C-mac product catalogue

Programmable converters

Current-voltage- and frequency monitoring

Temperature, speed, logic and preselection

Current, voltage and temperature converters

Speed, weight and pressure converters, temperature transmitters

Level monitoring relays

Single and multirange timers

Panel and wall instruments, test instruments

Click on the different groups to find more informations

Current transformers Various sensors

1- and 3-phase and load monitoring relays

Comadan Produktion a/s

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Power supplies

C-mac programmable converters

The C-mac programmable converters are used to convert various kinds of non-standard electrical signals to standard engineering units (0-20 mA, 4-20 mA or 0-10 V signals) In addition, tha units are also available with pulse outputs.

All units gives a galvanic isolation between suppy, inputs and outputs, thereby ensuring a safe isolation between the process control equipment and the external environment.

The programming of the units is extremely user friendly and simple.

The programming software can be downloaded to your PC, by cliking here: **DOWNLOAD PROGRAMMING SOFTWARE**

PCV10:

3 current and 3 voltage inputs, ranges between 20 µA and 10 A or 20 mV and 1000 V AC or DC (true RMS monitoring).

Frequency monitoring between 0.001 Hz and 5 kHz.

PMR10:

Temperature inputs from RTD or thermocouple sensors, resistor and potentiometer inputs, pulse inputs from proximity sensors.

PPV10:

1-phase and symmetrical 3-phase power monitoring, power direction and phase angle monitoring.

Click on the selected type to see detailed datasheet

On each datasheet, click on Comadan Produktion to return to this sheet

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C-mac fixed converters

These C-mac converters are used to convert non-standard current, voltage and temperature signals to standard engineering units (0-20 mA, 4-20 mA or 0-10 V signals).

LC10, LV10, LM30 and LM50 units

Common specifications:
AC or DC supply, analogue current and voltage outputs, input/output isolation, one or two independant units in each housing, optional 2 relay outputs.

LC10, LV10, LM30 and LM50:

AC or DC current input, 4 standard ranges

DC voltage input, 5 standard ranges

PT100 temperature input, 4 standard ranges

Resistor or potentiometer input, 5 standard ranges

LC24:

Double loop-powered isolation amplifier.
Input 4-20 mA, output 4-20 mA.
Up to 4 amplifiers in the same housing.

S-units

Common specifications:
Supply 15-30 VAC/DC, analogue current or voltage output.

SM31/SM32:

Single- or double channel temperature converter.

SM33/SM34:

Single or double channel temperature converter with isolation from input to output.

SC31:

Isolation amplifier, selectable ranges.

SC22:

Double isolation amplifier.
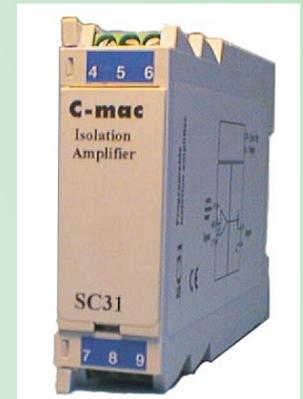
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C-mac fixed converters

These C-mac converters are used to convert various kinds of non-standard electrical signals to standard engineering units (0-20 mA, 4-20 mA or 0-10 V signals).

LR10:
Tachometer converter, 16 selectable ranges
NPN, PNP and voltage input
Analogue or double relay output

TL721 / TL722:
Programmable weight transmitter
Connection for 1-8 load cells
Standard analogue outputs
Possibility for RS485 or CAN
With or without display

TP701 / TP702:
Programmable pressure transmitter
Metering range 350 or 10 mbar
Standard analogue outputs
Possibility for RS485 or CAN
With or without display

FPA90:
3-phase power converter.
Up to 3 x 460 VAC / 80 A.
Current, voltage and pulse output.

TT22:
Programmable top-hat transmitter
Loop-powered Pt100 transmitter.

Click on the selected type to see detailed datasheet

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C-mac instruments

Panel instruments.

DP510:
Miniature display, 24 x 48 mm front.
Current or voltage input.

DM350:
Current or voltage input, supply for external sensor, AC supply.

DMP350:
Current, voltage or temperature input, supply for ext. sensor, AC or DC supply

DCL 35:
Loop-powered LCD instrument, 4-20 mA input, display range adjustable +/- 1999

DP5X family:
Current and voltage inputs, various dimensions, red or green display.

LPP420 and GP422:
LCD display with backlight, range +/-3999.

AP560:
Selectable bar or dot display, 60 points.

DTF199 / DTX199:
3 1/2 digit wall instrument
25 or 100 mm digit height.
Current, voltage or temperature input.

DP570:
Differential pressure instrument

DP571:
4-digit weight instrument

Programmable panel instrument.

DP545:
4-digit display. 2 relay outputs.
Analogue output.
Several input possibilities.

DPP451:
4½-digit LCD display with backlight.
2 relay +digital and analogue outputs.
Extremely many input possibilities.

DC470
3½ digit speed indicator,
2 relay outputs

Test instrument / calibrator.

MS4201:
Supplies and monitors current and voltage signals.
Both sink and source function.

Click on the selected type to see detailed datasheet

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C-mac 1- and 3-phase relays

Monitoring relays series FP.

DIN-rail mounting
Monitors its own 3-phase supply, 1-pole relay output

FP30:
Combined under- and over voltage relay
Fixed reaction delay and adjustable setpoint.

FP31:
Phase sequence / phase asymmetry relay
Fixed reaction delay and adjustable setpoint.

FP34:
Combined sequence / under- and over voltage relay
Fixed reaction delay and adjustable setpoint.

FP35:
Combined under- and over voltage relay
 Fixed setpoints and adjustable reaction delay.

Programmable 3-phase relay.

PPR10:
Monitoring of all static and dynamic parameters.
Programmable functions, ranges and delays.
2 independent relay outputs.

Monitoring relays series RP.

11-pole plug-in mounting, monitors its own supply
1- or 2-pole relay output

RP10:
1-phase supply monitoring

RP31:
3-phase asymmetry monitoring

RP32:
3-phase phase-sequence /phase breaking unit

RP33:
3-phase level monitoring

Load monitoring relays.

RP81:
3-phase load guard (cos φ)

RP91:
1- or 3-phase power guard (U x I x cos φ)

FPD93:
1- or 3-phase power guard / load monitor

MP92
3-phase load torque monitor

Click on the selected type to see detailed datasheet

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# C-mac Current, voltage and frequency monitoring relays

Current and voltage monitoring relays
RC30 and RV30
11-pole plug-in mounting
3 metering inputs in each module
Automatic AC/DC monitoring
Setpoint and delay adjustment
4 selectable relay- and delay functions
1-pole relay output

Current and voltage monitoring relays
RC15 and RC20
RC15: AC input   RC20: DC input
11-pole plug-in mounting
Relay inversion
1- or 2-pole relay output

RV20
DC monitoring
11-pole plug-in mounting
Relay inversion
1- or 2-pole relay output

Digital limit switch for current and voltage signals
RM15
2- or 3-digit setpoint selection
11-pole plug-in mounting
Relay inversion
1-pole relay output

Frequency relay
RF20
Monitoring of supply frequency
Adjustable bandwidth +/- 0.5 Hz to +/- 5 Hz
Selectable reaction delay
1- or 2-pole relay output

Click on the selected type to see detailed datasheet

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C-mac Level monitoring relays

C-mac level relays, series RL, are made for monitoring and control of the level in conductive liquids.
The level is monitored by 1 or 2 electrodes in the liquid.

RL10: Universal relay for filling or emptying

RL11: Level relay for emptying

RL12: Level relay for filling

1 or 2 sensor levels

Adjustable sensitivity

1- or 2-pole relay output

Click on the selected type to see detailed datasheet

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C-mac Temperature, speed, preselection and logic relays

Temperature relay
RM34
Monitoring relay for Pt100 sensor
4 metering ranges in one module
Adjustments for setpoint and time delay
Selectable range, relay inversion and time delay
Cable resistance compensation
1- or 2-pole relay output

Pulse divider / preselection relay
RD53
Digital adjustment between 2 and 999
Pulse inputs for contact, NAMUR or NPN transistor.
Transistor output for connection to "slave module"
1-pole relay output

Tachometer relay
RR10
3 metering ranges, from 10 rpm. to 20.000 rpm.
Adjustable start-up delay, from 0 to 10 seconds.
Universal pulse inputs for contact, NPN/PNP sensor, Namur sensor, etc.
Selectable latch function.
1-pole relay output.

Logic relays
**RD11, RD15, RD16, RD17 and RD18**
RD11: Flip-flop relay with phase-neutral or ph-ph supply.
RD15 and RD16: Flip-flop relay with or without memory.
RD17 and RD18: Bistable relay with or without memory.

RD20
Amplifying relay for external sensor.
Applicable for NPN, PNP and NAMUR sensors
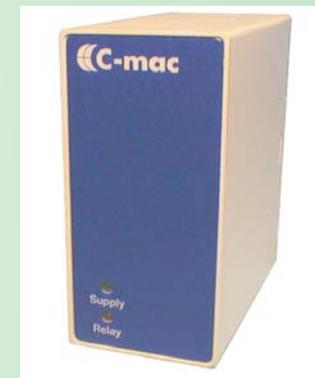
Click on the selected type to see detailed datasheet

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C-mac Timers
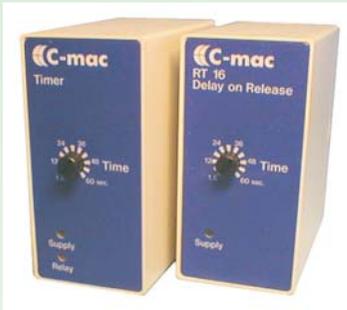
Automatic timers
RT10, RT12, RT14, RT15 and RT16
Timing function controlled by the supply connection
RT10: Delay on operate
RT12: Interval timer
RT14: Symmetrical recycler
RT15: One-shot timer
RT16: Delay on release
1- or 2-pole relay output
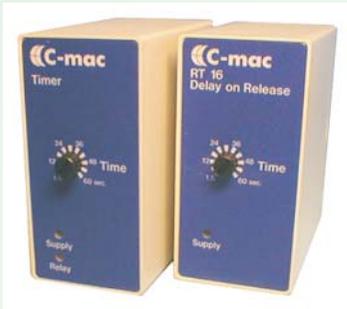
Externally controlled timers
Delay on operate timers type
RT10.6, RT10.7 and RT10.8
Interval timers type
RT12.6, RT12.7 and RT12.8.
Timing function controlled by external commands.
Time ranges from 0,08 seconds to 10 hours.
1- or 2-pole relay output.

Star/delta relay RT18
Timing relay for star-delta switches
Automatic start
4 time ranges from 0,4 sec. to 10 min.
Time adjustment on built-in potentiometer
1-pole relay output with neutral centre position
100 msec. fixed neutral time
Phase-neutral or phase-phase supply voltage

Multifunction timers
RT20 and RT31

RT20: 4 functions in the same unit:
Delay on release, delay on operate,
interval timer and symmetrical recycler.

RT31: Asymmetrical recycler, 4 different
funtcions.
16 time ranges/combinations in the same unit.
1- or 2-pole relay output.

Multirange timers
RT40 and RT41

RT40: Universal pulse continuity module
Automatic start or start at first pulse
With or without latch function

RT41: Delay-ON / delay OFF function in
one module

16 time ranges/combinations in one unit
Inputs for many sensor types
1-pole relay output

Click on the selected type to see detailed datasheet

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C-mac Power supplies

Supply, series SF

Linear controlled power supplies.
4variants, from 24 VDC / 2,5 A to 24 VDC / 10 A.
Short-circuit and overload protected.
Aluminum base-plate.
Max. ripple 3,5 mV RMS.
LED indication

Supply, series PSD

Switch-mode supply.
Output 24 VDC
PSD18, max. load 0.75 A
PSD30, max. load 1.25 A
PSD60, max. load 2.50 A
PSD120, max. load 5.00 A
Short-circuit and over-load protected.
Supply voltage 90 - 265 VAC.
DIN-rail mounting.

Click on the selected type to see detailed datasheet

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C-mac Sensors and transformers

Temperature sensors.

Pt100 or T/C sensors.

For wall mounting, with cable
or with B-head

Current transformers with
built-in control electronics

Selectable metering ranges

Current switches with DC output,
max 150 mA or 500 mA,
or AC output, max 1 A.

Current sensors with 4-20 mA output

Humidity sensor HS14
Internal sensor (wall mounting)
or immersion tube.
18-30 VDC supply,
analogue current or voltage output.

Humidity and temperature sensor HS16
2-wire loop-powered monitoring of
humidity and temperature.
4-20 mA current consumption proportional
to humidity and temperature.
Internal sensor (wall mounting)
or immersion tube.
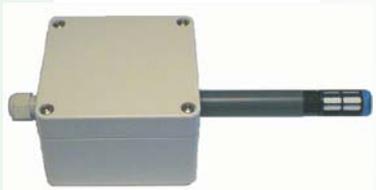
Pressure sensors
DC51 and DC66
Loop-powered 4-20 mA
Standard ranges up to 500 mm H2O

Wind speed and wind direction
DWC-INA and DWC-VXV
Brass housing, suitable for offshore

Click on the selected type to see detailed datasheet

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C-mac Programming software

With the C-mac programming software you can test the different possibilities of the programmable converters, no matter if you have the interface unit or not.

If you want to program the units, you must have a C-mac interface unit, which is connected to the PC on one of the serial outputs.

If you want to download the software, you must exit this program, and start the file:
SETUP.EXE in the directory NEWSOFT.

Click here to **RETURN TO MAIN MENU**

AC/DC current inputs from 15 µA to 10 A

AC/DC voltage inputs from 10 mV to 1500 V

Frequency monitoring up to 5 kHz

Analogue or pulse outputs

Galvanic separation, supply - input - output

DC supply or AC supply voltages up to 400 VAC

Made in accordance with the CE and EMC regulations

PCV10 is a multirange converter / isolation amplifier with current, voltage and pulse inputs and current, voltage, pulse or relay outputs.

The unit is supplied with 3 current and 3 voltage input connections, which makes it possible to program any input range between 15 µA and 10 A or 15 mV and 1000VAC/1500 VDC. With DC-inputs it is possible to monitor both positive and negative signals.

With AC inputs the converter monitors the RMS value of the signal, which means the signals are converted without any errors, no matter which shape they have.

The unit can also be programmed with frequency input, where the same input connections are used. The frequency of the input signal is then monitored instead of the analogue level.

You can select between 2 different output configurations:

- Type A is supplied with analogue current output, programmable between 0 and 20 mA and analogue voltage output, programmable between -10 and +10 V.

- Type B has the same outputs as type A, but in addition it is also supplied with pulse output, programmable to a maximum frequency of 10 kHz.

The unit is supplied with 2 trimming potentiometers, which can be used to fine-adjust the metering range, if the unit is used with analogue outputs. In either case the potentiometers can be disabled and fixed values selected, if adjustment is not required.

If you want, you can order the unit with specified metering ranges, or you can program it yourself, by means of the C-mac programming software for PC and a small interface to connect between the PC and the module.

All parameters in the converter are programmable within the specified limitations (min. and max. input and output levels), giving the following possibilities:

- **Basic converter, (0 to defined input range and standard output range, 0-20 mA, 4-20 mA or 0-10 V).**
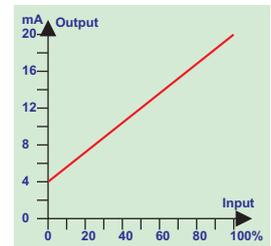
- **Converter with input and/or output offset, e.g. 12 to 50 VDC input and 8 to 15 mA output.**
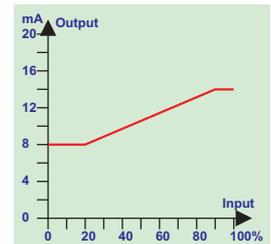
- **Bidirectional input range (only DC inputs), e.g. -50 to +300 mA.**
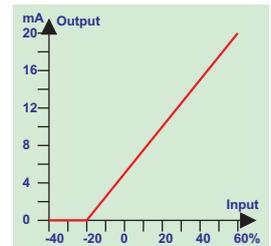
- **Bidirectional output range (only voltage output), e.g. -10 to +10 V.**
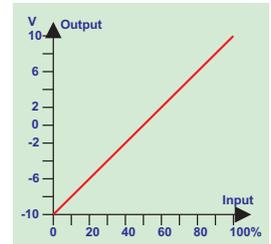
- **Inverted function with or without offset, f.inst 150 to 20 VAC input and 4 to 20 mA output.**

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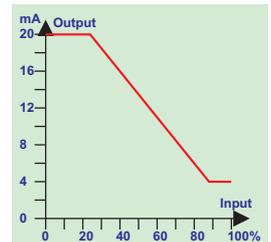
PCV10 connections:

Supply voltage.

terminal 15 and 16

Inputs.

1: input common
2: 10 AAC/DC
3: 207 mAAC/292 mADC
4: 5,8 mAAC/8,2 mADC
5: 0,8 VAC/1,1 VDC
6: 27 VAC/39 VDC
8: 1000 VAC/1500 VDC

Outputs, type PCV10-A and PCV10-B.

 9: output common
10: current output
11: voltage output
12: pulse output (type PCV10-B only)

## Connection drawings:

Supply voltage, AC

Supply voltage, DC

Pulse outputs type PCV10-B only):

NPN output.
Eksternal load:
max. 30 V / 30 mA
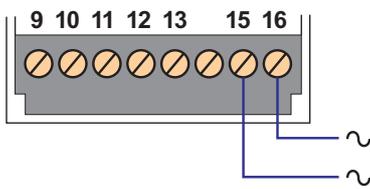
Current inputs:

High, max. 10 A AC/DC
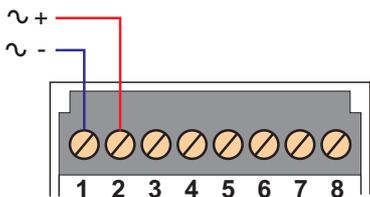
Medium, max. 207 mA AC
292 mA DC

Low, max. 5,8 mA AC
8,2 mA DC

Voltage inputs:

High, max.
1000 VAC / 1500 VDC

Medium, max.
27 VAC / 39 VDC

Low, max.
0,8 VAC / 1,1 VDC

PNP output.
Eksternal load:
max. 30 V / 30 mA

Pulse output.
$V_{out} = 10$ V
$R_{out} = 2$ kΩ
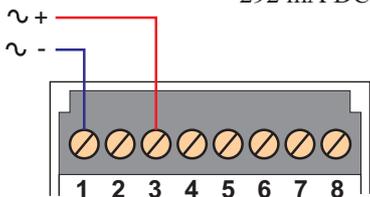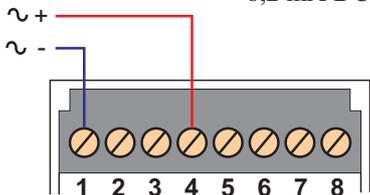
Analog current output:

Programmable ranges
between 0 and 20 mA

Com
+ (mA)
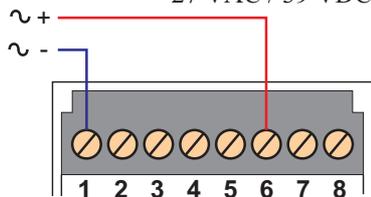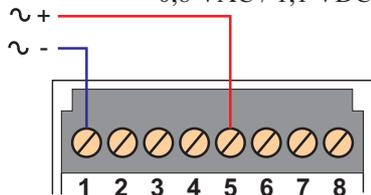
Analog voltage output:

Programmable ranges
between -10 and +10 V

Com
+/- (V)

1-2

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Mechanical dimensions:

70,0

1 2 3 4 5 6 7 8

C-mac

● Supply

Programmable converter

9 10 11 12 13 | 15 16

45,0

117,0

Materials:

Housing base:	CYCOLOY C2100, grey
Frontplate:	CYCOLOY C2100, grey
Terminal cover:	CYCOLOY C2100, black
Terminals:	nickel plated brass
Screws:	nickel plated iron
Weight:	350 g

Programming connections and adjustments:
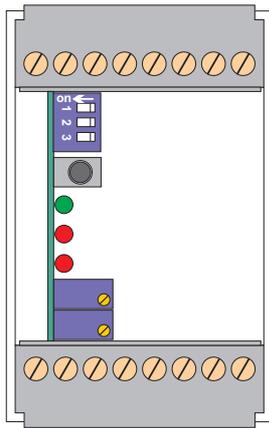
Programming connector CON.

Connects to the PC via C-mac interface cable.

The interface unit is internally battery powered, which means it is not necessary to connect any external supply voltage to the PCV unit during programming.

Function selector switch DS.

1 OFF: Normal mode
1 ON: Programming mode
2 OFF: Disable P1 adjustment
2 ON : Enable P1 adjustment
3 OFF: Disable P2 adjustment
3 ON : Enable P2 adjustment

Potentiometers P1 and P2.

