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1 Description

The K-Patents mA output unit is used to convert the standard ethernet signal from a PR-33 or a PR-23 sensor into a 4–20 mA output signal. The core of an output system consists of a CPU and 1 to 4 mA output unit modules, each with two independent galvanically isolated current outputs. The unit is powered with 24 V DC.

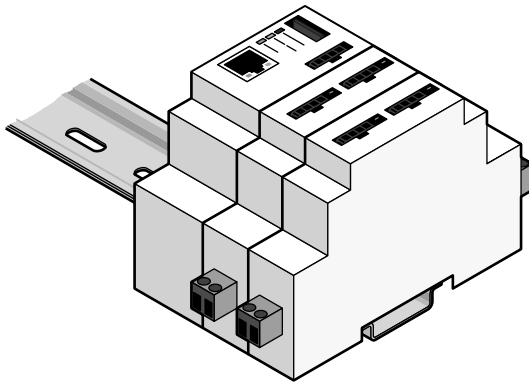


Figure 1.1 A CPU (PR-10952) with two output unit modules (PR-10922) on a DIN rail

1.1 Suggested configurations

The mA output can be used in several different configurations. There are two questions which determine the modules required by the system:

- How many outputs are required?
- How is the system powered?

Each mA output unit (PR-10922) has two independent current outputs. A maximum of four mA output modules can be connected to the CPU (PR-10952), to give a maximum of eight current outputs. If, for example, five outputs are required, the system consists of one CPU and three mA output modules.

If there is a 24-volt supply already installed into the control system, no separate power supply is required. If a 24-volt connection is not available, a mains power supply (PR-10951) can be used to supply the 24 V DC.

The following sections describe some typical PR-33 installations with mA outputs.

1.1.1 Single-sensor PR-33 system with mA outputs

- 1 pc PR-33
- 1 pc PR-10920, PoE switch (part of the PR-33 system)
- 1 pc PR-10952, CPU unit for mA outputs
- 1 pc PR-10922, mA output unit
- 1 pc PR-10951, 24 V power supply for the PoE switch and the CPU

This configuration enables mA outputs for concentration and temperature for a single PR-33, as there are two independent outputs in the mA output unit.

1.1.2 Three-sensor PR-33 system with mA outputs

- 3 pcs PR-33
- 1 pc PR-10920, PoE switch (part of the PR-33 system)
- 1 pc PR-10952, CPU unit for mA outputs
- 2 pcs PR-10922, mA output unit (gives a total of four outputs)
- 1 pc PR-10951, 24 V power supply for the PoE switch and the CPU

This configuration gives three concentration mA outputs, one for each sensor. If the temperature outputs are required, an additional mA output unit (PR-10922) may be added to give a total of 6 mA outputs.

1.1.3 Four-sensor PR-33 system with mA outputs

- 4 pcs PR-33
- 1 pc PR-10920, PoE switch (part of the PR-33 system)
- 1 pc PR-10952, CPU unit for mA outputs
- 2 pcs PR-10922, mA output unit (gives a total of four outputs)
- 1 pc PR-10951, 24 V power supply for the PoE switch and the CPU

This configuration gives four concentration mA outputs, one for each sensor. If the temperature outputs are required, two additional mA output units (PR-10922) may be added to give a total of 8 mA outputs.

