-ST-5,08 or compatible

## Connector X04: digital inputs

Connector type: 9-pole mini Combicon with 3.81mm (0.15”) pitch

| Pin | Name | Function |
|---|---|---|
| 1 | C+ | Contact input common |
| 2 | C1 | Contact input 1 |
| 3 | C2 | Contact input 2 |
| 4 | C3 | Contact input 3 |
| 5 | C4 | Contact input 4 |
| 6 | C5 | Contact input 5 |
| 7 | C6 | Contact input 6 |
| 8 | C7 | Contact input 7 |
| 9 | C8 | Contact input 8 (PTC) |

Cable harness plug: Phoenix Contact type MC 1,5/9-ST-3,81 or compatible

## Connector X05: analog inputs

Connector type: 6-pole mini Combicon with 3.81mm (0.15”) pitch

| Pin | Name | Function |
|---|---|---|
| 1 | C-ANA1 | Common of analog input 1 |
| 2 | ANA1 | Analog input 1 |
| 3 | C-ANA2 | Common of analog input 2 |
| 4 | ANA2 | Analog input 2 |
| 5 | C-ANA3 | Common of analog input 3 |
| 6 | ANA3 | Analog input 3 |

Cable harness plug: Phoenix Contact type MC 1,5/6-ST-3,81 or compatible

## Connector X06: Analog output (optional)

Connector type: 2-pole mini Combicon with 5.08mm (0.2”) pitch.

| Pin | Name | Function |
|---|---|---|
| 1 | AGND | Analog output |
| 2 | ANA-OUT | Analog output |

Cable harness plug: Phoenix Contact type MC 1,5/2-ST-5,08 or compatible.

## Connectors X07: RS485-1

Connector type: 2-pole mini Combicon with 3.81mm (0.15”) pitch.

| Pin | Name | Function |
|---|---|---|
| 1 | L1+ | RS485 L1+ |
| 2 | L2- | RS485 L2- |

Cable harness plug: Phoenix Contact type MC 1,5/2-ST-3,81 or compatible

## Connector X08: RS485-2 (optional)

Connector type: 2-pole mini Combicon with 3.81mm (0.15”) pitch.

| Pin | Name | Function |
|---|---|---|
| 1 | L1+ | RS485 L1+ |
| 2 | L2- | RS485 L2- |

Cable harness plug: Phoenix Contact type MC 1,5/2-ST-3,81 or compatible.

# Appendix 3: UL508 RATINGS / CONDITIONS

UL

PRODUCT COVERED

USR, CNR – Component Miscellaneous Apparatus, Controller, Model Airmaster S1.

GENERAL

Only for use in Class 2 Circuits.
This device is an open type controller for general industrial use.
The device is suitable for factory wiring only, intended to be used in combination with Industrial Control Equipment in a pollution degree 2 environment.

RELAY OUTPUT CONTACT RATINGS

| | |
|---|---|
| Input | 24 V ac (LV/C) or Class 2 |
| Output 1 to 3<br>(3 outputs with one common contact) | Max. total load: max. 250 Vac, 10A<br><br>Ratings for each separate output contact: 250 Vac / 8 A (resistive) |
| Output 4 to 6<br>(3 separate contacts) | 250 Vac / 8 A (resistive) |

CONDITIONS OF ACCEPTABILITY

In determining the acceptability of the combination, the following details should be examined.

1. These devices should be mounted in an enclosure having adequate strength and thickness. The front face of the touch screen controller may be used as part of an enclosure.

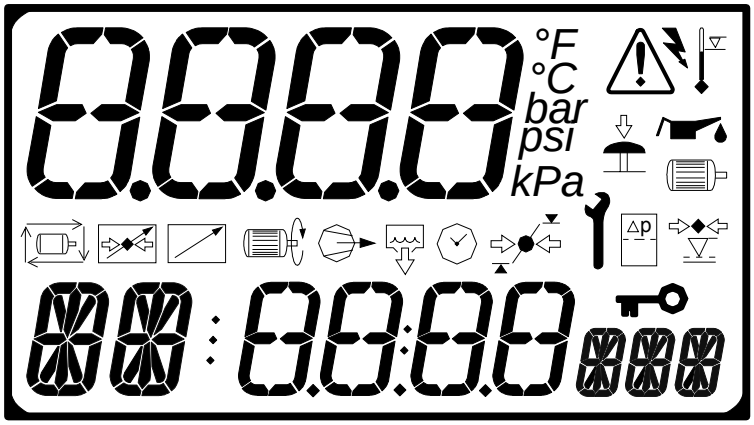
2. These devices should be used within their recognized ratings as specified.