PCV10-A and PCV10-B:

P1 =   Offset fine adjust +/- 5%

P2 =   Span fine adjust +/- 5%

PCV10 programming.

It is possible to program and reprogram the unit at any time, no matter if the supply voltage is connected or not. If the program is modified while the unit is installed and in operation, all input signal conversions are disabled and the output will not update as long as DS 1 is ON. Programming of the unit is made by following the instructions in the C-mac programming software.The unit starts with the modified program as soon as DS 1 is switched back to OFF position.

Fine adjustments with potentiometer 1 and 2.

In order to avoid unwanted modifications of the programmed ranges and to ensure a good temperature stability it is only possible to fine-adjust the programmed metering ranges if you use the following procedure:

When you have a known and stable input signal, you set switch 2 or 3 ON, for P1 or P2 adjustment, respectively.When the switch has been activated for minimum 2 seconds, the supply LED extinguishes and the output signal changes to the value, which corresponds to the actual position of the potentiometer. Now you adjust the output signal to the wanted value, and then you set the switch back in OFF position. The modified range is now programmed, and the power LED is ON again. If you want to adjust the ranges again, you set the switch back in ON position, wait for the LED to extinguish, adjust on the potentiometer, and set the switch back in OFF position.

Please notice, that it is only possible to adjust on one of the potentiometers at a time, i.e. you cannot set both switch 2 and 3 ON simultaneously.

Reset to the programmed settings.

If you have fine-adjusted the programmed ranges, and you want to reset to the original settings, you use the following procedure:Set switch 2 or 3 ON, depending on which of the ranges you want to reset.Wait for the supply LED to extinguish.Set switch 1 ON, and reset switch 2 or 3 to OFF position.Set switch 1 OFF again. Now the selected range has been reset, and you can repeat the procedure on the other range, if you want.

Comadan Produktion a/s

1-3

Technical data:

Supply voltage AC: 24, 115, 230 and 400 VAC +/- 10%

Supply frequency: 40-70 Hz

Supply voltage DC: 12-50 VDC

Isolation voltages: Supply - internal electronics: 3,75 kV
Input - output: 2.5 kV

Power consumption: 6 VA

Operation temp.: -20°C to +60°C

Humidity: 0-90% RH, non condensing

Temp. coefficient: < 0.003% /°C

EMC data.

Emission: EN 50 081 - 1

Immunity: EN 50 082 - 2

Safety: EN 60 730 - 1

Approvals. The module is produced in accordance with CE and high voltage regulations.

Speed and accuracy.

Conversion speed:
AC input (50 Hz): in - out delay: 150 msec
DC input in - out delay: 20 msec.

Accuracy: better than 0,2%, except at 10 A range
at I_{in} > 5 A: accuracy better than 1%

Linearity: better than 0.02%

Resolution: Between 0,037% and 0,1%, dependent on the programmed metering range. If the unit is programmed with input and/or output offset, the resolution will be reduced proportionally. In either case the actual resolution is informed, when the unit is programmed.

Indications:
Green LED: Steady light = supply ON
Flashing = programming mode

Outputs.

Current output: Terminals 9-10, programmable from 0 to 20 mA.
Max. external load: 500 Ω

Voltage output: Terminals 9-11, programmable from -10 to +10 V.
Min. external load: 1000 Ω

Pulse output: Terminals 9-12, programmable NPN, PNP or active output.
NPN and PNP: Max. external voltage: 30 VDC
Max. load: 30 mA
Active output: Vout = 10 V
Rout = 2 kΩ
Min. load resistance: 10 kΩ

Out of range: If the input signal is above or below the specified range, the output signal can move up to 5% above or below the specified output range. If wanted, this function can be disabled.

Current inputs:
Terminals 1-2: Metering ranges (DC) 290 mA to 10A
Rin = 10 mΩ
Max. inrush current (10 sec): 20 A
Terminals 1-3: Metering ranges (DC) 8 mA to 290 mA
Rin = 2.7 Ω
Max. inrush current (10 sec): 1 A
Terminals 1-4: Metering ranges (DC) 15µA to 8 mA
Rin = 55 Ω
Max. inrush current (10 sec): 130 mA

Voltage inputs:
Terminals 1-5: Metering ranges (DC) 15 mV to 1.1 V
Rin = 4.2 kΩ
Max. voltage (10 sec): 60 V
Terminals 1-6: Metering ranges (DC) 1.1 V to 38 V
Rin = 270 kΩ
Max. voltage (10 sec): 220 V
Terminals 1-8: Metering ranges (DC) 38 V to 1500 V
Rin = 10 MΩ
Max. continuous voltage: 1800 V
Max. voltage (10 sec): 2000 V

AC input, current or voltage:
Input frequency: 5 - 420 Hz

Frequency inputs:
If the unit is programmed to monitor the frequency of the input signal, the normal current or voltage inputs are used. Because the pulses are detected at a level very close to zero, it is only recommended to use the frequency option, if the input signal comes from an AC source.
During programming you select the input which corresponds to the actual current- or voltage level.

Panel mounting.
If several modules are placed beside each other in a control panel, there must be a minimum distance of 5 mm between each module.

Ordering guide.

1. Basic units without range programming.

PCV10-x-yyy

x = Output configuration.
A: Current and voltage output
B: Current, voltage and pulse output

yyy = Supply voltage.
024 = 24 VAC   115 = 115 VAC
230 = 230 VAC   400 = 400 VAC
712 = 12-50 VDC

2. Converters included range programming.

When the modules are ordered with programmed ranges, the same ordering numbers are used to specify the basic unit, but in additon, the wanted ranges must be specified, as shown on the examples below:

e.g. 1: PCV10-A-230 In: 0-85 VAC Out: 4-20 mA

e.g. 2: PCV10-B-024 In: 0-100 mADC Out: -10 to +10 V
Pulse out: NPN, 0-600 p.p.m, pulse width 20 msec.

Comadan Produktion a/s

C-mac®

Temperature inputs from RTD or thermocouple sensors

Potentiometer or variable resistor inputs

Sensor supply for NPN, PNP, NAMUR and analogue inputs

Analogue or pulse outputs

Galvanic separation, supply - input - output

DC supply or AC supply voltages up to 400 VAC

Made in accordance with the CE and EMC regulations

PMR10 is a multirange converter / isolation amplifier with temperature, resistance, pulse and analogue inputs and current, voltage, pulse or relay outputs.
The unit has a number of programmable input functions:

Temperature monitoring with 3-wire RTD sensors Pt100, Pt500; Pt1000, Ni100, Ni500 and Ni1000, including sensor cable monitoring.

Temperature monitoring with thermocouple sensors type J (Fe-CuNi), type K (NiCr-Ni), type R (Pt13%Rh-Pt), type S (Pt10%Rh-Pt), type T (Cu-CuNi), type B (Pt30%Rh-Pt6% Rh), type N (Nicrosil-Nisil) or type E (NiCr-CuNi).
When the unit is programmed for thermocouple sensor, you can select between internal Cold Junction Compensation and external CJC-box, which gives a higher accuracy.No matter which type of temperature sensor is used, the unit will compensate for the unlinearity of the sensor.

Potentiometer monitoring. If this function is selected, the output signal will indicate the actual position of the potentiometer, independent of the total value of the potentiometer.

Resistor monitoring. With resistor monitoring the output signal is an expression of the actual value of the resistor, compared with the programmed metering range.

Speed monitoring with programmable inputs from NPN, PNP or NAMUR sensors, including supply voltage for the sensor.

Input signals from analogue transducers, including supply voltage for the transducer.

You can select between 2 different output configurations:

- Type A is supplied with analogue current output, programmable between 0 and 20 mA and analogue voltage output, programmable between -10 and +10 V.

- Type B has the same outputs as type A, but in addition it is also supplied with pulse output, programmable to a maximum frequency of 10 kHz.

The unit is supplied with 2 trimming potentiometers, which can be used to fine-adjust the metering range, if the unit is used with analogue outputs. In either case the potentiometers can be disabled, if the adjustment possibility is not wanted.

If you want, you can order the unit with specified metering ranges, or you can program it yourself, by means of the C-mac programming software for PC and a small interface to connect between the PC and the module.

All parameters in the converter are programmable within the specified limitations (min. and max. input and output levels), giving the following possibilities:

- **Basic converter, (0 to defined input range and standard output range, 0-20 mA, 4-20 mA or 0-10 V).**
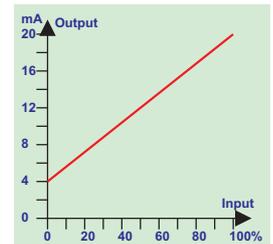
- **Converter with input and/or output offset, e.g. 10 to 50 °C input and 8 to 15 mA output.**
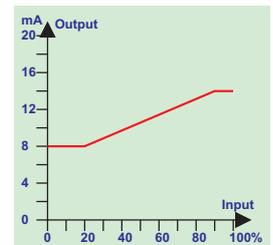
- **Bidirectional output range (only voltage output), e.g. -10 to +10 V.**
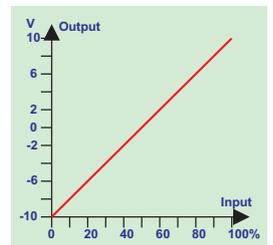
- **Inverted function with or without offset, e.g. 150 to 20 S input and 4 to 20 mA output.**

Comadan Produktion a/s
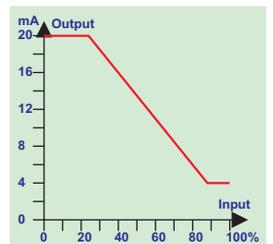
PMR10 connections:

Supply voltage.
terminal 15 and 16

Inputs.
1: sensor cable monitor
2: current input
3: voltage input
4: sensor current out
5: NPN/PNP input
6: transducer supply out
7: NAMUR supply
8: input common

Outputs, type PMR10-A and PMR10-B.
 9: output common
10: current output
11: voltage output
12: pulse output (type PCV10-B only)

CC-mac
● Supply
● Relay 1
● Relay 2
Programmable converter

Connection drawings:

Supply voltage:
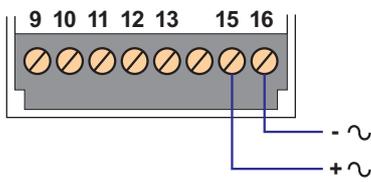
Sensor inputs:

PNP and NPN sensor
* see page 1-7
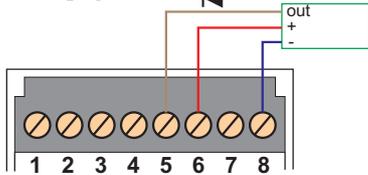
NAMUR sensor
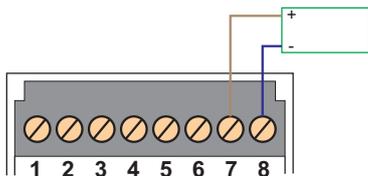
Analogue transducer
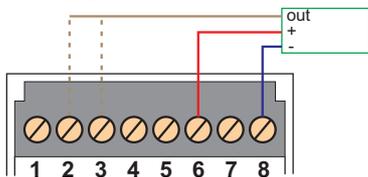
Analogue current output:
Programmable ranges
between 0 and 20 mA

Com
+ (mA)
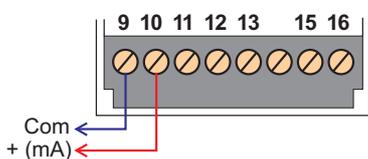
Temperature inputs:

RTD sensor
(Pt or Ni)
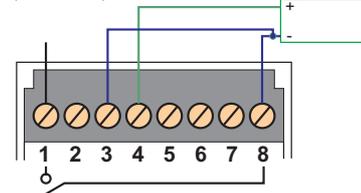
Thermocouple sensor, direct
* see page 1-7
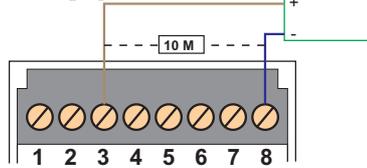
Thermocouple sensor,
external CJC-box
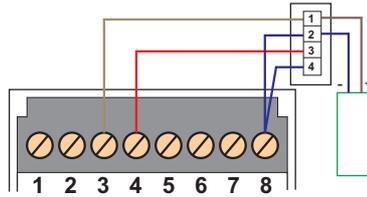
Resistance inputs:

Potentiometer
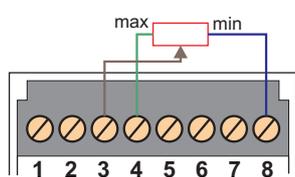
Resistor
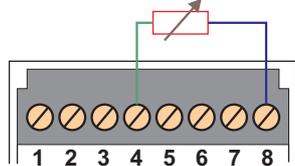
Analogue voltage output:

Programmable ranges
between -10 and +10 V

Com
+/- (V)
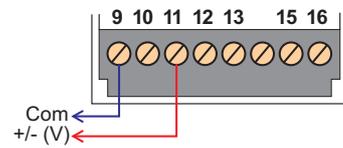
Pulse outputs (type PMR10-B only):
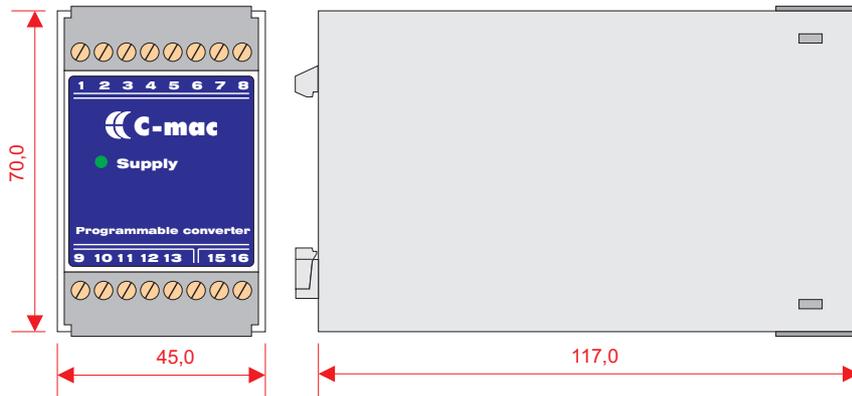
GND
IN

NPN output.
Eksternal load:
max. 30 V / 30 mA

IN
+

PNP output.
Eksternal load:
max. 30 V / 30 mA

-
+

Pulse output.
V_{out} = 10 V
R_{out} = 2 kΩ

1-6

Comadan Produktion a/s

Mechanical dimensions:

70,0

45,0   117,0

Materials:

Housing base:	CYCOLOY C2100, grey
Frontplate:	CYCOLOY C2100, grey
Terminal cover:	CYCOLOY C2100, black
Terminals:	nickel plated brass
Screws:	nickel plated iron
Weight:	350 g

Programming connections and adjustments:
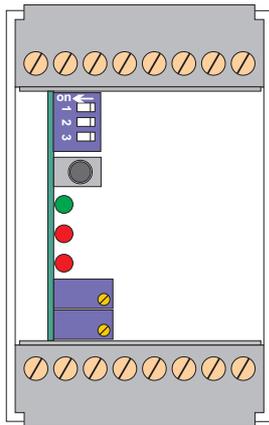
Programming connector CON.

Connects to the PC via C-mac interface cable.

The interface unit is internally battery powered, which means it is not necessary to connect any external supply voltage to the PMR unit during programming.

Function selector switch DS.

1 OFF: Normal mode
1 ON: Programming mode
2 OFF: Disable P1 adjustment
2 ON :   Enable P1 adjustment
3 OFF: Disable P2 adjustment
3 ON :   Enable P2 adjustment

Potentiometers P1 and P2.

PMR10-A and PMR10-B:

P1 =   Offset fine adjust +/- 5%
P2 =   Span fine adjust +/- 5%

PMR10 programming.

It is possible to program and reprogram the unit at any time, no matter if the supply voltage is connected or not. If the program is modified while the unit is installed and in operation, all input signal conversions are disabled and the output will not update as long as DS 1 is ON. Programming of the unit is made by following the instructions in the C-mac programming software.The unit starts with the modified program as soon as DS 1 is switched back to OFF position.

Fine adjustmens with potentiometer 1 and 2.

In order to avoid unwanted modifications of the programmed ranges and to ensure a good temperature stability it is only possible to fine-adjust the programmed metering ranges if you use the following procedure:

When you have a known and stable input signal, you set switch 2 or 3 ON, for P1 or P2 adjustment, respectively.When the switch has been activated for minimum 2 seconds, the supply LED extinguishes and the output signal changes to the value, which corresponds to the actual position of the potentiometer. Now you adjust the output signal to the wanted value, and then you set the switch back in OFF position. The modified range is now programmed, and the power LED is ON again. If you want to adjust the ranges again, you set the switch back in ON position, wait for the LED to extinguish, adjust on the potentiometer, and set the switch back in OFF position.

Please notice, that it is only possible to adjust on one of the potentiometers at a time, i.e. you cannot set both switch 2 and 3 ON simultaneously.

Reset to the programmed settings.

If you have fine-adjusted the programmed ranges, and you want to reset to the original settings, you use the following procedure:Set switch 2 or 3 ON, depending on which of the ranges you want to reset.Wait for the supply LED to extinguish.Set switch 1 ON, and reset switch 2 or 3 to OFF position.Set switch 1 OFF again. Now the selected range has been reset, and you can repeat the procedure on the other range, if you want.

* Special notes:

The counter input (terminal 5) is universal, which means it can be used for both NPN and PNP sensors, but if the sensor is a "push-pull" type (both PNP and NPN output), you must put a diode in series with the sensor output, as it is shown on the connection drawing.

If the PMR10 is used for thermocouple monitoring, and you have a cable breakage on the sensor cable, this will not be indicated on the output, but if you connect a 10 MΩ resistor on the output as shown on the connection diagram, you will ensure, that the output will go to minimum in case of a cable breakage.

Comadan Produktion a/s

Technical data:

Supply voltage AC: 24, 115, 230 and 400 VAC +/- 10%

Supply frequency: 40-70 Hz

Supply voltage DC: 12-50 VDC

Isolation voltages: Supply - internal electronics: 3,75 kV
                        Input - output: 2.5 kV

Power consumption: 6 VA

Operation temp.:   -20°C to +60°C

Humidity: 0-90% RH, non condensing

Temp. coefficient: < 0.003% /°C

EMC data.

Emission: EN 50 081 - 1

Immunity: EN 50 082 - 2

Safety: EN 60 730 - 1

Approvals.   The module is produced in accordance with CE and high voltage regulations.

Speed and accuracy.

Conversion speed: in - out delay: min. 150 msec programmable up to 4 sec.

Accuracy:
RTD sensors: < +/-0,2°C
Thermocouple: with external CJC box: < +/- 2°C internal compensation: < +/- 6°C
remaining ranges: < 0.2%

Linearity: better than 0.1%

Resolution: Between 1/1500 and 1/3000, dependent on the programmed metering range. If the unit is programmed with input and/or output offset, the resolution will be reduced proportionally. In either case the actual resolution is informed, when the unit is programmed.

Indications:
Green LED: Steady light = supply ON
Flashing = programming mode

Outputs.

Current output: Terminals 9-10, programmable from 0 to 20 mA.
Max. external load: 500 Ω

Voltage output: Terminals 9-11, programmable from -10 to +10 V.
Min. external load: 1000 Ω

Pulse output: Terminals 9-12, programmable NPN, PNP or active output.
NPN and PNP: Max. external voltage: 30 VDC
Max. load: 30 mA
Active output: V_{out} = 10 V
R_{out} = 2 kΩ
Min. load resistance: 10 kΩ

Out of range: If the input signal is above or below the specified range, the output signal can move up to 5% above or below the specified output range. If wanted, this function can be disabled.

Inputs.

Input impedances:
Terminal 2-8:   Current input. R_{in} = 122 Ω
Terminal 3-8:   Voltage input. R_{in} = 125 kΩ

RTD sensor:
Terminal 3-4-8:   Metering ranges -100°C to +850°C 3-wire metering with cable comp.
Terminal 1-8:   Sensor cable monitoring output ON, if the cable is OK.
Max. external voltage: 30 VDC
Max. Load: 30 mA

Thermocouple input:
Terminal 3-4-8:   Metering ranges -100°C to +1800°C depending on sensor tyep. In- or external cold junction compensation.

Resistor and potentiometer input:
Terminal 3-4-8:   Ranges from 10 Ω to 10 kΩ

Pulse input:
Terminal 5-6-8:   NPN and PNP sensors. Ranges from 10 pph to 10 kHz.
Sensor supply on terminal 6: 24VDC +5% -15%, max load 20 mA.
Terminal 7-8:   NAMUR sensors. Ranges from 10 pph to 10 kHz. Sensor supply on terminal 7: 8,2 VDC, R_{out} = 1 k.Ω

Transducer input:
Terminal 2-3-6-8: Ranges up to 20 mA or 10 V.
Transducer supply on terminal 6: 24 VDC +5% -15%, max load 20 mA

Panel mounting.
If several modules are placed beside each other in a control panel, there must be a minimum distance of 5 mm between each module.