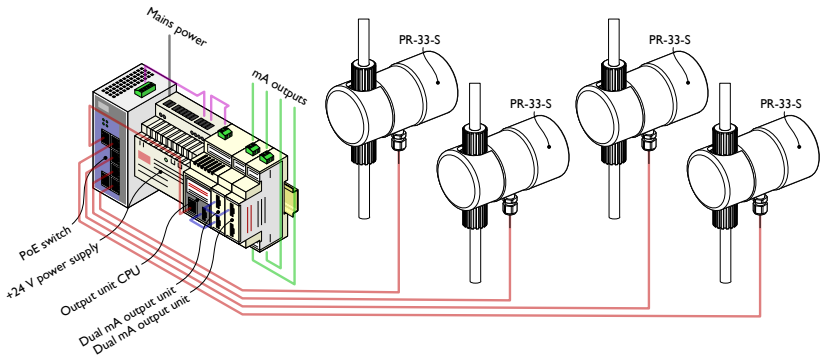


Figure 1.2 Four-sensor system with in total 4 mA outputs

1.1.4 Two-sensor PR-23 system with remote mA outputs

- 1 pc PR-23 DTR
- 2 pcs PR-23 sensors
- 1 pc PR-10952, CPU unit for mA outputs
- 1 pc PR-10951, 24 V power supply for the CPU
- 2 pcs PR-10922, mA output unit

A single PR-23 system may have two sensors connected to one transmitter (DTR). The DTR has two current outputs, but in some cases it is useful to have extra outputs or remote outputs.

In the system above the DTR is connected to the mA output unit CPU (PR-10952) with a cross-over Ethernet cable so that no Ethernet switch is required. The two mA output units give a total of four outputs so that both the concentration and the temperature can be indicated for both sensors.

If the Ethernet cable is replaced by a fiber connection, the distance between the DTR and the output unit may be up to several kilometers (miles).

The system can be expanded to accommodate more DTRs by adding an Ethernet switch and mA outputs as required.

For wiring instructions, please see chapter 2.

2 Wiring

2.1 CPU (PR-10952)

The CPU unit requires +24 V DC voltage (< 1A) and an Ethernet connection to the sensors.

The supply voltage comes either directly from the control system, or from a mains adapter (PR-10951). **Important:** Make sure the supply polarity is correct to avoid equipment damage.

The Ethernet connection is typically connected to the sensors through an Ethernet switch. If the sensors are connected to the factory network, please consult the local network administrator.

The mA output units are connected to the CPU through the K-Bus connection. All units are chained into the same bus the K-Bus connection cables (supplied with the output units) are designed so that the units can be installed next to each other.

! Warning! The output units cannot be connected or disconnected from the K-Bus while powered on. Always power off before touching the K-Bus connections. Disconnecting a unit while the power is on may damage the unit or the CPU.

The mA outputs in the mA output unit are galvanically isolated and can feed a load of up to 1 000 ohms. The current outputs are factory calibrated and burned in to meet the specification, and they do not need recalibration.

The mA output units are identified by their position in the chain. If a mA output unit needs to be replaced, no configuration changes are required. (See chapter 3 for more information on configuring the outputs.)