3. The terminals are suitable for factory wiring only.

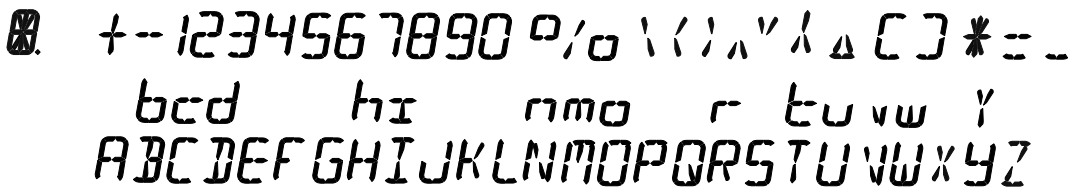
4. The input circuitry of these devices have to be supplied from:
   a) A Class 2 transformer in accordance with UL1585, or
   b) an isolating device such that the maximum open circuit voltage potential available to the circuit is not more than 28.8 Vac and the current is limited to a value not exceeding 8 amperes measured after 1 minute of operation, or
   c) a suitable isolating source with a maximum open circuit voltage potential of not more than 28.8 Vac in conjunction with a fuse in accordance with UL248. The fuse shall be rated max. 1.6 A and be installed in the input circuitry of the device in order to limit the available current.

5. Spacing at factory wiring terminals of not less than 6.4mm (1/4 in) should be maintained between any un-insulated live part and the walls of a metal enclosure.

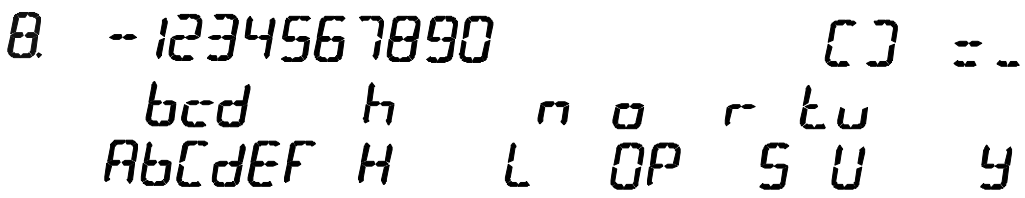
# Appendix 4: Display symbols



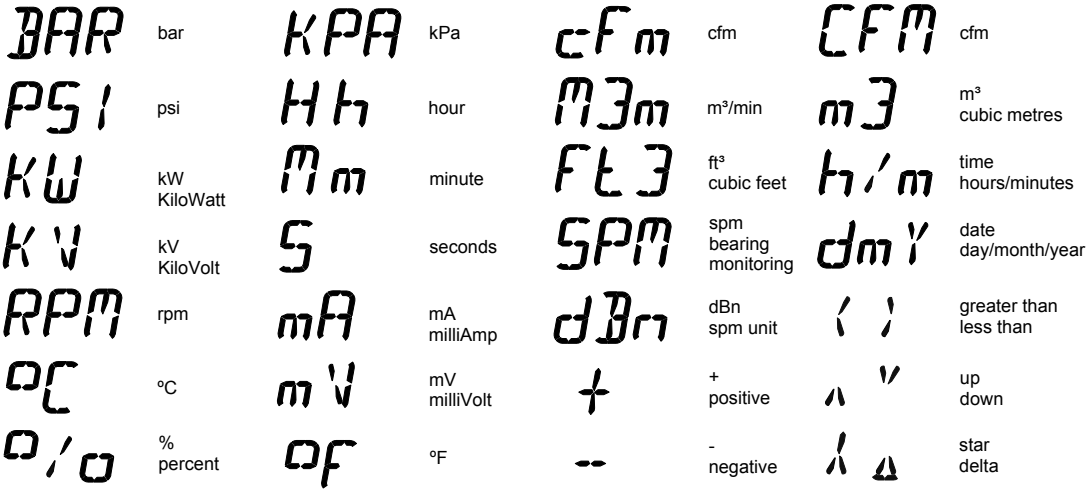

***14 Segment Display Character Set:***



**7 Segment Display Character Set:**



***Display Character Examples:***



Operational Display Symbols:


Motor R


Loaded


Amount of time, timer


Filter, differential pressure


Pressure set point indication (upper and lower set point indicators displayed independently)


Condensate drain active (optional function)


Power failure auto restart enabled (optional function)


Remote load or remote pressure regulation active


Remote start/stop


Normal Operational:
selected item locked as temporary default display
Menu Mode:
page item locked (adjustment inhibited)

Fault Display Symbols:


unning
General fault


Emergency stop


Excess pressure or above set pressure


Power failure (displayed when power restored after power failure event interrupted operation)


High temperature or above set temperature limit


Service due or service attention required


High filter differential or filter change due


Oil change due