Ordering guide.

1. Basic units without range programming.

     PMR10-x-yyy

x = Output configuration.
     A: Current and voltage output
     B: Current, voltage and pulse output

yyy = Supply voltage.
     024 = 24 VAC   115 = 115 VAC
     230 = 230 VAC   400 = 400 VAC
     712 = 12-50 VDC

2. Converters included range programming.

When the modules are ordered with programmed ranges, the same ordering numbers are used to specify the basic unit, but in additon, the wanted ranges must be specified, as shown on the examples below:

eks. 1: PMR10-A-230 In: Pt100, 0-200°C, Out: 4-20 mA
eks. 2: PMR10-B-024 In:NPN 20-90 rpm. Out: -10 to +10 V
       Pulse out: NPN, 0-600 p.p.m, pulse width 20 msec.

Comadan
Produktion a/s

1-phase and symmetrical 3-phase power monitoring

Phase angle monitoring

Analogue, pulse or relay outputs

Galvanic separation, supply - input - output

DC supply or AC supply voltages up to 400 VAC

Made in accordance with the $C\epsilon$ and EMC regulations

PPV10 is a programmable multirange converter / isolation amplifier with 1- and 3-phase voltage input, one current input and current, voltage, pulse or relay outputs.

The unit has a number of programmable input functions:

Monitoring of phase angle or power consumption on single phase AC or DC loads.

Monitoring of phase angle or power consumption on symmetrical 3-phase loads.

The unit is supplied with 2 voltage range and 3 current range inputs, in order to achieve the highest possible accuracy.

The unit can operate between 20 and 750 V input voltage and 150 mA to 6 A input current. If the metering current exceeds 6 A, you can use an external current transformer, and in this way it is also possible to monitor very big loads.

The supply voltage for the unit is separated from the metering signal, this is particularly interesting, if there is a big variation of the metering voltages.

You can select between 2 different output configurations:

- Type A is supplied with analogue current output, programmable between 0 and 20 mA and analogue voltage output, programmable between -10 and +10 V.

- Type B has the same outputs as type A, but in addition it is also supplied with pulse output, programmable to a maximum frequency of 10 kHz.

The unit is supplied with 2 trimming potentiometers, which can be used to fine-adjust the metering range, if the unit is used with analogue outputs. In either case the potentiometers can be disabled, if adjustment is not required.

If you want, you can order the unit with specific metering ranges, or you can program it yourself, by means of the C-mac programming software for PC and a small interface to connect between the PC and the module.

All parameters in the converter are programmable within the specified limitations (min. and max. input and output levels), giving the following possibilities:

- **Basic converter (0 to defined input range and standard output range, 0-20 mA, 4-20 mA or 0-10 V).**
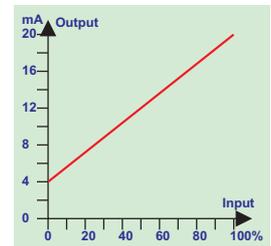
- **Converter with input and/or output offset, e.g. 200 to 800 W input and 8 to 15 mA output.**
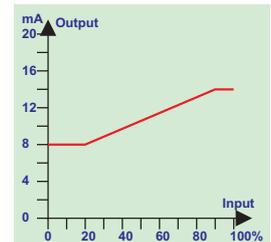
- **Bidirectional input range (phase angle), e.g. -50 to +40 deg.**
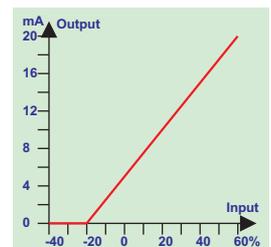
- **Bidirectional output range (only voltage output), e.g. -10 to +10 V.**
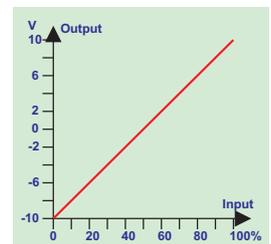
- **Inverted function with or without offset, e.g. 300 to 200 W input and 4-20 mA output.**

Comadan Produktion a/s

1-9
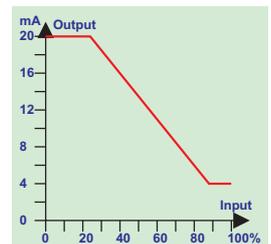
PPV10 connections:

Supply voltage.

terminal 15 and 16

Inputs.

1: voltage input, phase 1, $V_{in} > 75$ V
2: voltage input, phase 1, $V_{in} < 75$ V
3: voltage input, phase 2, $V_{in} > 75$ V
4: voltage input, phase 2, $V_{in} < 75$ V
5: voltage input / phase 3,
   and load current, input
6: load current, output, $I_{max} = 6$ A
7: load current, output, $I_{max} = 3$ A
8: load current, output, $I_{max} = 0,9$ A

Outputs, type PPV10-A and PPV10-B.

9: output, common
10: current output
11: voltage output
12: pulse output only(type PPV10-B)

C-mac
- Supply
- Relay 1
- Relay 2

Programmable converter

Connection examples:

Supply voltage, AC
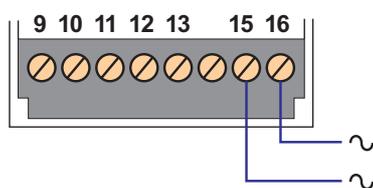
Supply voltage, DC
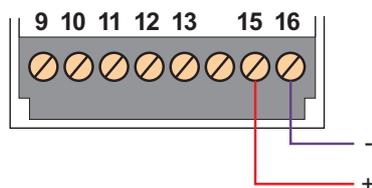
Pulse outputs only(type PPV10-B):
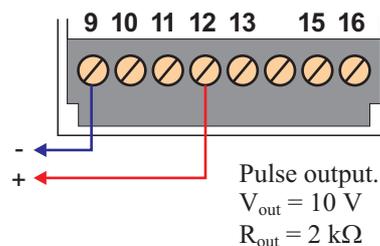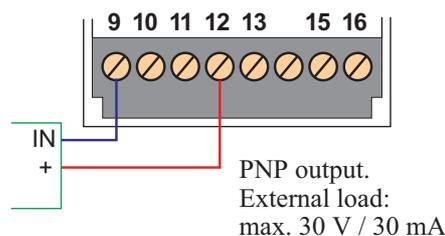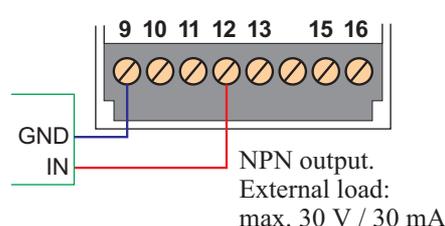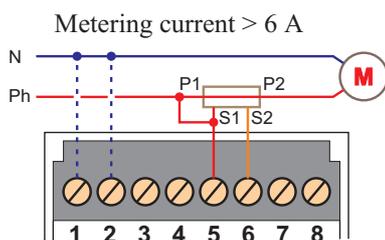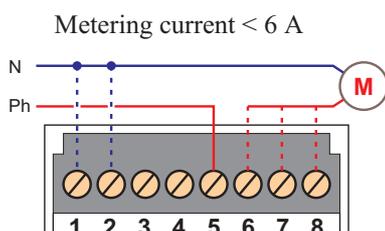
GND
IN

NPN output.
External load:
max. 30 V / 30 mA

Inputs, 1-phase metering:

Metering current < 6 A

Metering current > 6 A

Inputs, 3-phase metering:

Metering current < 6 A

Metering current > 6 A

IN
+

PNP output.
External load:
max. 30 V / 30 mA

-
+

Pulse output.
$V_{out} = 10$ V
$R_{out} = 2$ kΩ
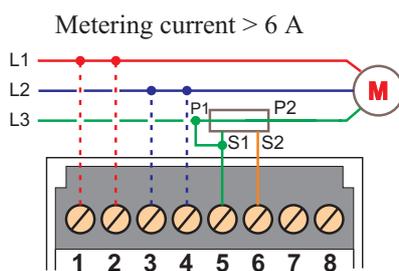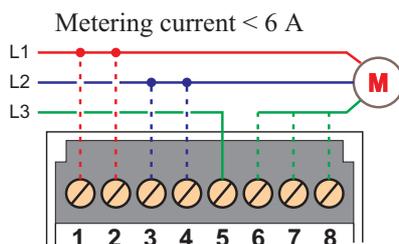
Analogue current output:

Programmable ranges between 0 and 20 mA

Com
+ (mA)

Analogue voltage output:

Programmable ranges between -10 og +10 V

Com
+/- (V)

Comadan Produktion a/s
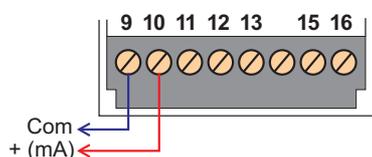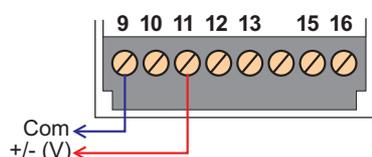
Mechanical dimensions:

Materials:

Housing base:	CYCOLOY C2100, grey
Frontplate:	CYCOLOY C2100, grey
Terminal cover:	CYCOLOY C2100, black
Terminals:	nickel plated brass
Screws:	nickel plated iron
Weight:	350 g

Programming connections and adjustments:
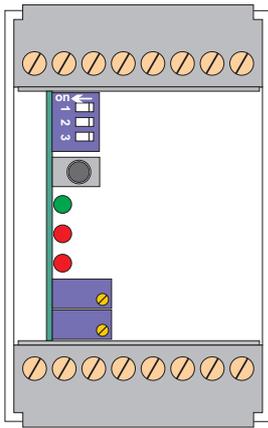
Programming connector CON.

Connects to the PC via C-mac interface cable.

The interface unit is internally battery powered, which means it is not necessary to connect any external supply voltage to the PPV unit during programming.

Function selector switch DS.

1 OFF: Normal mode
1 ON: Programming mode
2 OFF: Disable P1 adjustment
2 ON : Enable P1 adjustment
3 OFF: Disable P2 adjustment
3 ON : Enable P2 adjustment

Potentiometers P1 and P2.

PPV10-A and PPV10-B:

P1 = Offset fine adjust +/- 5%

P2 = Span fine adjust +/- 5%

PPV10 programming.

It is possible to program and reprogram the unit at any time, no matter if the supply voltage is connected or not. If the program is modified while the unit is installed and in operation, all input signal conversions are disabled and the output will not update as long as DS 1 is ON. Programming of the unit is made by following the instructions in the C-mac programming software.The unit starts with the modified program as soon as DS 1 is switched back to OFF position.

Fine adjustmens with potentiometer 1 and 2.

In order to avoid unwanted modifications of the programmed ranges and to ensure a good temperature stability it is only possible to fine-adjust the programmed metering ranges if you use the following procedure:

When you have a known and stable input signal, you set switch 2 or 3 ON, for P1 or P2 adjustment, respectively.When the switch has been activated for minimum 2 seconds, the supply LED extinguishes and the output signal changes to the value, which corresponds to the actual position of the potentiometer. Now you adjust the output signal to the wanted value, and then you set the switch back in OFF position. The modified range is now programmed, and the power LED is ON again. If you want to adjust the ranges again, you set the switch back in ON position, wait for the LED to extinguish, adjust on the potentiometer, and set the switch back in OFF position.

Please notice, that it is only possible to adjust on one of the potentiometers at a time, i.e. you cannot set both switch 2 and 3 ON simultaneously.

Reset to the programmed settings.

If you have fine-adjusted the programmed ranges, and you want to reset to the original settings, you use the following procedure:Set switch 2 or 3 ON, depending on which of the ranges you want to reset.Wait for the supply LED to extinguish.Set switch 1 ON, and reset switch 2 or 3 to OFF position.Set switch 1 OFF again. Now the selected range has been reset, and you can repeat the procedure on the other range, if you want.

Comadan Produktion a/s

Technical data:

Supply voltage AC:	24, 115, 230 and 400 VAC +/- 10%
Supply frequency:	40-70 Hz
Supply voltage DC:	12-50 VDC
Isolation voltages:	Supply - internal electronics: 3,75 kV
	Input - output: 2.5 kV
Power consumption:	6 VA
Operation temp.:	-20°C to +60°C
Humidity:	0-90% RH, non condensing
Temp. coefficient:	< 0.003% /°C

EMC data.

Emission:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730 - 1
Approvals.	The module is produced in accordance with CE and high voltage regulations.

Speed and accuracy.

Conversion speed:	in - out delay: 300 msec
Accuracy:	better than 0,2%, except at 6 A range
at I_{in} > 5 A:	accuracy better than 1%
Linearity:	better than 0.02%
Resolution:	Between 0,037% and 0,1%, dependent on the programmed metering range. If the unit is programmed with input and/or output offset, the resolution will be reduced proportionally. In either case the actual resolution is informed, when the unit is programmed.

Indications:

Yellow LED:	Steady light = supply ON
	Flashing = programming mode

Outputs.

Current output:	Terminals 9-10, programmable from 0 to 20 mA.
	Max. external load: 500 Ω
Voltage output:	Terminals 9-11, programmable from -10 to +10 V.
	Min. external load: 1000 Ω
Pulse output:	Terminals 9-12, programmable NPN, PNP or active output.
NPN and PNP:	Max. external voltage: 30 VDC
	Max. load: 30 mA
Active output:	Vout = 10 V
	Rout = 2 kΩ
	Min. load resistance: 10 kΩ
Out of range:	If the input signal is above or below the specified range, the output signal can move up to 5% above or below the specified output range. If wanted, this function can be disabled.

Inputs.

Single phase voltage input:

Terminals 1-5:	max. voltage 750 VAC or DC
Terminals 2-5:	max voltage 75 VAC or DC
	min. voltage range 20 V

3-phase voltage input:

Terminals 1-3-5:	max. voltage 3 x 750 VAC
Terminals 2-4-5:	max. voltage 3 x 75 VAC
	min. voltage range 3 x 20 V

Current shunt:

Terminals 5-6:	Rin = 10 mΩ, max. current 6 A
	max. inrush current (20 sec): 20 A
Terminals 5-7:	Rin = 20 mΩ, max. current 3 A
	max. inrush current (20 sec): 20 A
Terminals 5-8:	Rin = 50 mΩ, max. current 0.9 A
	max. inrush current (20 sec): 10 A
	min. current range: 150 mA

Programming.

When you are programming the unit you must define the current range, the voltage range and the wanted output range in power, phase angle or cos φ, and the programming software will then inform about the actual resolution.If the output is programmed to indicate the power consumption, the resolution is informed for cos φ = 1. With a smaller cos φ, the resolution is reduced proportionally.If you use the module in connection with an external current transformer, you must also define the current ratio (i.e. 100/5), and the programming software will then include this ratio in the power calculation.

Panel mounting:

If several units are placed beside each other, there must be minimum 5 mm space between the units.

Ordering guide.

1. Basic units without range programming.

    PPV10-x-yyy

x = Output configuration.
    A: Current and voltage output
    B: Current, voltage and pulse output

yyy = Supply voltage.
    024 = 24 VAC
    115 = 115 VAC
    230 = 230 VAC
    400 = 400 VAC   712 = 12-50 VDC

2. Converters included range programming.

When the modules are ordered with programmed ranges, the same ordering numbers are used to specify the basic unit, but in additon, the wanted ranges must be specified, as shown on the examples below:
e.g. 1:   PPV10-A-230 Vin: 3 x 400 VAC, Iin: 5 A, CT: 200/5 Pin: 0-100 kW, Out: 4-20 mA

e.g. 2:   PPV10-B-024 Vin: 230 VAC, Iin: 200 mA, Pin: 0-50 W Out: 0-10 V Pulse out: NPN, 0-5000 p.p.h., pulse width 100 msec.

Comadan Produktion a/s

C-mac®

Non-programmable signal converters / monitoring relays

Current, voltage, temperature or resistor inputs

Built-in exitation supply for transducer

Current, voltage or relay output

Galvanic separation, supply - input - output

DC supply or AC supply voltages up to 230 VAC

Made in accordance with the CE and EMC regulations

The C-mac® converters, series L, consists of 3 different basic units, each of them available in a number of variants:

- **LC10 has current input and current, voltage or relay output.**

- **LV10 has voltage input and current, voltage or relay output.**

- **LM30 has temperature input (3-wire Pt 100) and current, voltage or relay output.**

- **LM50 has resistor or potentiometer input and current, voltage or relay output.**

The signal converters convert a standard or non-standard analogue input signal to a standard analogue output signal, selectable between 0-20 mA, 4-20 mA, 0-10 V or 2-10 V, and because all units have galvanic isolation between suppy, input and output, a safe and effective isolation between the input signals and the equipment, which is connected to the output of the converters, is ensured.

All connections to the converter module are placed on one terminal block, and therefore it is possible to install 2 independent converters in the same housing, thereby reducing the required space in the control panel, where the modules are installed.
Optionally, the converters can be supplied with an input signal monitor with isolated transistor output. This output is only activated, if the input signal is within the specified metering range.

Note:
If the converter is supplied with this monitor, only one converter can be installed in the housing.

The monitoring relays operate with the same input signals, but instead of having an analogue output signal, the modules are supplied with 2 relay outputs, where setpoints and relay functions are user adjustable. All monitoring relays have input signal monitor with transistor output, and only one module can be installed in each housing.

Block diagram, converter unit:
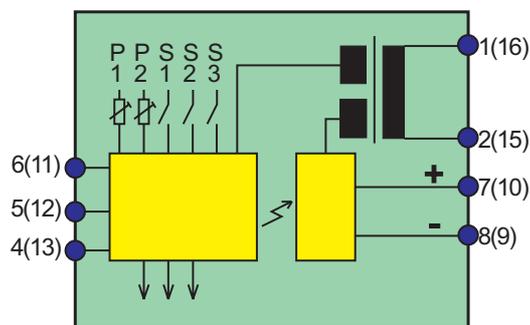
Connections:

1-2: supply

4: input GND

5: input +

6: exitation +
   (LC10 and LV10)

6: cable comp.
   (LM30)

7: output +

8: output -

Note:
The numbers in brackets refer to unit 2, if 2 converters are installed in the same housing.

Block diagram, input monitor/relay output option:
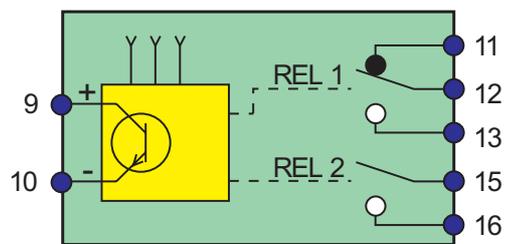
Connections:

9: monitor +

10: monitor -

11: relay 1, NC

12: relay 1, com

13: relay 1, NO

15: relay 2, com

16: relay 2, NO

Converters with relay output are always supplied with input signal monitor.
With relay output option, there is no analogue output.
For input monitor option without relay output, connections 12-16 are left open.
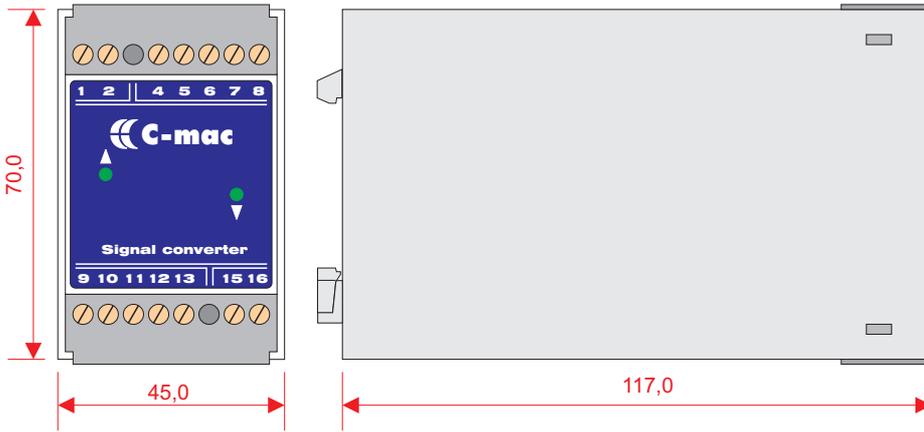
Comadan Produktion a/s

Mechanical dimensions:

70,0

45,0

117,0

Materials and weight:

Housing base:	CYCOLOY C2100, grey
Frontplate:	CYCOLOY C2100, grey
Terminal cover:	CYCOLOY C2100, black
Terminals:	Zinc-plated brass
Screws:	Zinc-plated iron

Weight:
with 1 converter:	280 g
with 2 converters:	450 g
relay unit:	350 g

Front view, converter:

Note:
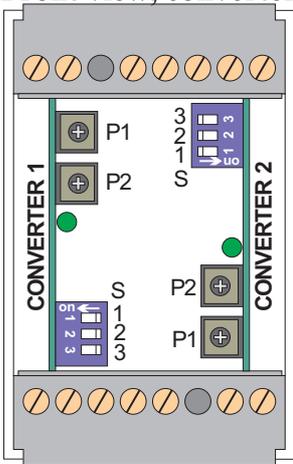
The drawing shows 2 converters in the same housing.