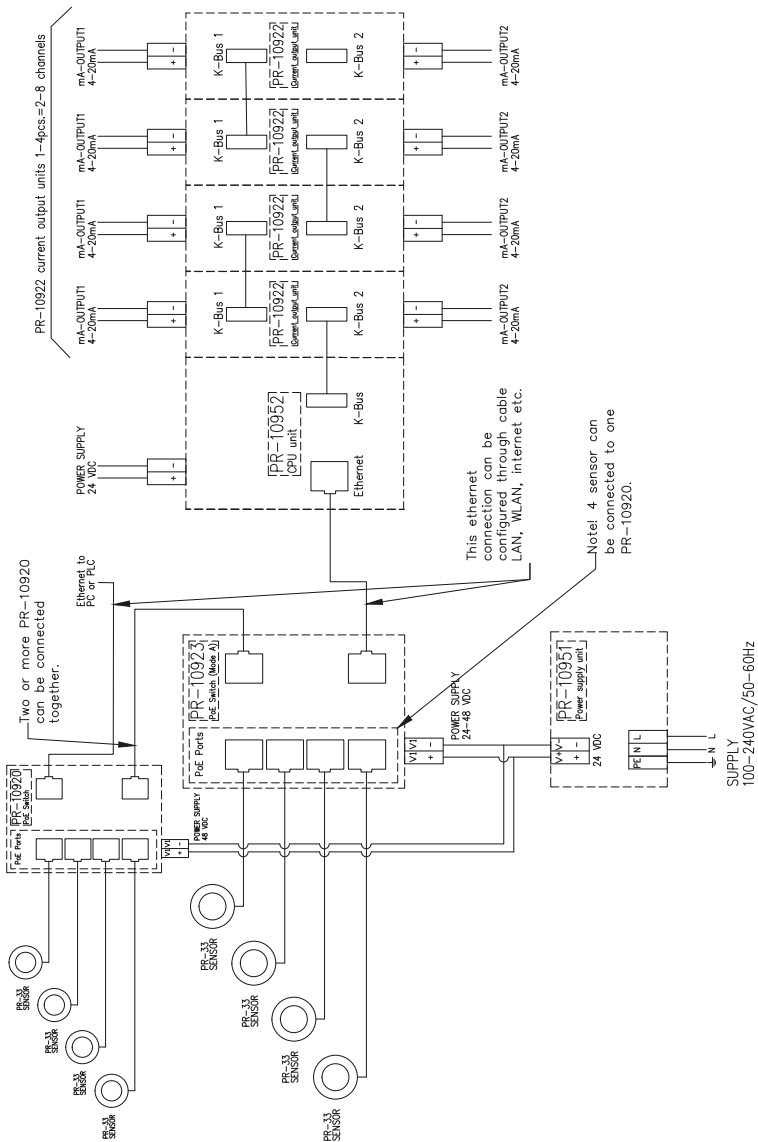


Figure 2.1 Wiring when using a separate power supply for the CPU

2.2 Connecting the CPU to a DTR (PR-23 systems)

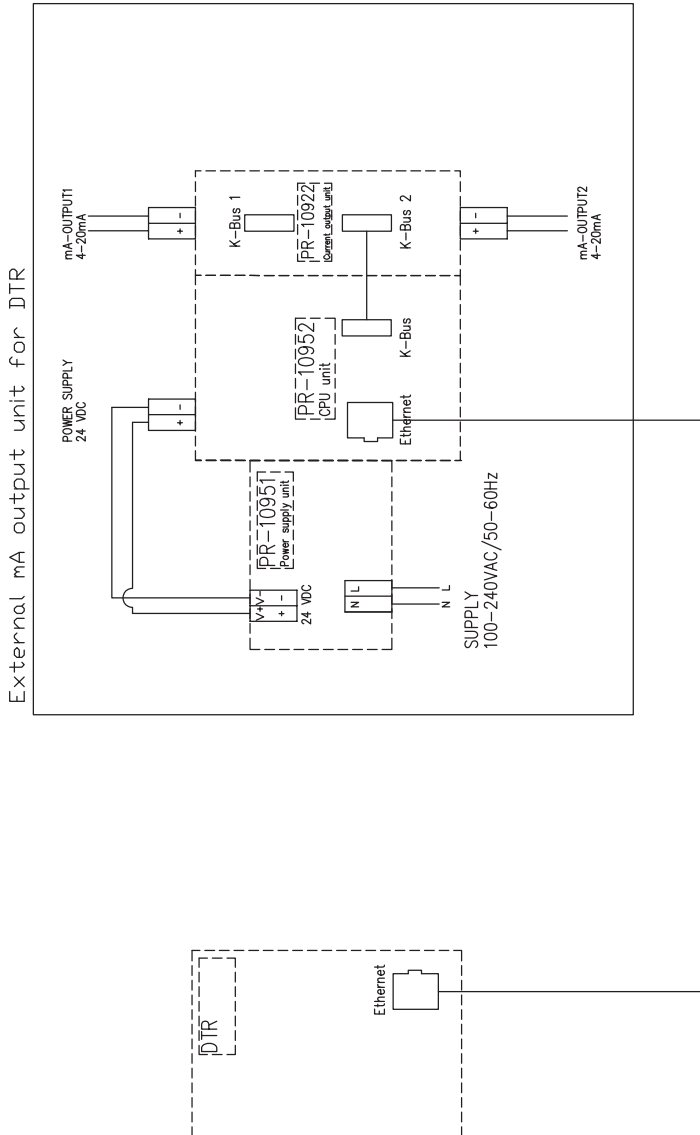


Figure 2.2 Wiring for a PR-23 system

3 Configuration

The mA output CPU unit is configured via ethernet just like a PR-33 sensor. The first setup will require the use of a stand-alone computer, but if the unit is configured to fit an existing computer network, it can later be accessed over the network.

3.1 IP address settings

Important: The mA output unit has two different IP addresses. The default address is 169.254.23.22. This address is in the zeroconf address space, and it can be reached from most stand-alone computers (only a computer and the CPU unit in the same network) without any configuration changes in the computer. This factory-default address cannot be changed.

The user-configurable address can be set to any IP address as required by the user's network.

To set the configurable IP address of a mA output unit to fit your network, connect a stand-alone computer (the computer and the unit can be connected with a cross-over Ethernet cable or by using an Ethernet switch) and the unit to the same network (see Chapter 2 of the PR-33-S instruction manual for more instructions).

To reach the output unit, use the Firefox browser (version 2.0 or newer) and type the address 169.254.23.22. This should show the main page of the instrument homepage, see Figure 3.1. The button Configure under the CPU unit (topmost unit) will reveal the IP settings, see Figure 3.2.

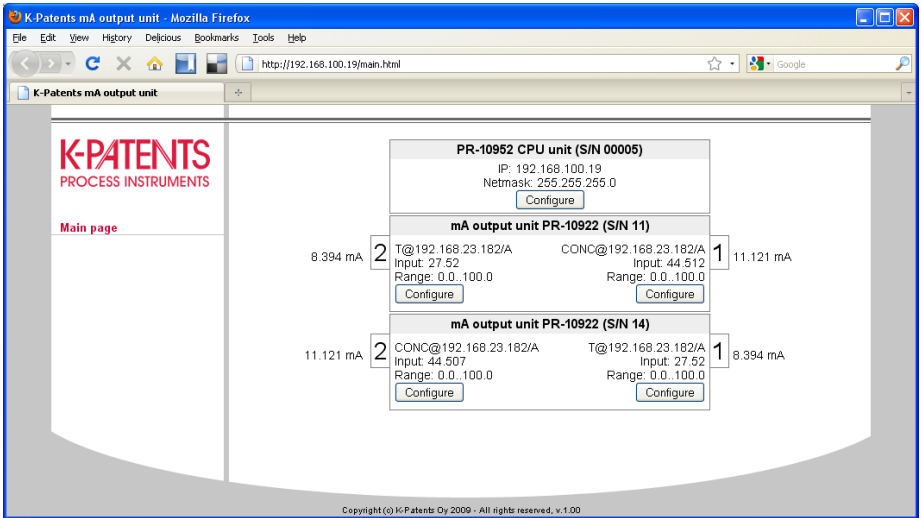


Figure 3.1 mA output unit homepage



Figure 3.2 IP address settings

3.1.1 Recommended settings for a single sensor with one mA output unit

If there is only one instrument and only one mA output unit, the easiest way to configure the network is to use the default addresses of the CPU unit and the PR-33 (or PR-23) in the zeroconf network (169.254.x.x) The settings should be as follows:

- **Instrument IP:** 169.254.23.33 (N.B. if the instrument is a PR-33, this is the default address and does not require any configuration)
- **mA output CPU IP:** 169.254.23.22 (default IP, no configuration required)
- **Configuration computer IP:** 169.254.x.x (should get configured automatically if there are only one PR-33/23, one CPU unit and one computer in the network).

The IP address of the instrument (169.254.23.33) should be configured to be used as a source for the mA output as explained in section 3.2.

! Warning! This configuration is not possible if there are more than one instrument in the network, or if the instruments are connected to the factory network.

3.1.2 Recommended settings for multiple instruments and outputs

If there are multiple instruments in the network, the default address of the instrument (169.254.23.33) cannot and must not be used, as there would be an address conflict between the instruments.