P1: zero adjustment
P2: span adjustment

S1	S2	output range
off	off	0 - 20 mA
off	on	4 - 20 mA
on	off	0 - 10 V
on	on	2 - 10 V

S3 off: factory adjusted
S3 on: enable fine-adjust

Front view, relays:
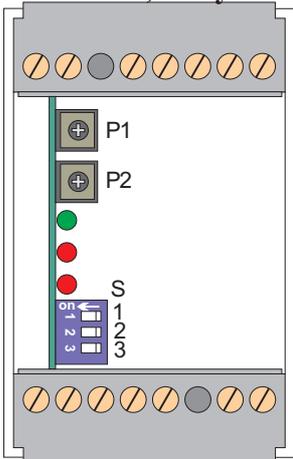
P1: setpoint adjustment 1
P2: setpoint adjustment 2
S1, S2: function selection
relay 1 and 2:
off: relay releases, if input signal exceeds the setpoint.
on: relay activates, if input signal exceeds the setpoint.

S3: Hysteresis:
off: 1 %
on: 5 %

Input connection examples::

Example 1.

External current or voltage source.

LC10 and LV10, all metering ranges.
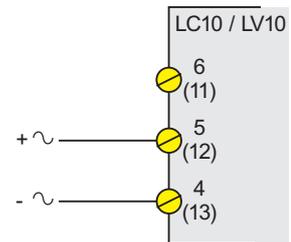
Example 2.

2-wire transducer with current consumption proportional with metering input, e.g. pressure transmitter.

LC10, 4-20 mA range
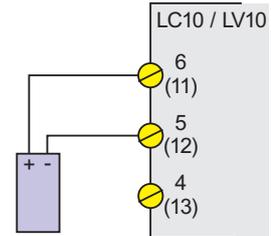
Example 3.

3-wire transducer with current or voltage output.

LC10, 0-20 mA or 4-20 mA input and LV10, 0-10 V input.

NOTE: max. current output, pin 6 = 22 mA.
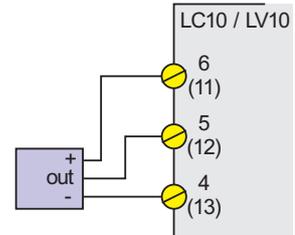
Example 4.

Temperature sensor, 3-wire connection.

LM30, all metering ranges.
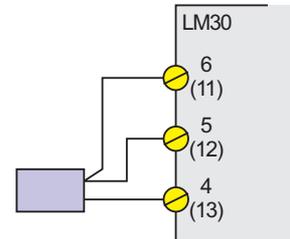
Example 5.

Potentiometer input. (resistor input, connect terminals 5 and 6).

LM50, all metering ranges.

Comadan Produktion a/s

Common technical data:

Supply voltage:	24, 115 and 230 VAC +/- 10%
Supply frequency:	40-70 Hz
Supply voltage DC:	12-50 VDC
Isolation voltages:	Supply - internal electronics: 3.75 kV Input - output: 2.5 kV
Power consumption:	3 VA
Operation temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non condensing
Temp. coefficient:	< 0,01% /°C

Indications:

Green LED, activated: Supply ON and input levels are OK
flashing: Supply ON and input level error
2 red LED's: Relay 1 and 2 active
(only modules with relay output)

Selections:

Converter modules: S1-S2: selection of output range
S3: enable fine adjustment

Relay modules: S1-S2: selection of relay function
S3: selection of hysteresis

Adjustments:

Converter modules: If S3 is off, the converter is factory adjusted. With S3 on, the adjustments are in accordance with the potentiometer positions.

Potentiometer 1: Fine adjustment of zero point:
LM50: +/- 50% of range
All other units: +/- 5% of range

Potentiometer 2: Fine adjustment of metering range:
LM50: +/- 50% of range
All other units: +/- 5% of range

Relay modules: potentiometer 1:setpoint adjustment, relay 1: 0-100% of range
potentiometer 2: setpoint adjustment, relay 2: 0-100% of range

Exitation output:	pin 6, (LC10 and LV10 only)
V_{out}:	24 VDC +5% -20%
I_{out}:	max 22 mA

Output ranges, converters:

Range	External load
0 - 20 mA	max. 500 Ω
4 - 20 mA	max. 500 Ω
0 - 10 V	min. 1 kΩ
2 - 10 V	min. 1 kΩ

Max. load relays:	4 A - 250 VAC, ohmic load
Input signal monitor:	Transistor output, active if input signal is within the specified metering range, +/- approx. 10%
max. voltage:	30 VDC
max. load:	30 mA

Conversion speed, accuracy and resolution:

type	speed	accuracy	resolution
LC10, AC input	200 msec	2 %	1 %
LC10, DC input	50 msec	1 %	0.5 %
LV10	50 msec	1 %	0.5 %
LM30	50 msec	1 %	0.5 %
LM50	50 msec	1 %	0.5 %

EMC and safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730
Approvals:	The units are produced in accordance with CE and low voltage directives.

Ordering guide:

aaaa-b-ccc-d	
aaaa = type number	
b = option	
ccc = supply voltage	
d = metering range	

type number:
LC10
LV10
LM30
LM50

option:
0 = basic converter, pos. 1
H = converter, pos. 2
R = converter with relay output
M = converter with input monitor

supply voltage:
024 = 24 VAC
115 = 115 VAC
230 = 230 VAC
712 = 12-50 VDC

Metering ranges:

LC 10	LV 10
1 = 0 - 20 mADC	1 = 0 - 60 mVDC
2 = 4 - 20 mADC	2 = 0 - 10 VDC
3 = 0 - 1 AAC	3 = 0 - 250 VAC
4 = 0 - 5 AAC.	4 = 0 - 500 VDC
	5 = 0 - 500 VAC

LM30	LM50
1 = -50 - +150°C	1 = 0 - 100 Ω
2 = 0 - +100°C	2 = 0 - 500 Ω
3 = 0 - +200°C	3 = 0 - 1 k Ω
4= -50 - + 50 °C	4 = 0 - 5 k Ω
	5 = 0 - 10 k Ω

Ordering examples:

LC10-0-230-2:	Basic current converter, 230 VAC supply, input range 4-20 mA
LV10-0-115-1:	Voltage converter, 115 VAC supply, input range 0-60 mV in position 1.
LC10-H-115-4	Current converter, 115 VAC supply, input range 0-5 AAC in pos. 2 in the same unit.
LM30-M-024-2:	Temperature converter with input monitor, 24 VAC supply, range 0-100°C
LC10-R-230-3:	Current relay, 230 VAC supply, input range 0-1 AAC, 2 relay outputs.

Front view, relay   **Front view, converter**

Comadan Produktion a/s
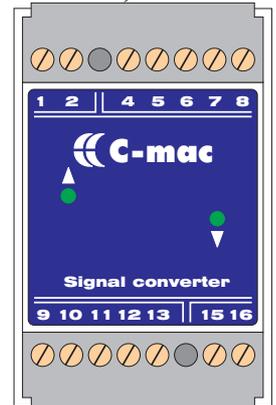
C-mac®

Double, loop-powered isolation amplifier
Consumption 4-20 mA, equivalent to 4-20 mA input
Up to 4 amplifiers in the same housing
Made in accordance with the CE and EMC regulations

C-mac® module type LC24 is a loop-powered double isolation amplifier, which means the current consumption is proportional with the input current

The unit is suitable in connection with process monitoring systems, if you want to separate several monitoring signals with diffenrent potentials, before they are being connected to PLC-controls or the like.

The two isolation amplifiers are totally separated from each other, which means there is a galvanic separation between inputs, outputs and between the two amplifiers.

Technical data:

Input signal:	4-20 mA
Voltage drop, input:	5 V
Protection:	Max. input voltage 30 VDC, Current limitation: 100 mA.
Output:	Current consumption 4-20 mA, proportional with the input current Note: If the input current is zero, the current consumption on the output is = 3,6 mA
Supply voltage:	8,5 - 30 VDC
Voltage drop:	min. 5 V
Isolation:	2 kV between input and output
Accuracy:	0,5%
Linearity:	0,1%
Operation temp.:	-20°C to +50°C
Temp. coefficient:	0,015% / °C
Indications:	none
Adjustments:	Fine adj. +/- 5% of zero and span. This adjustment is only possible, if the unit is removed from the housing.

EMC:
Emission: EN 50081-1
Immunity: EN 50082-1

Ordering guide:
The isolation amplifier is available in two variants:
LC24-2 is supplied with 2 isolation amplifiers with connections on pins 1-4 and 5-8.
LC24-4 is supplied with 4 isolation amplifiers with connections on pins 1-4, 5-8, 9-12 and 13-16.

Block diagram:
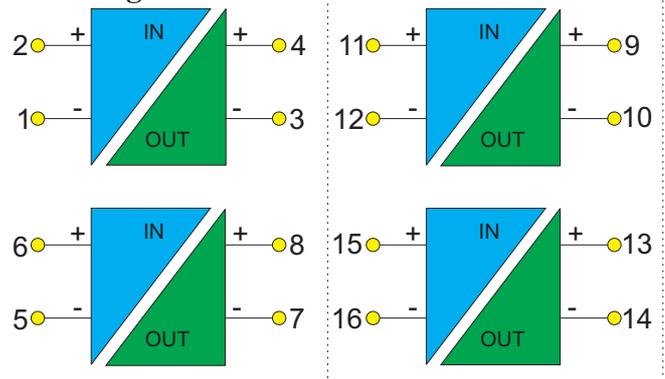
Note: connections 9-16 only type LC24-4

Connection example:
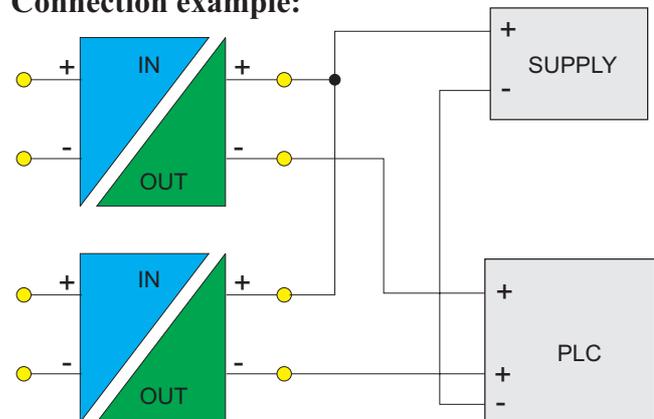
If you connect several isolation amplifiers to a PLC or the like, the plus connections on the output of the amplifiers are connected to plus on the power supply, and the different minus-outputs are connected to the plus inputs on the PLC. Minus from the supply is then connected to common minus on the PLC.
If the PLC has a voltage output for the supply of external sensors, you can use this instead of an external power supply, on the condition, that is can supply the neccessary power.

Adjustments:

Comadan Produktion a/s
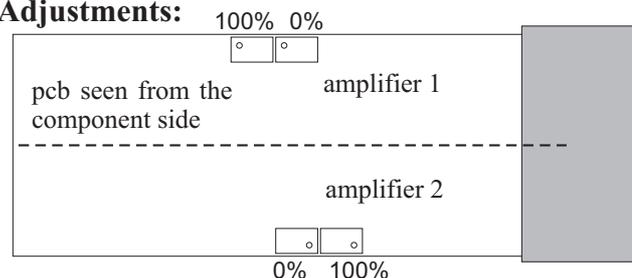
C-mac®

Programmable loop-powered Pt100 transmitter

For mounting in sensor head type B

Consumption 4-20 mA, equivalent to temperature input

For 2,3 or 4 wire sensors

Made in accordance with the C€ and EMC regulations

C-mac temperature transmitter type TT22 is specifically designed for standard sensor head, type B.

The transmitter, which must be connected to a Pt100 sensor element, is loop-powered, which means the current consumption is proportional with the temperature at the Pt100 sensor.

The transmitter is available in 4 standard variants, covering the most popular metering ranges. On request, the transmitter can be supplied for special metering ranges.

By means of a programming unit it is also possible to program the transmitter yourself within the ranges -200 to 850°C and minimum span 25°C.

You can also program the reaction delay and several other parameters.

Technical data:

Metering input:	2, 3 or 4-wire Pt100 acc.to DIN 43760
Output:	Current consumption 4-20 mA, proportional with the actual temperature at the Pt100 sensor.
Cable fault:	Short circuit: typ. 3,5 mA Breakage: typ: 23 mA
Supply voltage:	8,5 - 30 VDC
Voltage drop:	min. 8,5 V
Linearity:	0,1%
Temperature stability:	
span <100°C:	< 0,02% / °C
span 100°C:	< 0,01% / °C
Operation temp.:	-20°C to +50°C

Response time (10-90%)**:** 0,1 sec.

Dimensions:	Ø44 x 20 mm
EMC-data:	
Emission:	EN 50081-2
Immunity:	EN 50082-2

Standard metering ranges, all 3-wire:

-50 to + 50°C
-50 to +150°C
0 to 100°C
0 to 200°C

Special metering ranges available on request

Connections:
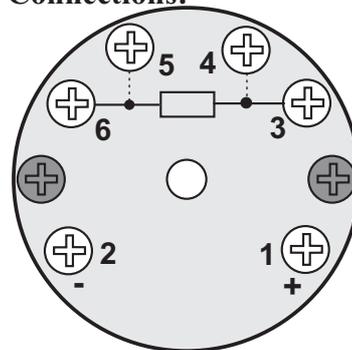
pin 1: current +
    2: current -
    3: Pt100 sensor
    4: Pt100 sensor, 3 wire
    5: Pt100 sensor
    6: Pt100 sensor, 4 wire

Connection example:
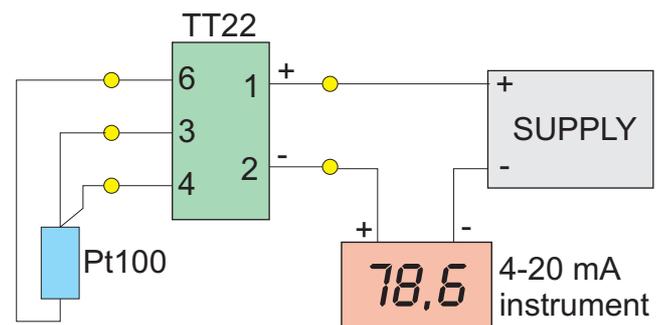
Ordering guide:

TT22-1:	metering range -50 to +150°C
TT22-2:	metering range 0 to +100°C
TT22-3:	metering range 0 to +200°C
TT22-4:	metering range -50 to +50°C
TT22-x:	specify metering range
TTP22:	Programmable unit
Flextop:	Programming interface

Comadan Produktion a/s

Tachometer converter/relay LR10

C-mac®

- **Pulse inputs for NPN, PNP or voltage signals**
- **Built-in supply for external sensor**
- **16 metering ranges, switch selectable**
- **Galvanically isolation between supply, input and output**
- **Current, voltage or relay output**
- **DC supply or AC supply voltages up to 230 VAC**
- **Made in accordance with the CE and EMC regulations**

The C-mac® converter, type LR10 is used for speed monitoring, where the input signal comes from a contact, a proximity sensor, a flow transducer or similar.
The unit is supplied with a 24 VDC, max. 25 mA output, which can be used to supply an external proximity sensor.

The unit is supplied with either analogue or relay output.

By means of a rotary switch on front of the unit you can select between 16 different metering ranges from 0-100 p.p.m. to 0-20000 Hz.
With analogue outputs you use another switch to select the output range (0-20 / 4-20 mA or 0-10 / 2-10 V) and to enable fine-adjustment of the metering range
With the fine-adjustment you can select any range between the nominal range lower than the actual range up to maximum of the actual range.
With relay output you use the switches to select the relay functions (relay on / relay off)
The analogue output level is updated at each input pulse (at high speed ranges 10 times per second), which ensures a quick reaction and a stable output signal, even at very low input frequencies.

Technical data:

Supply voltage:	24, 115 and 230 VAC +/- 10%
Supply frequency:	40-70 Hz
Supply voltage DC:	12-50 VDC
Isolation voltages:	Supply - internal electronics: 3.75 kV
	Input - output: 2.5 kV
Power consumption:	3 VA
Operation temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non condensing
Temp. coefficient:	< 0,01% /°C
Transducer supply:	24 VDC, max. 25 mA

Indications:

Green LED:	Supply ON
2 red LED's:	Relay 1 and 2 active
	(only modules with relay output)
Accuracy:	better than 0.3%
Resolution:	0.1%

Adjustments,

analogue units:	Span adjustment.
relay units:	setpoint adjustment relay 1 and 2.
	adjustment range 10 - 100%

Hysteresis:

Relay version:	5%

Metering ranges: 16 Selectable ranges from 0-100 p.p.m. to 0-20000 Hz.

Pulse/pause ratio: min 10% at max speed for each range (min 15μsec. at range D,E and F)

Front view:

SW 1
SW 2
LED 1
LED 2
LED 3
P 1
P 2
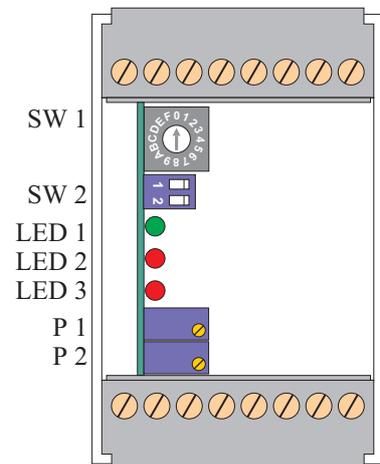
SW 1: Range selection:

0 = 0 - 100 p.p.m.	8 = 0 - 100 Hz
1 = 0 - 200 p.p.m.	9 = 0 - 200 Hz
2 = 0 - 500 p.p.m.	A = 0 - 500 Hz
3 = 0 - 1000 p.p.m.	B = 0 - 1000 Hz
4 = 0 - 2000 p.p.m.	C = 0 - 2000 Hz
5 = 0 - 5000 p.p.m.	D = 0 - 5000 Hz
6 = 0 - 10000 p.p.m.	E = 0 - 10000 Hz
7 = 0 - 20000 p.p.m.	F = 0 - 20000 Hz

SW 2.1, analogue version: Output offset
off: 0-20 mA / 0-10 V
on: 4-20 mA / 2-10 V

SW 2.1, relay version: Inversion, relay 1

SW 2.2, analogue version: Range adjustment
off: Factory adjusted
on: manual adjustment

SW 2.2, relay version: Inversion, relay 2

LED1: Power on
LED2: Relay 1 on
LED3: Relay 2 on

P 1, analogue version: Manual range adjustment

P 1, relay version: setpoint adjustment, relay 1

P 2, relay version only: setpoint adjustment, relay 2

Mechanical dimensions:
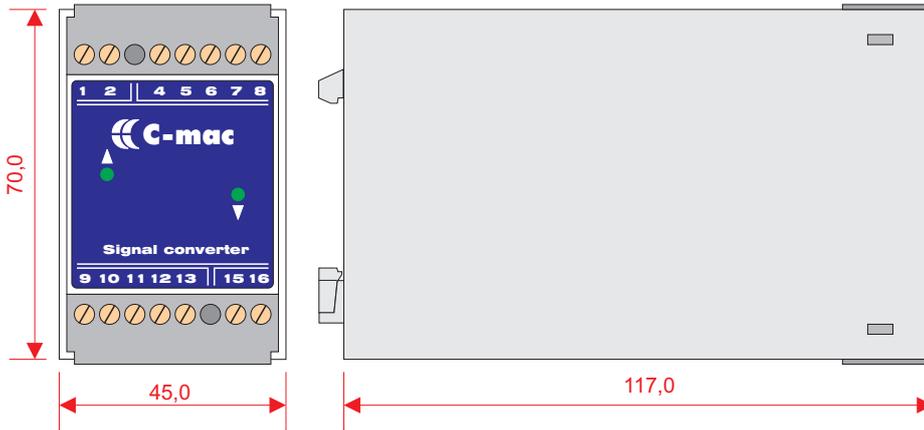
70,0

45,0

117,0

Materials and weight:

Housing base:	CYCOLOY C2100, grey
Frontplate:	CYCOLOY C2100, grey
Terminal cover:	CYCOLOY C2100, black
Terminals:	Zinc-plated brass
Screws:	Zinc-plated iron
Weight:	260 g

Block diagram, analogue outputs:
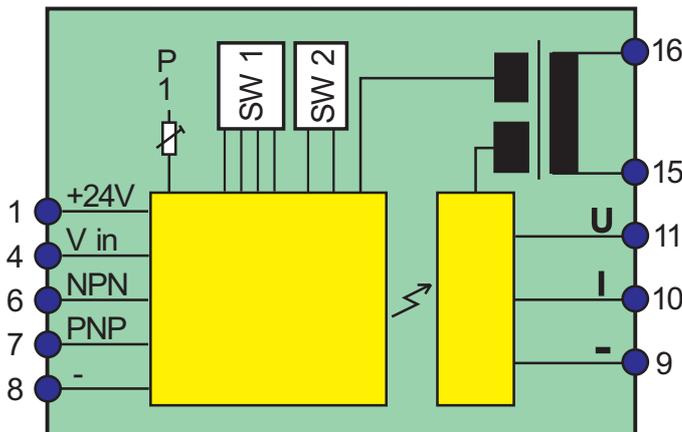
Block diagram, relay outputs:
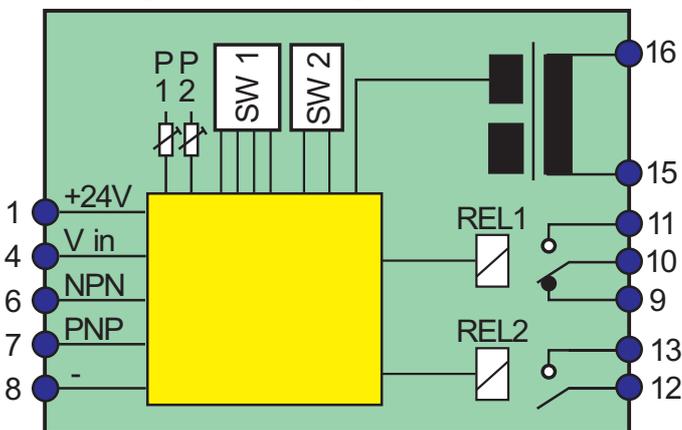
Electrical connections:

Supply voltage: pins 15 and 16

Input circuit:
  Common   Pin 8
  DC supply out   Pin 1, 24 VDC, max load 25 mA

  Voltage input: Pin 4, AC or DC signals, max 50 V
                  input resistance 50 kOhm
    Input active: $V_{in} > 3$ V
    not active: $V_{in} < 1.5$ V

  NPN input: Pin 6, input resistance 10 kOhm
    Input active: $V_{in} < 6$ V
    not active: $V_{in} > 15$ V

  PNP input: Pin 7, input resistance 10 kOhm
    Input active: $V_{in} > 15$ V
    not active: $V_{in} < 6$ V

Analogue output:
  Common: Pin 9
  Current out: Pin 10, max. output load 500 Ohms
  Voltage out: Pin 11, min. output load 4 kOhms

Relay output:
  Relay 1:   pin 9 (NC), 10 (C) and 11 (NO)
  Relay 2:   pin 12 (C) and 13 (NO)
  Max load: 6A / 240 VAC

EMC and safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.