In this case the network should be configured into a private network. There are several possibilities, but the following addresses can be used without violating the relevant standards:

- **Instrument #1 IP:** 172.23.1.1
- **Instrument #2 IP:** 172.23.1.2
- **Instrument #3 IP:** 172.23.1.3
- **mA output CPU #1 IP:** 172.23.2.1
- **mA output CPU #1 netmask:** 255.255.0.0
- **mA output CPU #2 IP:** 172.23.2.2
- **mA output CPU #2 netmask:** 255.255.0.0
- **Configuration computer IP:** 172.23.3.1
- **Configuration computer netmask:** 255.255.0.0

The configuration above makes it possible to have more than one mA output CPU in the network, as well. One CPU can have up to 4 mA output units (8 outputs). There are no hard limits to the number of instruments or mA outputs in a single Ethernet network.

Note: The computer IP settings need to be changed in order to reach the instruments in this network.

! **Warning!** Mistyping the instrument IP addresses may make them invisible to the network. However, the default IP addresses may be used to recover them.

3.1.3 Sensors and outputs connected to a factory network

Use the addresses supplied by the local network administrator.

3.2 mA output settings

All mA outputs in the system can be set independently to indicate the concentration, temperature or a number of diagnostic values. The values can be taken from any instrument in the same network regardless of its type (PR-23 or PR-33) or number of instruments in the network. Two or more inputs may specify the same instrument as the source.

The configuration is carried out through the system homepage by clicking on the “Configure” button of the chosen output (see Figure 3.3).

There are three items to be configured for an output: source, parameter, and output range. The source requires the IP address of the (source) instrument. If the output is connected to a PR-33, always select “PR-33/PR-23 ch A”; for a dual-sensor PR-23, you can select either channel A (= sensor A) or channel B (= sensor B).

The output parameter can be selected from a drop-down list.

The output range is specified by selecting the zero value (at this value the output is set to 4 mA) and the span value (the output is at 20 mA when the parameter is at zero+span).

After setting the values, please remember to save them by clicking on the “Save changes” button (Figure 3.4). Then press the “Reload Parameters” button that appears on top of the instrument homepage (Figure 3.5).

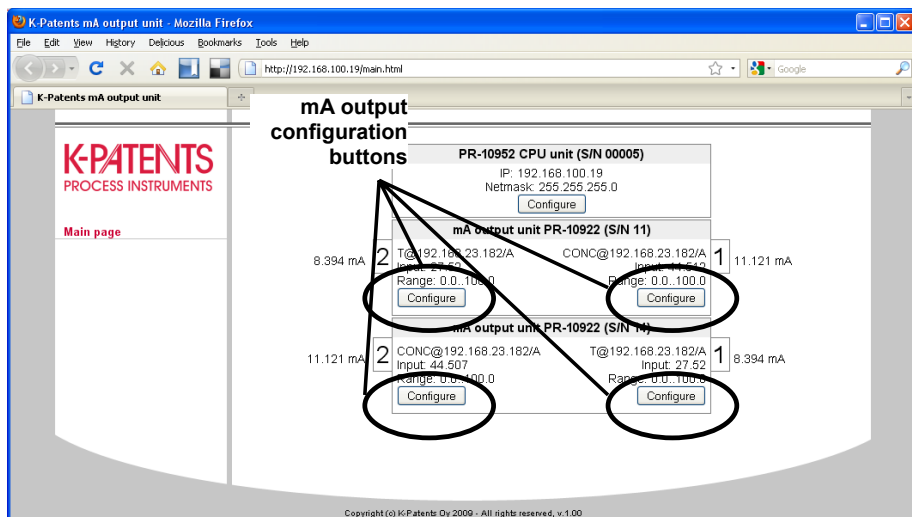


Figure 3.3 Location of mA output configuration buttons

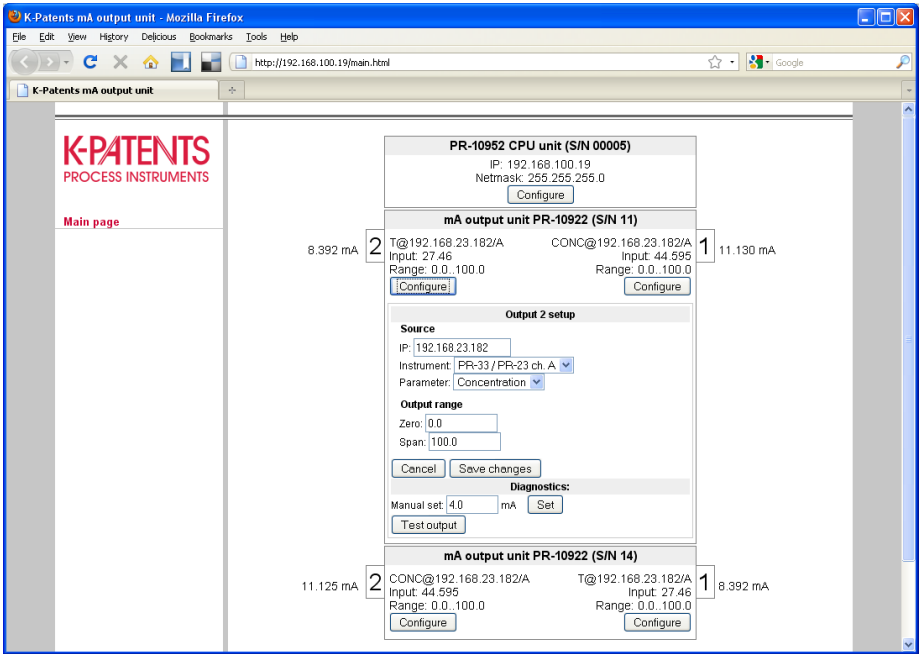


Figure 3.4 mA output settings

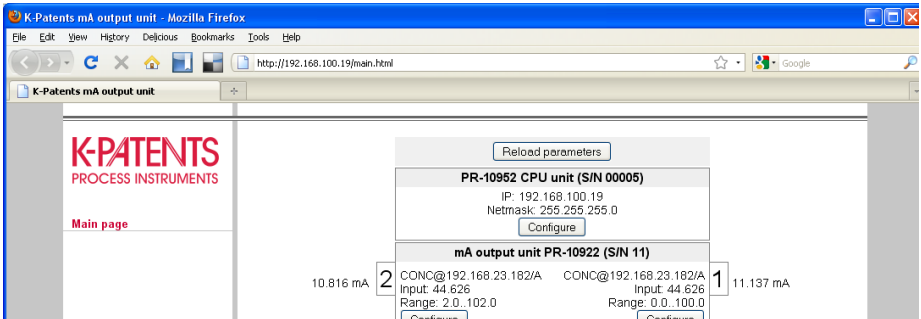


Figure 3.5 The “Reload parameters” button, only available after parameters have been changed.

3.3 Troubleshooting

If the mA output does not function as expected, the main troubleshooting tool is the instrument web page (Figure 3.1).

If the output current seems wrong, please check the parameter value and the mA value for the output. Both values are visible on the page. Also the source is shown as a string. For example, T@192.168.23.182/A means that the output parameter is temperature (T), and the IP address of the instrument from which the signal comes from is 192.168.23.182. The /A indicates that either a PR-33 sensor is used or the source is sensor A in a PR-23 system.

If a physical fault in an output is suspected, the output test functionality can be accessed under the configure button (Figure 3.4). “Manual set” can be used to set the output to a fixed value between 0 and 25 mA. Clicking on the “Test output” button starts alternating the output current between 4 and 20 mA at a period of a few seconds.

4 mA output unit specifications

A complete system of two mA outputs requires one CPU unit (PR-10952) and one mA output module (PR-10922). This system can be expanded to up to 8 mA outputs by adding mA output modules (4 maximum per one CPU).