Ordering guide:

LR10-x-yyy

x = Converter type
        A = analogue outputs
        R = Relay outputs

yyy = Supply voltage
        024 = 24 VAC
        115 = 115 VAC
        230 = 230 VAC
        712 = 12-50 VDC

Ordering example: LR10-A-230

Comadan
Produktion a/s

C-mac®
3-phase power converter FPA90

Monitoring of power consumption on 3-phase motors etc.

Metering voltages 3 x 380 V to 3 x 460 VAC

Built-in current transformer for direct monitoring up to 80 A

Selectable metering ranges from 0,1 kW to 70 kW

Analogue outputs and pulse output for kWh

Selectable divider and average function

Made in accordance with the $C \in$ and EMC regulations

C-mac® FPA90 is monitoring the consumed power on symmetrical 3-phase loads like motors, etc.

The power monitoring uses the formula

$P = \sqrt{3} \times U \times I \times \cos \varphi$

The unit has a built-in current transformer, making it possible to monitor loads up to 460 VAC - 80 A direct.

The converter is connected to the same 3-phase supply voltage as the load, and one of the phases are let through the hole in the unit, for monitoring of the load current.

If the load current exceeds 80 A, you can use an external current transformer, and the secondary from the transformer is then let through the hole.

The wanted metering range (in kW) is adjusted on 3 rotary switches on the front of the unit. If you use an external current transformer, you must divide the power setting with the ratio of the transformer.

In order to ensure the correct function it is important to connect the converter as shown on the next page, i.e. the metering current must be the phase, which is connected to terminal 1, and the current direction must be correct too.

The converter is supplied with analogue current and voltage outputs and a pulse output, and the outputs are in maximum, when the monitored power is the same as the selected metering range.

All outputs are galvanically separated from the supply voltage.

In addition the unit has 3 digital inputs for the selection of analogue output signal, pulse ratio and input filter.

The input filter is used if the load is very unstable, in this way, the output signal is more stable.

The unit is also supplied with 3 LED indications.

Technical data:

Supply voltage:	3 x 380 - 3x460 VAC +/- 10%
Frequency:	45-65 Hz
Power consumption:	4 VA
Operation temp.:	-20°C to +60°C
Humidity:	0-90%, non-condensing
Metering ranges:	Selectable 0,1 to 70,0 kW
Metering current:	0-80 A continuously
	500 A short-term (10 sec.)
	Max. diameter, cable: 10 mm
Accuracy:	2 %

Outputs, analogue:

Current:	0(4)-20 mA, max load 300Ω
Voltage:	0(2)-10 V, min load 10 kΩ

Output, pulses:

	Transistor output,
	max load 36 V / 25 mA
Frequency:	0-100/300 pulses/hour
Pulse width:	200 msec.

Indikations:

Green LED, On:	Supply voltage OK
Red LED. Load:	Metering current >3% of metering range
Red LED, kWh:	Power consumption, follows the pulse output, but 10 times faster (max. 1000/3000 pulses /h)

Comadan Produktion a/s

Connection diagram, direct current monitoring:
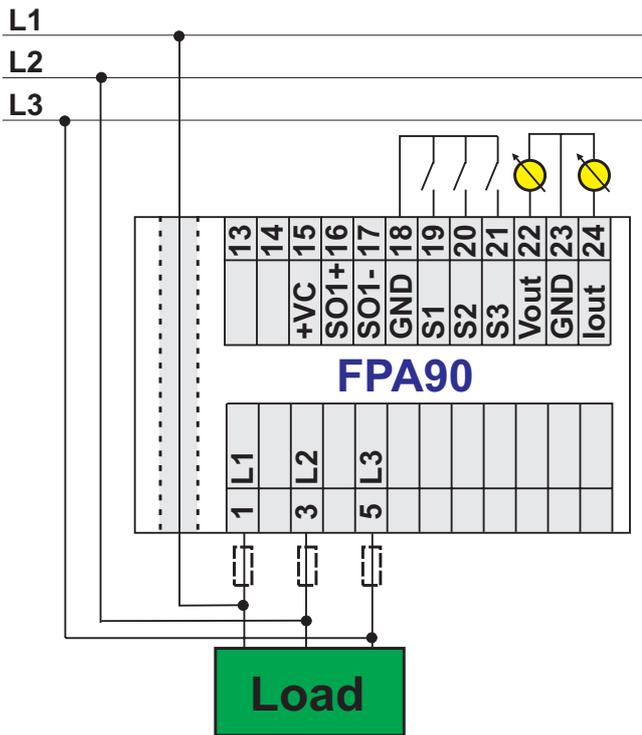
Connection diagram, current monitoring via current transformer:
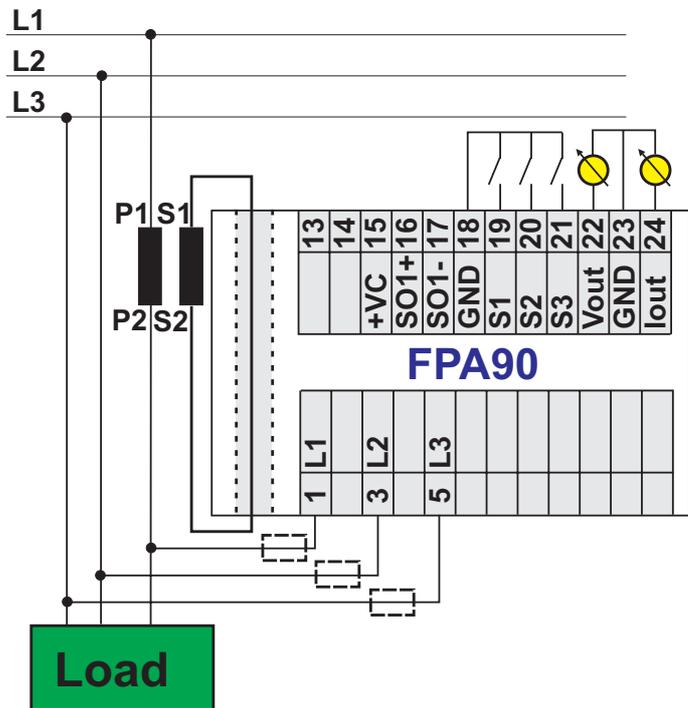
Connection examples, pulse output:

Example 1: External DC-supply, f.inst. PLC

Example 2: Internal DC-supply, f.inst. for a counter.
Pulse output: 5 V, max. 25 mA
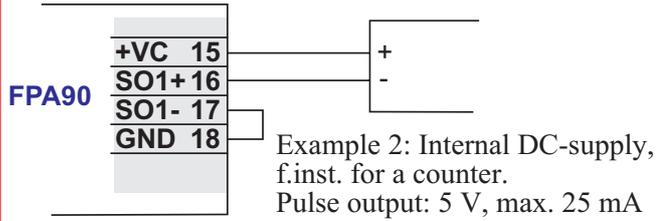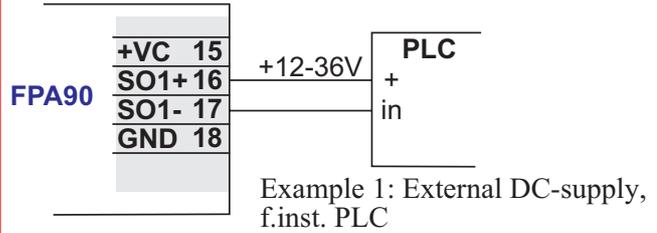
Function selection, digital inputs:

S1, pulse output	100 pulses/h/FS	off
	300 pulses/h/FS	on
S2, noise filter	Filter x 1	off
	Filter x 16	on
S3, analogue output	4-20 mA / 2-10 V	off
	0-20 mA / 0-10 V	on

If the pulse output is used for summing of the power consumption, you can get an equal number of pulses per kWh by selecting the metering ranges as shown in the table below

	Range kW	3	10	30	100
S1 off	pulses/kWh		10		1
S1 on	pulses/kWh	100		10	

Mechanical dimensions:

86 x 70 x 58 mm, for mounting on DIN-rail

Ordering guide:

FPA94-400

Comadan Produktion a/s

C-mac®

3½ digit panel instrument DP510

Miniature display - front dimensions 24 x 48 mm

Current or voltage indication

Supply voltage 9-35 VDC / 9-26 VAC

Galvanic isolation between supply and internal electronics

Made in accordance with the C E and EMC regulations

DP510 is a 3½ digit panel instruments with LED display, and because of the small dimension it is very suitable in various kinds of control panels.

DP510 is supplied with selectable metering ranges 0-20 mA, 0-1 V and 0-10 V, and by means of switches on the top and potentiometers on the back of the instrument the display range is adjustable, as well as the decimal point.

Technical data:

Supply voltage:	9-35 VDC / 9-26 VAC The supply voltage is galvanically isolated from the internal electronics.
Power consumption:	typ. 60 mA @ 24 VDC
Operating temp.:	-10°C to +50°C
Humidity:	0 - 90% RH, non-condensing
Protection:	IP 44
Temp.coefficient:	max. 0,01% FS/ °C
Linearity:	+/- 1 count
Display range:	-999 to 1999
Metering ranges:	0-1 V, 0-10 V and 0-20 mA
Input protection:	+/- 36 VDC (all ranges)
Outside range:	Display shows "1---"
Input impedance:	Voltage metering: >100 kΩ Current metering: typ. 75 Ω
Dimensions:	according to DIN 43700
L x W x D:	24 x 48 x 95 mm.
Panel cut-out:	21,5 x 43,5 mm.
Weight:	90 g.
Materials:	NORYL, SE1
Connections:	screw terminals, max. 1,5 mm.
EMC-data:	
Emission:	EN 50081-2
Immunity:	EN 50082-2
Safety:	EN 60730

Connection and calibration:
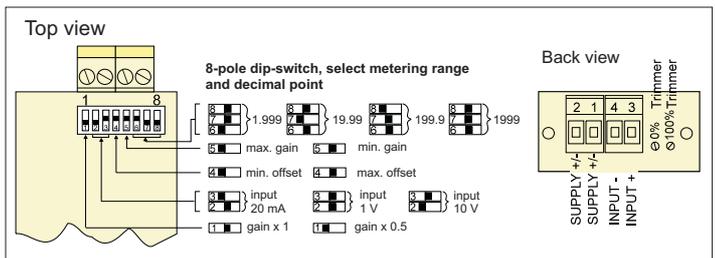
1: Select metering range on switch 2-3

2: Set coarse adjustment of range and offset at switch 1, 4 and 5

3: Connect minimum input signal and adjust to the wanted minimum display at the 0% trimmer.

4: Connect maximum input signal and adjust to the wanted maximum display at the 100% trimmer

5: Check min. reading and repeat step 3-4 if necessary.

6: Select wanted decimal point at switch 6-8

Block diagram:

Comadan Produktion a/s

3½ digit panel instrument DM350

C-mac®
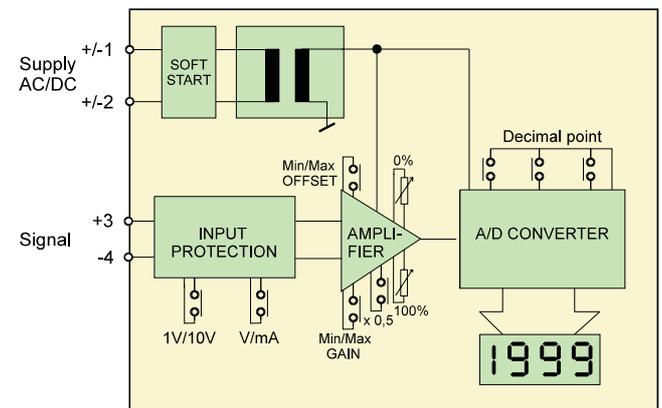
> **Universal 3½-digit panel instrument**
> **Current- and voltage inputs in the same instrument**
> **Separate zero- and span adjustments**
> **Galvanic isolation between supply and internal electronics**
> **Made in accordance with the CE and EMC regulations**

DM350 is a universal 3½-digit panel instrument with analogue inputs. The instrument has an adjustable display range between -1999 og +1999. The instrument can be used in connection with all C-mac® converters and relays with analogue outputs.

In addition to the current and voltage inputs the instrument is also supplied with a 24 VDC output, for the supply of external sensors or the like.

Technical data:

Supply voltage:	24, 120 or 230 VAC +/-10% The supply voltage is galvanically isolated from the internal electronics. (test voltage 2 kV AC)
Power consumption:	4 VA
Operation temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing
Protection:	IP 54
Voltage output:	24 VDC, max.. 50 mA
Metering inputs:	0-20 mA / 4-20 mA 0-1 V / 0-1 mA 0-10 V
Input impedance:	0-20 mA: 50 Ω 0-1 V: 1,1 kΩ 0-10 V: 100 kΩ
Adjustments:	Trimming potentiometers and switches on the back of the instrument.
Zero:	range: -1999 to +1999
Span:	0 to 1999
Decimal point:	selectable after digit 1, 2 or 3

Mechanical dimensions:

L x W x D:	48 x 96 x 85 mm.
Panel cut-out:	43 x 91 mm
Weight:	320 g.
Materials:	NORYL, SE1
Connections:	screw terminals, max. 1,5 □ mm.
pin 1-2:	supply
pin 4:	input, common
pin 5:	input 0-20 mA (4-20 mA)
pin 6:	input 0-1 V / 0-1 mA
pin 7:	input 0-10 V
pin 8:	voltage output +24 VDC

Connections:

ex. 1:
0-20 or
4-20 mA
external signal

DM350
8
7
6
+ 5
0-20 mA
4

ex. 2:
0-1 mA or
0-1 V external
signal

DM350
8
7
+ 6
0-1 mA
/ 0-1 V 5
- 4
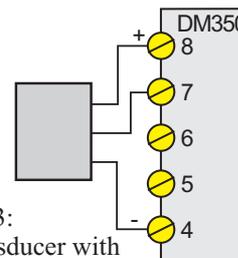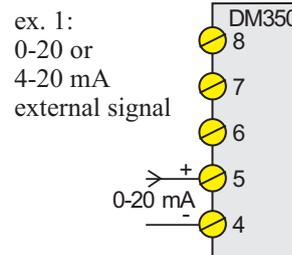
ex. 3:
transducer with
0-10 V output,
supplied from DM350
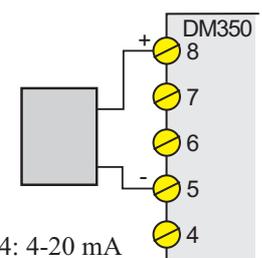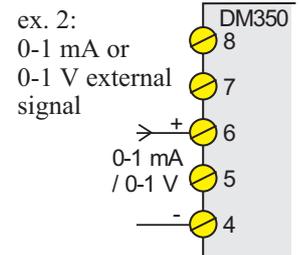
DM350
+ 8
7
6
5
- 4

ex. 4: 4-20 mA
transducer,
supplied from DM350

DM350
+ 8
7
6
- 5
4

Ordering guide:

DM350-aaa

aaa = supply voltage

024 = 24 VAC
120 = 120 VAC
230 = 230 VAC

ex: DM350-230

Comadan Produktion a/s

3-3

C-mac® 4 digit panel instrument DM400

Programmable panel instrument

Current, voltage or temperature indication

Programmable range, function and setpoints

Galvanic isolation between supply and internal electronics

Made in accordance with the CE and EMC regulations

DMC400 and DMT400 are 4-digit panel instruments, which in addition to metering display can be programmed with 2 setpoints and time-delay.

DMC400 is available in several variants for indication of current and voltage, and display range as well as set-points and time-delays are programmable.

DMT400 is made for temperature metering, and it is available in several variants for either Pt100 or thermo-couple sensors.

On the DMT-units it is not possible to adjust the display range, but set-points and reaction-delays are programmable.

Technical data:

Supply voltage: 12-48 V AC/DC
24,120 or 230 V AC
The supply voltage is galvanically isolated from the internal electronics. (test voltage 4 kV AC)

Power consumption: 2 VA

Operating temp.:   -10°C to +50°C

Humidity: 0 - 90% RH, non-condensing

Protection: IP 54

Temp.coefficient: max. 0,01% / °C

Metering ranges: see ordering guide.

Programmations:
Display reading: -1999 to +1999 (only DMC400).
Decimal point: after 1., 2., 3. or 4. digit.
Relay function: 2 off SPDT.
Hysteresis: programmable, relating to setpoint.
Time delay: relay function, 0,1 to 10 sec.

See detailed users guide for further informations.

Digit height: 14 mm.

Input impedances: see ordering guide

Accuracy:
DMC400:   AC: 0,3% of the range +/- 1
DC: 0,1% of the range +/- 1
DMT400:   0,1% of the range +/- 1

Mech. dimensions: in accordance with DIN 43700
L x W x D: 48 x 96 x 105 mm.
Panel cut-out: 43 x 91 mm.
Weight: 350 g.
Materials: NORYL, SE1

Connections: screw terminals, max. 1,5 □ mm.