4.1 PR-10952 CPU unit

Form factor	DIN rail mountable
Dimensions (excl. wiring)	90mm x 60mm x 35mm (HxLxW)
Connections	
Power input	24 V DC (< 1 A)
Data and configuration	100BaseT Ethernet, RJ-45 connector (standard Ethernet) K-Bus output for mA modules
Configuration	Configuration through the Ethernet connection with a laptop and a web browser

4.2 PR-10922 mA output unit

Form factor	DIN rail mountable
Dimensions (excl. wiring)	90mm x 60mm x 18mm (HxLxW)
Connections	K-Bus input and output for connections to the CPU and other mA modules 2 current outputs (4–20 mA)
mA output specifications	Galvanically isolated, 4–20 mA Compliance up to 1 kohm load (20 V maximum voltage)
Absolute accuracy	Better than 0.1 % of range (± 0.016 mA)
Configuration	A mA output can be assigned (via CPU) to any PR-33 or PR-23 in the same Ethernet network Any output can be configured to indicate concentration, refractive index, temperature, or a number of diagnostic values

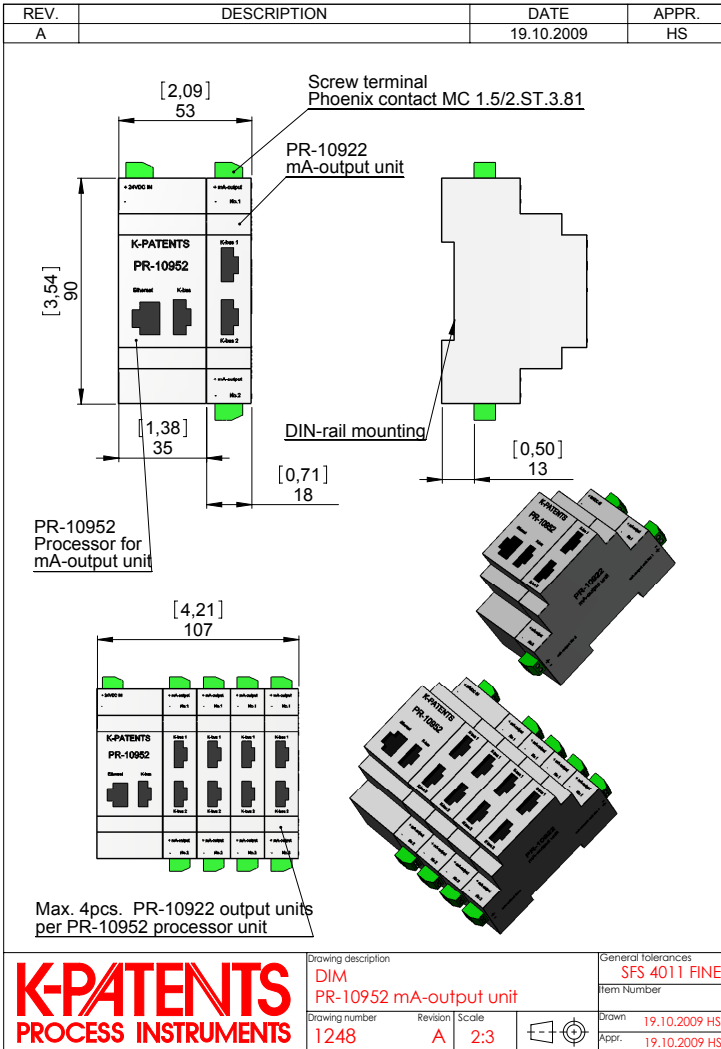


Figure 4.1 mA output unit dimensions

K-PATENTS OY

P.O. BOX 77
FI-01511, VANTAA, FINLAND
TEL. +358 207 291 570
FAX +358 207 291 577
INFO@KPATENTS.COM

K-PATENTS, INC.

1804 CENTRE POINT CIRCLE, SUITE 106
NAPERVILLE, IL 60653, USA
TEL. (630) 955 1545
FAX (630) 955 1585
INFO@KPATENTS-USA.COM