Connections, inputs:

ex. 1: Pt100 input — DMT

ex. 2: Thermo-couple input — DMT

ex. 3: AC/DC cur/vol. input — DMC

ex. 4: mA/V input (range 10-11) — DMC
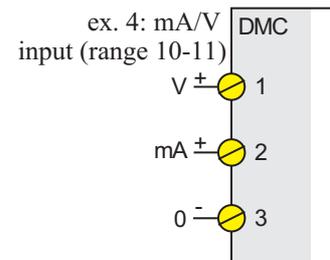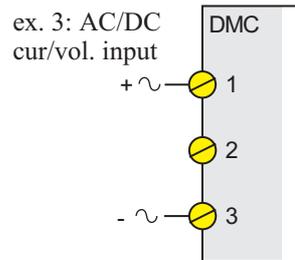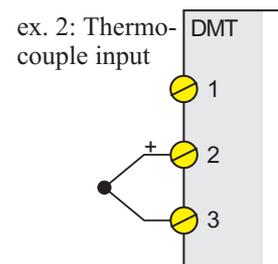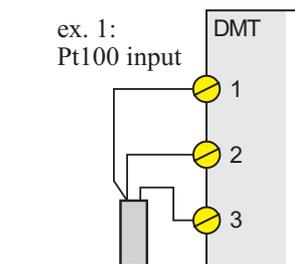
Connections, supply and relays:
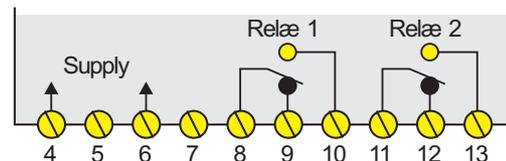
Ordering guide, DMT400:

DMT400-aaa-b

aaa = supply	b = metering range	
012 = 12-48 V	1 = Pt100	-50,0 - +300,0°C
024 = 24 VAC	2 = Pt100	-50 - +800°C
120 = 120 VAC	3 = Fe-const.	0 - +1400°C
230 = 230 VAC	4 = NiCr-Ni	0 - +1400°C
724 = 24 VDC	5 = PtRh-Pt10%	0 - +1800°C
	6 = PtRh-Pt13%	0 - +1800°C

Ordering guide, DMC400:

DMC400-aaa-b   aaa = supply, see above

b = metering range	input impedance
10 = 4-20 mA / 2-10 V	I: 50Ω V: 500kΩ
11 = 0/4-20 mA / 0/2-10V	I: 50Ω V: 500kΩ
12 = 0 - 200 mA DC	5 Ω
14 = 0 - 200 mA AC	5 Ω
15 = 0 - 5 A AC	0,2 Ω
16 = 0 - 500 V DC	1,1 MΩ
17 = 0 - 500 V AC	100 kΩ

Comadan Produktion a/s

C-mac®

3½ digit instruments series DP5xx

Current and voltage inputs.

Separate zero and span adjustments.

Supply voltage 9-35 VDC / 9-26 VAC.

Galvanic isolation between supply and internal electronics.

Red or green LED display.

Series DP5xx consists of 4 different panel instruments, all with the same electrical data and functions, but with different mechanical dimensions and digit heigths.

Common technical data:

Supply voltage:	9-36 VDC / 9-26 VAC The supply voltage is galvanically isolated from the internal electronics.
Power consumption:	typ. 60 mA @ 24 VDC
Operating temp.:	-10°C to +50°C
Humidity:	0 - 90% RH, non-condensing
Protection:	IP 44
Temp.coefficient:	max. 0,01% / °C
Linearity:	+/- 1 count
Display reading:	-999 to 1999
Display color:	red or green (DP542: red only)
Metering ranges:	0-1 V, 0-10 V and 0-20 mA.
Input protection:	+/- 36 VDC (all ranges)
Overload indication:	display shows "1---"
Input impedances:	Voltage metering: >100 kΩ Current metering: typ. 75 Ω
Connections:	screw terminals, max. 1,5 ☐ mm.

EMC and safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE and low voltage regulations.

Individual specifications:

DP520: Dimensions: 24 x 96 mm, depth 66 mm
digit height: 13 mm

DP530: Dimensions: 48 x 48 mm, depth 67 mm
digit height: 10 mm

DP531: Dimensions: 48 x 96 mm, depth 66 mm
digit height: 13 mm

DP542: Dimensions: 48 x 96 mm, depth 66 mm
digit height: 20 mm

Connections and calibration

(Example DP520)
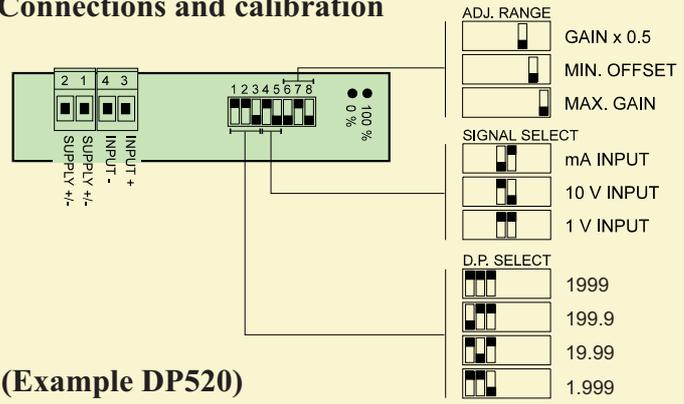
1: Select the wanted input type (1V, 10V or 20 mA)

2: Select the wanted offset and gain.

3: Connect the wanted minimum signal to the input and adjust for wanted minimum display with 0% potmeter.

4: Connect the wanted maximum signal to the input and adjust for wanted maximum display with 100% potmeter.

5: Check min and max display and readjust if needed.

6: Select decimal position

Block diagram:

Comadan Produktion a/s

C-mac®

3 3/4 digit LCD panel instruments
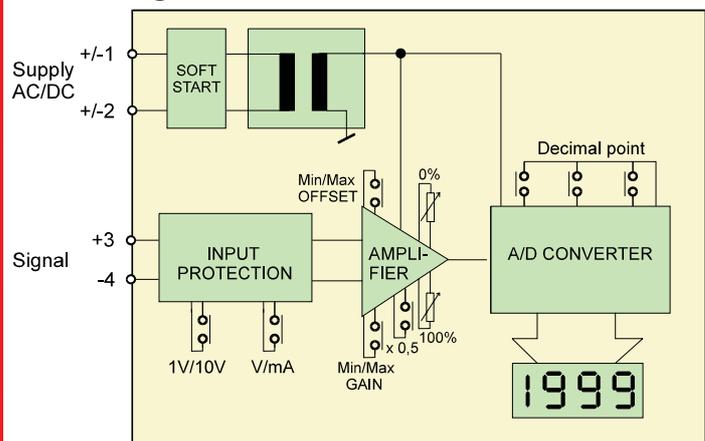
LPP420: Loop powered, range 4-20 mA.

GP422: Supply voltage 9-35 VDC / 6-25 VAC, 3 ranges.

LCD display with yellow backlight.

Easy range adjustments with push-buttons.

Made in accordance with the CE and EMC regulations

LPP420 and GP422 are 3 3/4 digit instruments (+/-3999) with backlit LCD display. The displays have a very large contrast, which makes them very suitable in panels where the ambient light is high.

Technical data:

Supply voltage GP422:	9-35 VDC / 6-25 VAC. The supply voltage is galvanically isolated from the internal electronics.
Metering ranges:	0-1 V, 0-10 V and 0-20 mA.
Input protection:	35 VDC (all ranges)
Input impedances:	1V: >10 MΩ, 10V: >110 kΩ 20 mA: typ. 50 Ω
Loop voltage, LPP420:	<3,7 V, normal light intensity <5,7 V, increased light intensity
Operating temp.:	-10°C to +60°C
Humidity:	0 - 90% RH, non-condensing
Protection:	IP 44
Temp.coefficient:	<0,015%FS / °C
Linearity:	<0.05% FS
Display reading:	+/- 3999
Overload indication:	display shows "⁻⁻⁻⁻" or "₋₋₋₋"
Connections:	screw terminals, max. 1,5 ☐ mm.
Mech. dimensions:	48 x 48 mm, depth 67 mm

EMC and safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE and low voltage regulation

Block diagram, LPP420:
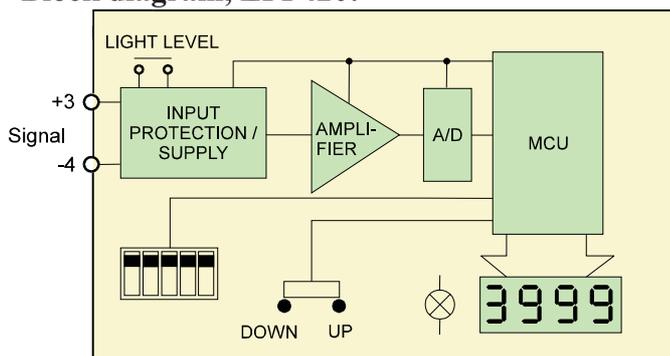
Connections and calibration
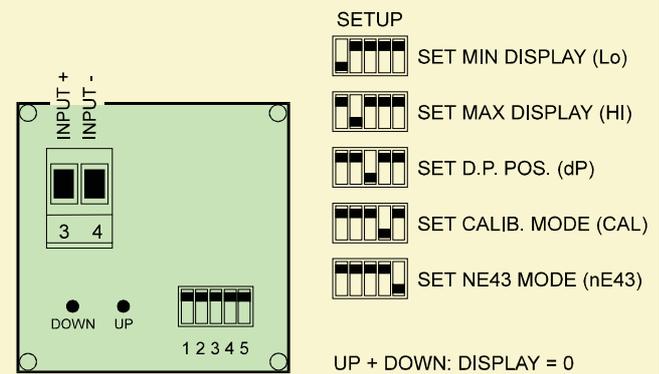
(Example LPP420)

Calibration procedure, general:
Select calibration parameter by setting SETUP switch 1-5 ON.
Display shows HOLD and the selected function for 2 secs.
Enter the wanted value with the UP and DOWN buttons.
Set SETUP switch OFF, backlight flashes and HOLD display extinguishes.

Range adjustment, calibration mode ON (LPP420 only):
Connect any current signal between 4 and 20 mA to the instrument.
Set switch 1 ON, and enter the wanted display reading for 4 mA input.
Set switch 2 ON, and enter the wanted display reading for 20 mA input.

Range adjustment, GP422 and LPP420, cal. mode off:
Connect minimum input signal, f.inst. 4 mA to the instrument.
Set switch 1 ON, and enter the wanted display reading for min. input.
Connect maximum input signal, f.inst. 20 mA to the instrument.
Set switch 2 ON, and enter the wanted display reading for max. input.

Select input type, (switch 4, GP422 only):
1: 0-20 mA (A)   2: 0-10 V (10U)   3: 0-1 V (1U)

Select contrast, (switch 5, GP422 only):
Selection 0-7, 0 = min. contrast, 7 = max. contrast

NE43 mode, (switch 5, LPP420 only):
ON: display shows "----" if input signal out of range.
OFF: display shows the actual value if possible.

Comadan Produktion a/s

60 point LED bargraph AP560

Selectable bar or dot display

Current or voltage input

Out of range indication

Upper and lower limit indication

Front panel 24 x 96 mm

Made in accordance with the CE **and EMC regulations**

AP560 has a selectable 60 point bar or dot indication. 2 out of range dots indicates if the input signal is smaller than 0% or higher than 100% of the selected display range.

It is also possible to adjust 2 visual limit indications. If the actual input signal exceeds the set limits, the active bar dots will flash, and the set dots is on steady light. MIN, MAX and UNIT indication is placed behind the front label for horisontal or vertical graph.

Technical data:

Supply voltage:	9-36 VDC / 9-26 VAC
	The supply voltage is galvanically isolated from the internal electronics.
	(test voltage 4 kV AC)
Power consumption:	1 VA
Operating temp.:	-10°C to +50°C
Humidity:	0 - 90% RH, non-condensing
Protection:	IP 54
Temp.coefficient:	max. 0,01% / °C
Metering ranges:	0-100 mV, 0-1 V, 0-10 V, 0-20 mA and 4-20 mA.
Input impedances:	Voltage metering: >100 kΩ
	Current metering: typ. 75 Ω
Range adjustment:	Offset (minimum scale): 0% potentiomer adjustable from 0 - 80% of selected metering range. Span (maximum scale): 100% potentiometer adjustable from 50% to 250% of the metering range.
Dot size:	1x1 mm red LED.

Mech. dimensions:

L x W x D:	24 x 96 x 66 mm.
Panel cut-out:	21 x 90 mm.
Weight:	100 g.
Materials:	NORYL2, SE1
Connections:	screw terminals, max. 1,5 ☐ mm.

EMC and safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE and low voltage regulations.

Calibration:
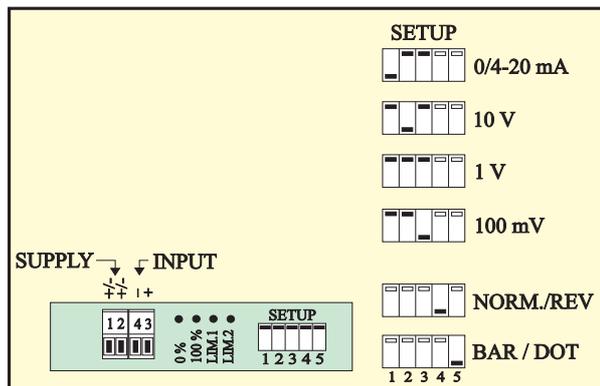
1: On dip 1-2-3 select the wanted input range.

2: Connect the wanted minimum signal to the input and adjust for wanted minimum display with 0% potmeter.

3: Connect the wanted maximum signal to the input and adjust for wanted maximum display with 100% potmeter.

4: Check min and max display and readjust if needed.

5: Select display options (bar/dots and normal/reverse) on dip 4-5.

6: Adjust min and max limits on LIM1 and LIM2 potmeters if wanted.

Block diagram:

Comadan Produktion a/s

4 digit universal instrument DP545
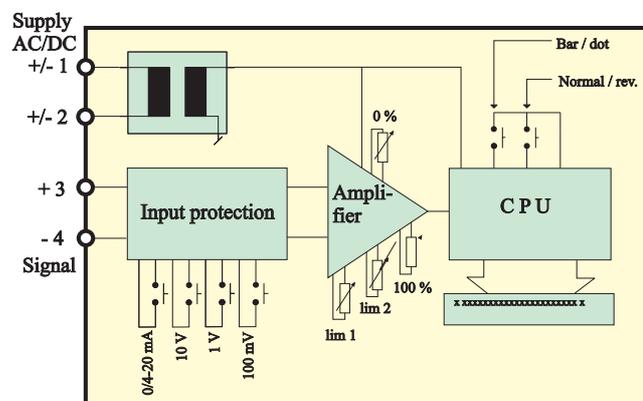
Universal inputs: mA, V, resistance/potmeter, Pt100, TC

2 relay outputs + analogue output

Programmable range, function and setpoints

Galvanic isolation between supply and internal electronics

Made in accordance with the C€ and EMC regulations

The DP545is supplied with universal metering inputs for direct connection to Pt100 and various TC temperature sensors, as well as linear current, voltage and resistance/potentiometer signals.

Built-in voltage references enables direct connection of 3-wire potentiometers and 2-wire transmitters.

The instrument is supplied with 1 analogue output and 2 relay outputs, all outputs are programmable.

A digital control input can be used for either HOLD function or display reset (tare).

Programming of the in- and output ranges is possible either with internal pre-calibrated signals or with external signals.

The unit is fully programmable via the keys on the front panel, and access limitation in several levels is possible. Reaction delay on both the display reading and the output relays is programmable too.

On the front panel there is a field, in which the metering unit (%, °C, kg, ...) can be inserted.

Universal metering input:

The input configuration is programmable, and the selection between input pins, metering current etc. is automatically selected, when the actual input is programmed.

Pt100 temperature metering with 3-wire cable compensation. It is possible to enter a manual correction of the metering signal.

TC temperature metering with standard thermocouple sensors, either with internal CJC or manually programmed CJC temperature.

Linear resistance metering with 3-wire cable compensation.

DC current metering with built-in input protection.

DC voltage metering, either direct metering, or relatively via 3-wire potentiometer.

2-wire transmitter current metering via built-in supply for transmitter.

Digital input:

Galvanically isolated input for display HOLD or reset (tare) function.

Outputs:

2 relay outputs with change-over contacts. Function, setpoint, delay, etc. is programmable.

1 analogue output, programmable in the range 0-20 mA / 0-10 V, normal or inverted function.

Display / operation:

4-digit LED (+/-9999) with programmable display intensity and decimal point, 2 LED's for relay position, 2 LED's for input trend (rising/falling), and 4 LED's used during programming.

3 buttons used during programming.

Technical data:

Supply voltage:	24 V AC/DC
	The supply voltage is galvanically isolated from the internal electronics. (test voltage 4 kV AC)
Power consumption:	2 VA
Operating temp.:	-10°C to +50°C
Humidity:	0 - 90% RH, non-condensing
Digit height:	13 mm.
Protection:	IP 65 (front panel only)
Calibration accuracy:	better than +/- 0.1% FS
Reference temp.:	23°C
Temp.coefficient:	max. 0,01% FS / °C
Linearity:	better than +/- 0.1% FS
Mech. dimensions:	in accordance with DIN 43700
L x W x D:	48 x 96 x 105 mm.
Panel cut-out:	43 x 91 mm.
Weight:	350 g.
Materials:	NORYL, SE1
Connections:	screw terminals, max. 1,5 ☐ mm.

I / O specifications:

Metering input:

Current.

Metering range:	0...20 / 4...20 mA (max. 25 mA)
Input resistance:	50 Ω (supply connected)

Voltage.

1. Metering range:	0...10 / 2...10 VDC (max. 12 VDC)
Input resistance:	typ. 130 kΩ
2. Metering range:	0...1 / 0.2...1 VDC (max. 1.2 VDC)
Input resistance:	typ. 10 MΩ

Potentiometer (3-wire connection).

Potmeter value:	100 Ω ... 10 kΩ
Ref. voltage:	typ. 1.2 VDC

Linear resistance (3-wire cable compensation).

Metering range:	0...400 Ω
Cable resistance:	max. 10 Ω / wire

Pt 100 (3-wire cable compensation).

Metering range:	-200...800°C (FS)
Display resolution:	0.1°C
Sensor current:	typ. 1 mA
Cable resistance:	max. 10 Ω / wire
Basic accuracy:	+/- 0.5°C
Temp. coefficient:	< +/- 0.04°C / °C ambient temp.

Thermocouple.

Range, type E:	-60..+ 780°C (FS)
Range, type J:	-60..+1000°C (FS)
Range, type K:	-100..+1300°C (FS)
Range, type R:	-50..+ 980°C (FS)
Range, type S:	-100..+1750°C (FS)
Range, type T:	-100..+ 400°C (FS)

Display resolution:	1°C
Basic accuracy:	+/- 2°C
CJC accuracy:	internal comp. +/- 2°C
Temp. coefficient:	< +/- 0.1°C / °C ambient temp. (E, J, K, T)
	< +/- 0.3°C / °C ambient temp. (R, S)

Digital input:

Active input:	> 12 VDC
Not active:	< 5 VDC
Input current:	10 mA @ 24 V

Analogue output:

1: Current:	0...20 / 4...20 mA (max 22 mA)
Load resistance:	max. 500 Ω
2: Voltage:	0...10 / 2...10 VDC (max. 11 VDC)
Output resistance:	typ. 500 Ω

Relay outputs (change-over contacts):

Max. load, AC:	250 VAC / 2 A
Max. load, DC:	max. 2 A, max. 100 W

2-wire transmitter supply:

Voltage:	typ. 15 VDC @ 20 mA
Current:	limitation, 24 mA

Potentiometer reference:

Voltage:	typ. 1.2 VDC
Current:	limitation, 24 mA

Metering current, Pt100:

Current:	typ. 1 mA
Internal load:	max. 450 Ω

Ordering guide: **DP545-1-1-1-1**

**Comadan
Produktion a/s**

C-mac®

4½ digit process indicator DPP451
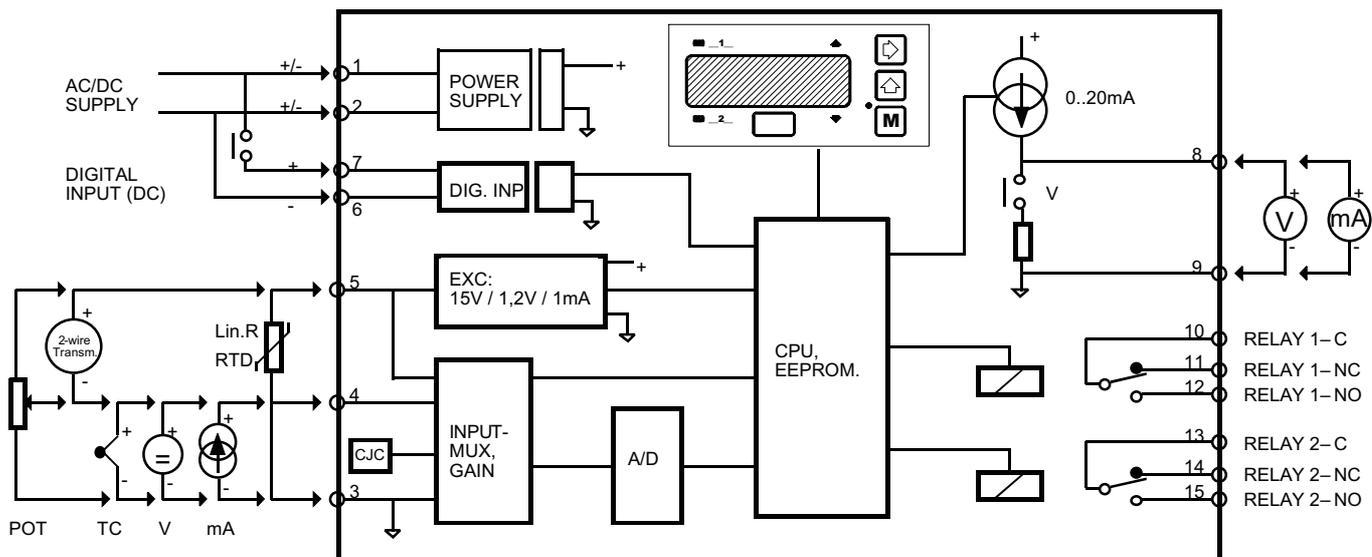
Universal inputs: mA, V, Ohm, RTD, TC, Strain gauge

2 relay outputs + digital and analogue output

Programmable range, function and setpoints

Galvanic isolation between supply and internal electronics

Communication protocol for PC or slave display

Made in accordance with the CE and EMC regulations

The DP545is a 4½ digit user programmable panel instrument with backlight LCD. The instrument is supplied with universal metering inputs for direct connection to RTD and various TC temperature sensors, as well as linear current, voltage and resistance/potentiometer signals. At temperature metering, the units are programmable in °C, °F or °K.

Built-in voltage references enables direct connection of 3-wire potentiometers, 2-wire transmitters and strain gauge transducers.

In addition to monitoring of linear signals and linearisation of standard temperature signals, it is also possible to linearize signals in accordance with a user defined curve. The curve is defined as a number of segments, each with individual slope and polarity.

The instrument is supplied with 1 analogue, 1 digital and 2 relay outputs, all outputs are programmable.

A digital control input can be used for several programmable functions.

Optionally the unit is supplied with serial RS232 or current loop interface and interface for a slave display.

The unit is fully programmable via the keys on the front panel, and access limitation in several levels is possible. Reaction delay on both the display reading and the output relays is programmable too.

On the front panel there is a field, in which the metering unit (%, °C, kg, ...) can be inserted.

Technical data:

Supply voltage:	230 V AC or 115 VAC The supply voltage is galvanically isolated from the internal electronics. (test voltage 4 kV AC)
Power consumption:	5 VA
Operating temp.:	-10°C to +50°C
Humidity:	0 - 90% RH, non-condensing
Digit height:	10 mm.
Protection:	IP 54 (front)
Mech. dimensions:	in accordance with DIN 43700
L x W x D:	48 x 96 x 117 mm.
Panel cut-out:	44 x 92 mm.
Weight:	350 g.
Materials:	NORYL, SE1
Connections:	screw terminals, max. 1,5 □ mm.

Universal metering input:

The input configuration is programmable, and the selection between input pins, metering current etc. is automatically selected, when the actual input is programmed.

DC current:

Input resistance:	75 Ω
Metering ranges, FS:	20 mA to 80 mA
Accuracy:	better than 0.1%

DC voltage:

Input resistance:	10 MΩ
Metering ranges, FS:	10 mV to 10 V
Accuracy:	better than 0.2%

Linear resistance:

Metering current:	2 mA
Metering ranges, FS:	5 Ω to 5 kΩ
Accuracy:	better than 0.2%

Potentiometer:

Metering voltage:	10 V
Metering ranges, FS:	400 Ω to 20 kΩ
Accuracy:	better than 0.2%

Thermocouple:

All signalr are linearized in acc. with the IEC584-1 regulations. The unit has internal compensation for Cold Junction and indication for broken sensor cable.
Display reading programmable in °C, °F or °K.

Metering ranges:

Type J:	-210..+ 1200°C	(-346..+2192°F)
Type K:	-270..+ 1371°C	(-454..+2500°F)
Type R:	0..+ 1768°C	(+ 32..+3214°F)
Type S:	0..+ 1768°C	(+ 32..+3214°F)
Type T:	-270..+ 400°C	(-454..+ 752°F)
Type E:	-270..+ 1000°C	(-454..+1832°F)
Type B:	0..+ 1820°C	(+ 32..+3308°F)

Display resolution:	Programmable 0.1 or 1°
Input resistance:	10 MΩ

RTD sensors:

Metering current:	2 mA
Cable resistance:	max. 100Ω / wire
Display reading:	Programmable in °C, °F or °K.
Display resolution:	0.1°
Metering ranges:	

Pt100:	-200..+850°C	(-328..+1562°F)
Pt1000:	-200..+850°C	(-328..+1562°F)
Ni100:	- 60..+180°C	(- 76..+ 356°F)

Comadan Produktion a/s

Digital input:

Programmable function. Input galvanically isolated from all other in- and outputs.

Max. voltage:	28 VDC
Active input:	> 8 VDC
Not active:	< 1.7 VDC
Input current:	10 mA @ 24 V

Digital output:

Programmable function. Transistor output, galvanically isolated from all other in- and outputs.

Max. voltage:	30 VDC (not active)
Max. voltage:	2.4 V (active)
Max. load current:	50 mA

Analogue output:

Galvanically isolated current output with programmable range. Retransmission of metering signals or peak-hold value. Other functions by request.

Output range:	0...20 (max 22 mA)
Load resistance:	max. 800 Ω
Output ripple:	max. 0.5% RMS

Relay outputs (change-over contacts):

Max. voltage:	250 VAC
Max. current:	2 A

RS232 interface (optional):

Retransmission of display value or other function per request. Communication with pc i connection with programming.

Transmission speed:	9600 bps
Data format:	7 data bits, no parity, 2 stop bits

Interface, slave display (optional):

Output for connection of one or more display units. Retransmission of display value.

Signal level:	5 V
Cable length:	max. 10 m

Ordering guide: DPP451-a-b-c-d

a = Supply voltage
    1 = 230 VAC
    2 = 115 VAC

b = RS232 interface
    0 = no interface
    1 = including interface

c = Interface, slave display
    0 = no interface
    1 = including interface

d = prefix
°C, °F, °K, mA, A, mV, V, g, kg, t, t/h, %, %H, Ohm, kOhm, mm, cm, m, mb, b, ml, l,............

Mechanical dimensions:

Block diagram:

Comadan Produktion a/s

4-digit pressure instrument DP570
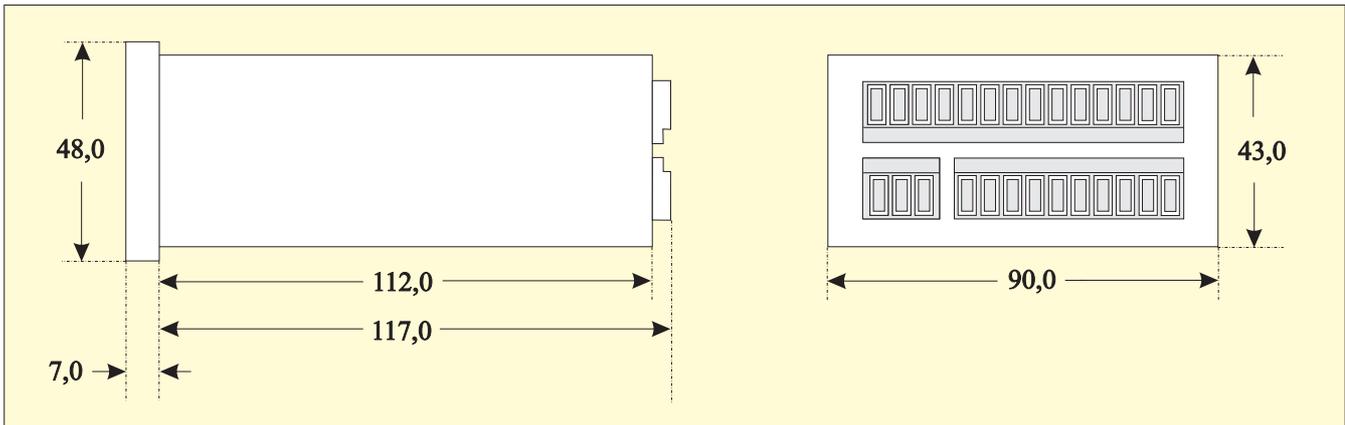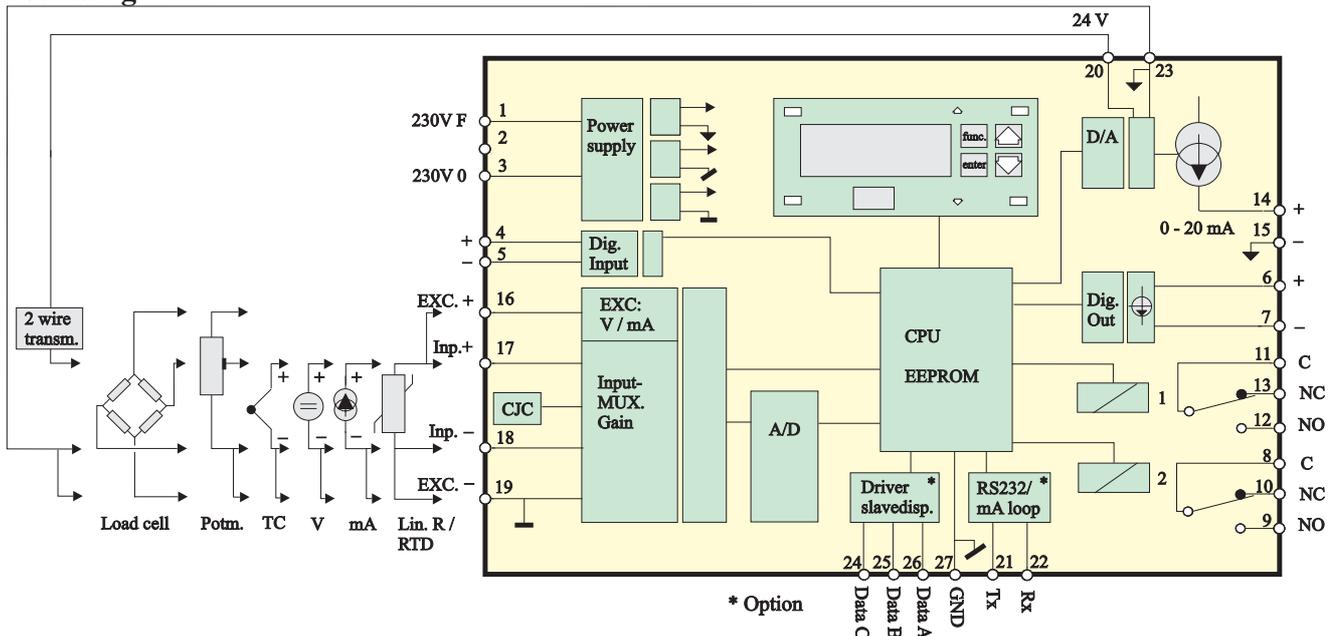
Monitoring of differential pressure

Metering input +/- 350 mbar

Supply voltage 9-35 VDC (12-26 VAC)

Air connection: 4 mm tube

Front dimensions: 72 x 72 mm, 13 mm LED display

Made in accordance with the CE and EMC regulations

DP570 is used for industrial instrumentation, where you want to monitor differential pressure or level in a control panel.

The instrument is also available with 1 analogue 4-20 mA metering output and 1 programmable digital output, or with RS485 / CAN connectionl.

The instrument is powered by 24 VAC/DC. Connections and programming are made on the back of the unit.

Offset, span, decimal point and light intensity are programmable, and if the instrument is supplied with outputs, it is possible to program setpoints, hysteresis and time-delay.

Additional informations: See programming manual.

Technical data:

Supply voltage:	9-35 VDC / 12-26 VAC
Power consumption:	typ. 12 mA @ 24 VDC
Operating temp.:	-10°C to +50°C
Humidity:	0 - 90% RH, non-condensing
Protection:	IP 54
Temp.coefficient:	max. 0.01% FS/ °C
Linearity:	+/- 0.1% FS
Display range:	-999 to 9999
Calibration accuracy:	better than +/- 0.1% FS
Metering range:	0 - 350 mbar
Input protection:	max. 1.7 bar (burst)
Dimensions:	according to DIN 43700
L x W x D:	72 x 72 x 67 mm

EMC-data:

Emission:	EN 50081-2
Immunity:	EN 50082-2
Safety:	EN 60730

Block diagram:
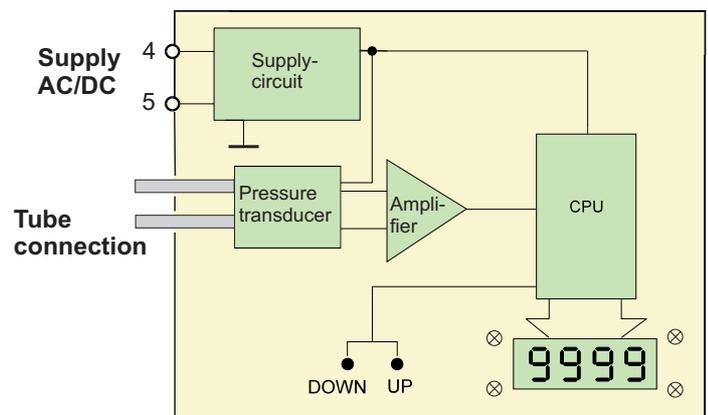
Option 1:
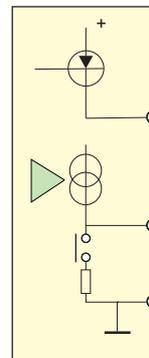
Option 2:
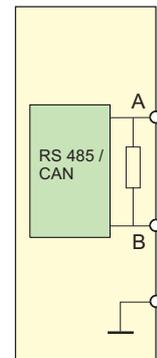
Ordering guide:		
Type:	Option	Metering range
DP570-1	**0** = indicator only **1** = 0/4-20 mA and 1 digital **2** = RS485 **3** = CAN	**1** = 0-350 mbar **x** = special
Example: DP570-1-0-1		

Comadan Produktion a/s

C-mac®

4-digit weight instrument DP571

Connections for 1 to 4 load cells

Tare function and automatic zero setting

Supply voltage 9-35 VDC (12-26 VAC)

Programming on keypad or RS 485

Front dimensions: 72 x 72 mm, 13 mm LED display

Made in accordance with the CE and EMC regulations

DP570 is used for industrial instrumentation, where you want to monitor weight or mechanical load in a control panel.
The instrument is also available as a counting scale.
Optionally the instrument is available with 1 analogue 4-20 mA metering output and 1 programmable digital output, or with RS485 / CAN connectionl.

The instrument is operated on the keypad on the front or via RS485 interface (option 2). It is possible to enter the load cell data, in this way you can change a load cell without recalibration of the instrument

The following data are programmable:
Zero and span adjustment of the display, light intensity, reaction delay, decimal point, load cell data, digital input function, keypad function, RS485 parameters and aut. zero parameters.
With option 1 setpoints, hysteresis etc. are also programmable.

Additional informations: See programming manual.

Block diagram:

Shown with option 2

Option 1:

Option 2:

Technical data:

Supply voltage:	9-35 VDC / 12-26 VAC
Power consumption:	typ. 15 mA @ 24 VDC (with one 350 Ω load cell)
Operating temp.:	-10°C to +50°C
Humidity:	0 - 90% RH, non-condensing
Protection:	IP 65 (front)
Temp.coefficient:	max. 0.01% FS/ °C
Linearity:	+/- 0.1% FS
Display range:	-999 to 9999
Calibration accuracy:	better than +/- 0.5% FS
Metering range:	0.25-30 mV/V exc. (load cells)
Exc. voltage:	typ. 4 VDC
Max. metering range:	0-200 mV (direct metering)
Resolution:	min. span 1 mV for 9999 counts
Dimensions: L x W x D:	according to DIN 43700 72 x 72 x 67 mm

EMC-data:

Emission:	EN 50081-2
Immunity:	EN 50082-2
Safety:	EN 60730
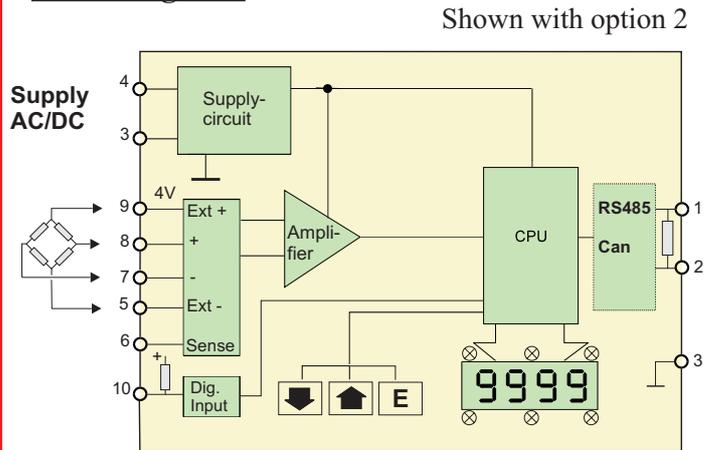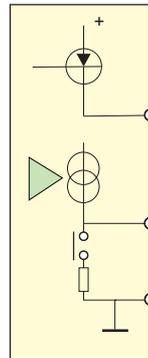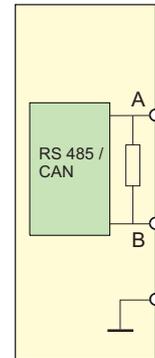
Ordering guide:		
Type:	Option	Metering range
DP571-1	**0** = indicator only **1** = 0/4-20 mA and 1 digital **2** = RS485 **3** = CAN	**1** = 2 mV/V exc. **x** = special
Example: DP571-1-0-1		

Comadan Produktion a/s

C-mac®

3½-digit speed monitor DC470

Speed monitor with relay outputs

Monitoring range 10.0 to 1999 r.p.m.

Supply voltage 230 VAC

2 programmable setpoints with relay output

Front dimensions: 48 x 96 mm, 13 mm LED display

Made in accordance with the ℃€ and EMC regulations

DC470 is used for industrial instrumentation, where you want to monitor speed, detected by a proximity sensor, and in addition you have two relay outputs, f.inst. for overspeed alarm.

The two setpoints are programmable within the ranges 20 to 1100 r.p.m.
The relays activate, when the control input is activated, and stays activated in a minimum time, programmable between 1 and 100 sec.
In case of overspeed, the reaction delay, programmable between 0 and 10 sec. starts, and if the overspeed is still present after the reaction delay, the relay releases, and stays released until the control input is opened and closed again.
Other parameters, input filter, pulses per revolotion and gear division, are also programmable, see programming manual.

Technical data:

Supply voltage:	230 VAC
Power consumption:	3-5 W
Operating temp.:	-10°C to +50°C
Humidity:	0 - 90% RH, non-condensing
Protection:	IP 54
Display range:	10.0 to 1999 r.p.m.
Accuracy:	better than +/- 0.05% FS
Dimensions:	according to DIN 43700
L x W x D:	48 x 96 x 67 mm

EMC-data:

Emission:	EN 50081-2
Immunity:	EN 50082-2
Safety:	EN 60730

Connections:
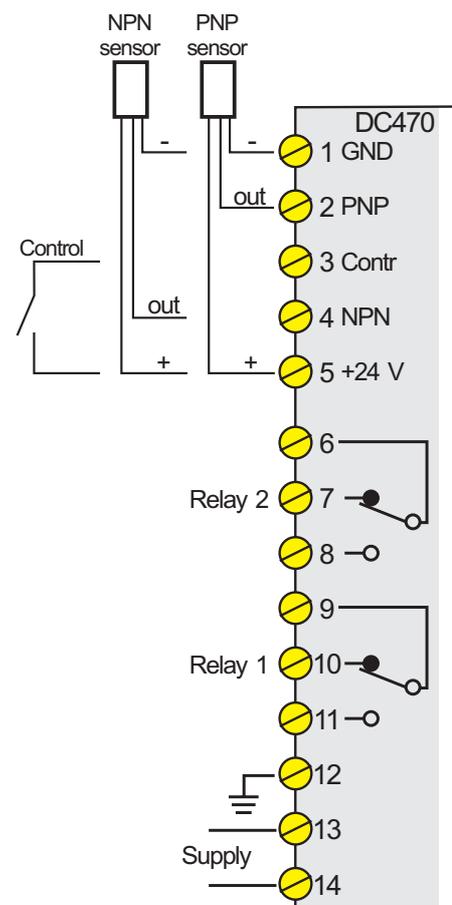
Ordering guide:

Type:	
DC470-230	
Example: DC470-230	

Comadan Produktion a/s

Universal instrument for monitoring and calibration of signal converters and process data

Supplies or monitors current- and voltage signals

Analogue adjustment and digital display

Supplied from battery or line via adaptor

Made in accordance with the CE and EMC regulations

The MS4201 is a battery supplied field instrument, which can be used for test and simulation of current- and voltage signals within the ranges 0-20 mA and 0-10 V.

The MS4201 can supply 0-20 mA or 0-10V DC variable. Furthermore there are 2 fixed positions for 2 V / 4 mA or 10 V / 20 mA.
The function "passive" is used for simulation of 2-wire transmitters, and the unit is then consuming the adjusted current..
Furthermore you can use the instrument for monitoring of 0-25 mA or 0-25 VDC.

The MS4201 is supplied from a standard 9 V battery, and it is also supplied with a plug for connection to an adaptor.
If the instrument has not been used for 25 minutes, it returns to "power down" mode, where the current consumption is very low.
This function can be avoided, if wanted.

The instrument is supplied with the following units:

4-digit LCD display
2 rotary switches for function and range selection
Potentiometer for range adjustmen.t

Technical data:

Battery type:	9 V, type 6LR61
Power consumption:	< 45 mA
Display, resolution:	0,01 mA / 0,01 V
Accuracy:	+/- 0,2 %
Operating temp.:	-20°C to +50°C
Temp. coefficient:	< 0,005% / °C
Input impedances:	Voltage: >100 kΩ Current: voltage drop<3,5 V
Max. load:	Current: max 500 Ω Voltage: min. 1 kΩ
Connections:	Banana plug in top of the instrument. All terminals are protected against over voltage, wrong polarity and short-circuit.

Ordering guide:

Instrument:	MS4201
AC-adaptor:	BE12-230

Dimensions and weight:

H x W x D:	150 x 80 x 35 mm
Weight:	250 g

Connections:

Comadan Produktion a/s

C-mac® 3-phase monitoring relays series FP
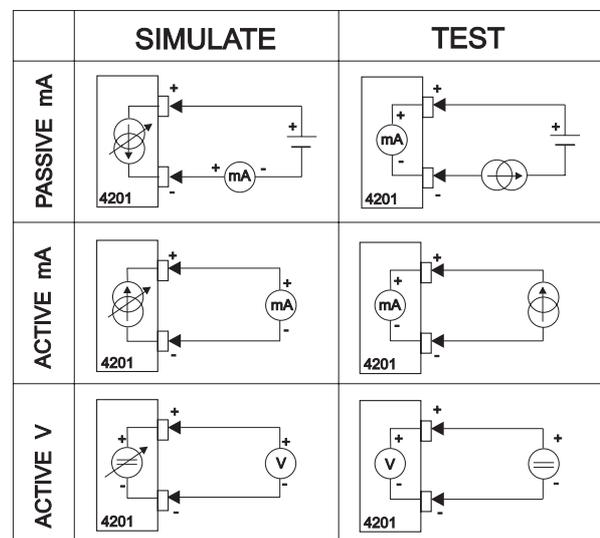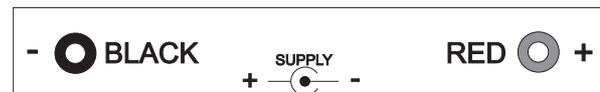
Under-voltage monitoring with or without time-delay

Over-voltage monitoring with or without time-delay

Phase-sequence monitoring with or without time-delay

Phase asymmetry monitoring with or without time-delay

+ various combinations of these monitoring principles

Single-pole relay output 8 A - 250 VAC

Made in accordance with the CE and EMC regulations

The C-mac® 3-phase monitoring relays series FP are made particularly to meet the requirements for safe and cost-effective monitoring of the quality of the 3-phase supply voltages and to protect electrical devices connected to the mains supply.

The units are enclosed in a DIN-rail housing, 35 mm wide and front height 45 mm, which makes them very suitable in industrial installations as well as domestic switchboard panels.

All units are connected to the 3-phase supply voltage with or without neutral and have a 1-pole relay output. The units are made in accordance with the EMC regulations for use in industrial environment.

The FP series consist of the following variants:

FP30: Combined under- and over voltage relay with fixed reaction delay and adjustable setpoint.

FP31: Phase sequence / phase asymmetry relay with fixed reaction delay and adjustable setpoint.

FP34: Combined phase sequence and under- and over voltage relay with fixed reaction delay and adjustable setpoint.

FP35: Combined under- and over voltage relay with fixed setpoints and adjustable reaction delay.

The functional principle is the same for all units:
When the supply voltage is connected, and the monitored parameters are within the selected limits, the output relay is activated, and if one or more of the parameters are outside the limits, the relay will release. The relay function can be with or without time delay, dependent on the type of module.

Common technical data:

Supply voltage (ph-ph):	3 x 220 VAC +/- 25 %
	3 x 230 VAC +/- 25 %
	3 x 380 VAC +/- 25 %
	3 x 400 VAC +/- 25 %
	3 x 415 VAC +/- 25 %
Supply frequency:	45 - 65 Hz
Power consumption:	Approx. 1.5 W
Operating temperature:	-20°C to +60°C
Isolation voltage:	Supply - relay output: 4 kV
Humidity:	0-90% RH, non condensing

Indications:

Green LED, activated: Supply ON and levels are OK
flashing: Supply ON and level error
Red LED: Relay activated

Relay output: 1-pole change-over contact max. load: 8 A / 250 VAC, ohmic load

EMC and safety regulations:

|	
Emission:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730 - 1
Approvals:	The modules are produced in accordance with CE and high voltage regulations

Mechanical dimensions:

N L1 L2 L3

C-mac
3-phase module
● Supply
● Relay
Level

NC C NO

90

62

45

35

26

21

10

Comadan
Produktion a/s
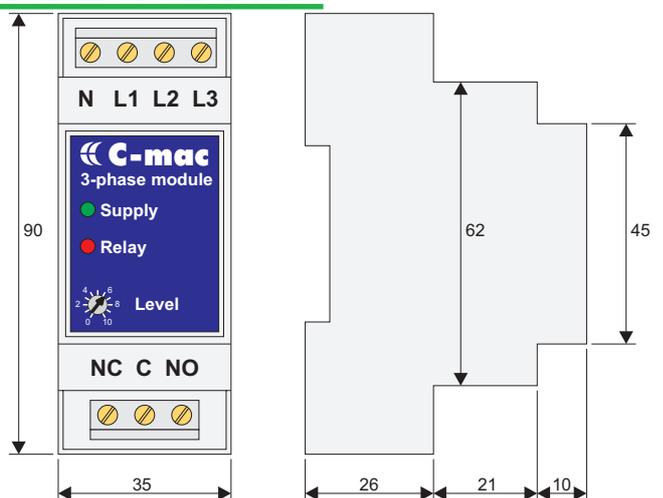
Sensitivity and accuracy.

All units are universal for 3-phase supply with or without neutral. Internally, the 3 phase signals are monitored with respect to neutral, and all adjustments are made with neutral connected. If the unit is connected to an installation without neutral, the unit will generate its own internal neutral level.In this case, the sensitivity of the unit is dependent on the way, the 3 phase-phase signals changes with respect to each other: If all 3 phases are equal, e.g. all of them are 10% lower than the nominal value, the accuracy and sensitivity of the unit is the same as if the neutral was connected, because the internal neutral remains the same.If only one of the phases changes, the result is that the internal neutral level will have an offset compared with the correct neutral, and the sensitivity of the unit will be decreased with up to 25%, depending on the difference between the 3 phase-phase voltages.

Specifications type FP30.

FP30 is a combined under- and over-voltage relay with fixed reaction delay and adjustable setpoint. The output relay activates, when all 3 voltages are within the set limits and releases, if one or more of the voltages are outside the limits.

The standard type has a delay-ON and delay-OFF time at 1 sec., and an adjustabe setpoint from +/- 5 to +/- 25 % of the nominal voltage. Optionally, the unit can be delivered for under-voltage or over-voltage detection only, with ON-delay or OFF-delay only, with different delay time, or with different set-point range, see ordering guide.

Accuracy, set-point: better than 2 %

Accuracy, delay: better than 1 %

Specifications type FP31.

FP31 is a phase-sequence/phase-asymmetry relay with fixed reaction delay and adjustable setpoint. The output relay activates, if the phase sequence is OK and the phase asymmetry between the 3 phases is lower than the set limit, and releases, if the asymmetry exceeds the setpoint. Compared with FP30 the relay does not release, if all 3 voltages are higher or lower than the nominal voltages, as long as the asymmetry between them is lower than the setpoint.

The standard type has a delay-ON and delay-OFF time at 1 sec., and an adjustabe setpoint from 5 to 25 %. Optionally, the unit can be delivered with ON-delay or OFF-delay only, with different delay times, or with different set-point range, see ordering guide.

Accuracy, set-point: better than 2 %

Accuracy, delay: better than 1 %

Specifications type FP34.

FP34 combines the functions from FP30 and FP31, i.e. it is a combined phase sequence and under- and over-voltage relay with fixed reaction delay and adjustable setpoint. The output relay activates, if the phase sequence is correct, and all 3 voltages are within the set limits and it releases, if one or more of the voltages are outside the limits.

The standard type has a delay-ON and delay-OFF time at 1 sec., and an adjustabe setpoint from +/- 5 to +/- 25 % of the nominal voltage. Optionally, the unit can be delivered for under-voltage or over-voltage detection only, with ON-delay or OFF-delay only, with different delay time, or with different set-point range, see ordering guide.

Accuracy, set-point: better than 2 %

Accuracy, delay: better than 1 %

Specifications type FP35.

FP35 is a combined under- and over-voltage relay with fixed setpoint and adjustable reaction delay. The output relay activates, when all 3 voltages are within the set limits and releases, if one or more of the voltages are outside the limits.

The standard type has a setpoint of +/-10% of the nominal supply voltage and an adjustable delay-ON and delay-OFF time between 0 and 10 sec. Optionally, the unit can be delivered for under-voltage or over-voltage detection only, with ON-delay or OFF-delay only, with different setpoint, or with different delay range, see ordering guide.

Accuracy, set-point: better than 2 %

Accuracy, delay: better than 1 %

Functional diagram FP30, FP34 and FP35:


Example: Setpoint adjusted to +/- 10%
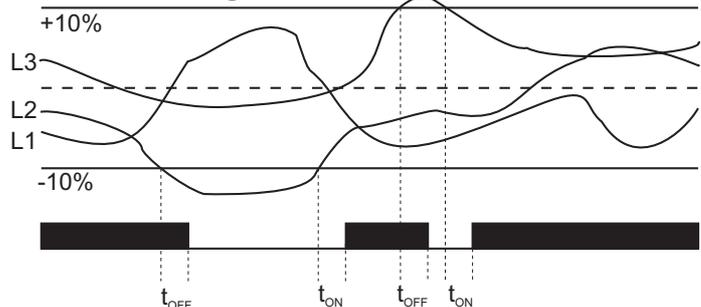
Functional diagramFP31:

Comadan Produktion a/s
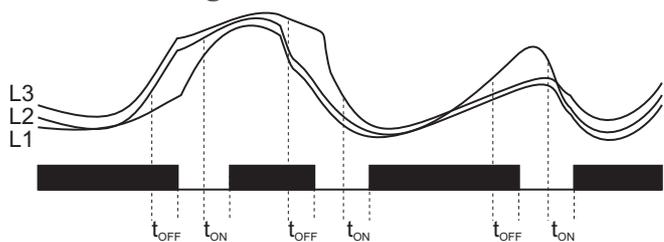
Connections:

ex. 1: Mains monitoring.
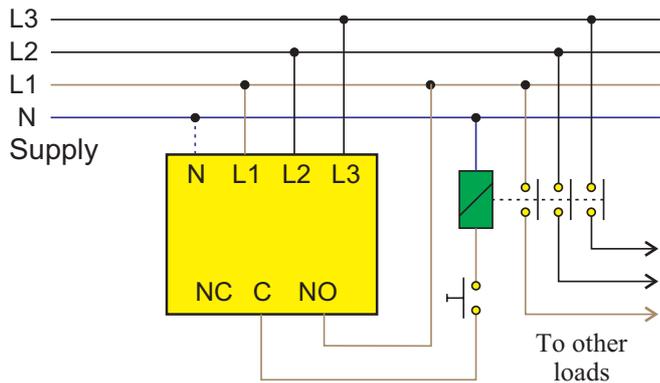
When the monitoring relay is connected as shown on the drawing above, the mains supply must be correct, before the load can be activated. This is particularly important if the load is sensitive to under- or over-voltage, and to ensure correct rotation direction of motors. This monitoring principle is recommended, when you want a general monitoring of the mains supply to several loads at the same time.

ex. 2: Load monitoring.
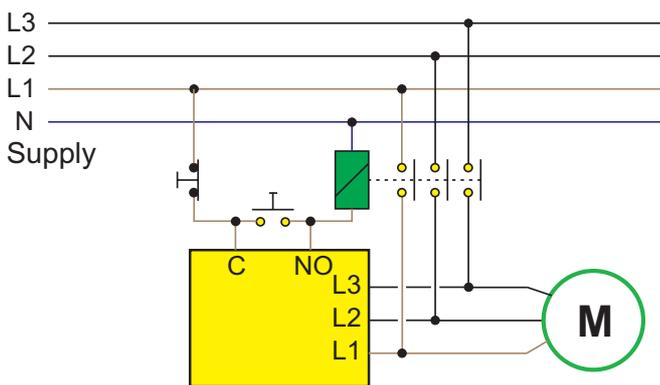
If instead you want to monitor the supply voltage for a single load, you can connect the monitoring relay after the contactor, in this way the contactor itself is also monitored. This principle is recommended if f.inst. you want a quick reaction in case of a phase failure to a motor. In the example above, the relay output is connected in parallel with the start contact, thereby it latches the contactor, if the supply is OK, and in case of an error, the contactor is released.

When you connect the monitoring relay after the contactor, you must notice, that the monitoring relay is activated at the same time as the load, which means the relay cannot protect against wrong phase-sequence during the period, where the start-button is activated..

Ordering guide:

FP30-xxx-ab-cd

FP31-xxx-e-cd

FP34-xxx-ab-cd

FP35-xxx-fg-hi

xxx = supply voltage (phase-phase)
220 = 220 VAC
230 = 230 VAC
380 = 380 VAC
400 = 400 VAC
415 = 415 VAC

If the standard unit is ordered, only the type number and the supply is used, e.g. FP31-400.

Standard units:

FP30-xxx:	Delay-ON and delay-OFF: fixed 1 sec. Setpoint: adjustable +/- 5% to +/- 25%
FP31-xxx:	Delay-ON and delay-OFF: fixed 1 sec. Setpoint: adjustable 5% to 25%
FP34-xxx:	Delay-ON and delay-OFF: fixed 1 sec. Setpoint: adjustable +/- 5% to +/- 25%
FP35-xxx:	Delay-ON, delay-OFF: adjustable 0-10 sec. Setpoint: fixed +/- 10%

If a special unit is ordered, the whole number must be used, e.g. FP30-400-30-31

a = under-voltage range   b = over-voltage range
0 = not used   5 = fixed 5 %   Note:
1 = 5 - 10 %   6 = fixed 10 %   If both under- and over
2 = 5 - 15 %   7 = fixed 15 %   voltage monitoring is
3 = 5 - 20 %   8 = fixed 20 %   used, both ranges must
4 = 5 - 25 %   9 = fixed 25 %   be the same, e.g. 5-15%
x = special

c = t_{on} delay   d = t_{off} delay
0 = 100 msec   3 = 3 sec   6 = 1 min
1 = 300 msec   4 = 10 sec   7 = 3 min
2 = 1 sec   5 = 30 sec   8 = 10 min
x = special

e = asymmetry range
1 = 5 - 10 %
2 = 5 - 15 %
3 = 5 - 20 %
4 = 5 - 25 %
x = special

f = setpoint, under voltage   g = setpoint, over voltage
0 = not used   0 = not used
1 = - 5 %   1 = + 5 %
2 = -10 %   2 = +10 %
3 = -15 %   3 = +15 %
4 = -20 %   4 = +20 %
5 = -25 %   5 = +25 %
x = special   x = special

h = t_{on} delay range   i = t_{off} delay range
Note: If both t_{on} and t_{off} is adjustable, both of them must have the same range.
If one of the delays is fixed, an "F" is placed before the delay range number (range 0 and 1 is always fixed)

0 = 100 msec   3 = 0 - 3 sec   6 = 0 - 1 min
1 = 300 msec   4 = 0 - 10 sec   7 = 0 - 3 min
2 = 0 - 1 sec   5 = 0 - 30 sec   8 = 0 - 10 min
x = special

Comadan Produktion a/s

Comadan
Produktion a/s

Monitoring of 1-phase supply voltage

Separate adjustments of minimum and maximum limits

1- or 2-pole relay output

DC supply or AC supplies up to 230 VAC

Made in accordance with the CE and EMC regulations

The C-mac® module type RP10 monitors its own 1-phase supply voltage and checks that it is within the adjusted minimum and maximum limits, and in that case, the output relay is activated.

The modulecan operate from 80% to 120% of the nominal supply voltage.

Technical data:

Supply voltage:	24 VDC, 24 VAC, 115 VAC or 230 VAC +/- 20%
Power consumption:	2,5 VA
Operation temp.:	-20°C til +60°C
Humidity:	0 - 90% RH, non-condensing
Adjustments:	
Upper limit:	Potentiometer, 105 to 120%.
Lower limit:	Potentiometer, 80 to 95%
Hysteresis:	1% of the nominal supply.
Indications:	
Green LED:	Supply voltage connected
Red LED:	Relay active
Max. load, relay:	1-pole: 8 A - 250 VAC 2-pole: 5 A - 250 VAC, ohmic load

EMC and safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.

Connections:

pin 8-9-11: 2-pole version only

Supply

Functional diagram:

setpoint
hysteresis
nom.sup.
actual sup.
hysteresis
setpoint
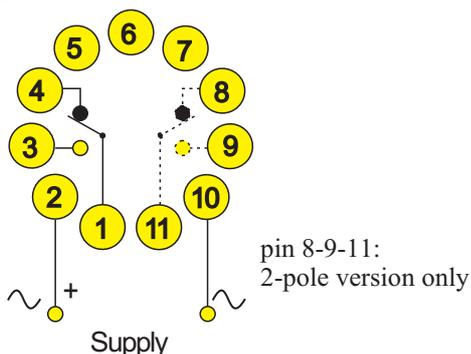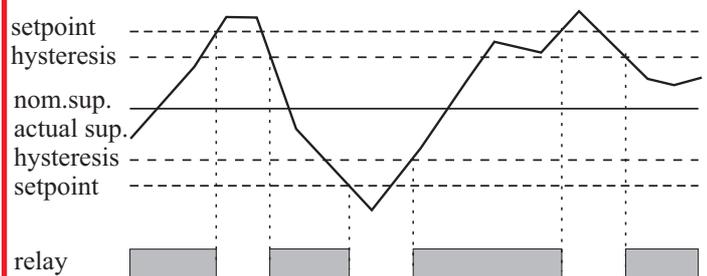
relay

Ordering guide:

Supply	Type no.
24 VDC	RP10-x-0-024
24 VAC	RP10-x-1-024
115 VAC	RP10-x-1-115
230 VAC	RP10-x-1-230
x = output relay:	1 = 1-pole
	2 = 2-pole

Mechanical dimensions:
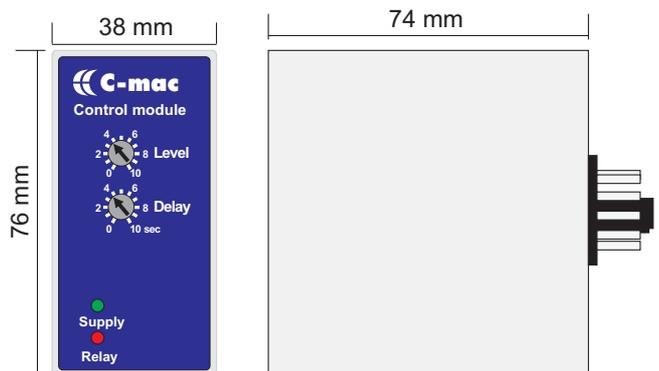
38 mm

74 mm

76 mm

Materials and weight:

Housing:	NORYL-SE-1, grey, self-extinguishing
Housing bottom:	NORYL SE-1, GFN-2, black, self-extinguishing
Terminals:	Nickel-plated brass
Weight:	110 g

C-mac®

3-phase monitoring of phase asymmetry

Monitors correct phase sequence

Adjustable asymmetry level 5-25 %

1-pole relay output 8 A / 250 V AC

AC supply voltages up to 3 x 415 VAC

Made in accordance with the CE and EMC regulations

The C-mac® module type RP33 meters its own 3-phase supply voltage, and if the phase sequence is correct and the phase asymmetry is below the adjusted level, the output relay is activated.

The module is suitable for monitoring of motors, since it ensures correct rotation direction and releases in case of a missing phase, also if the motor continues its rotation, provided that the resulting asymmetry is higher than the adjusted limit.

To ensure the best possible monitoring, the module must be connected as close to the motor as possible, in this way, the contactor function is also monitored.

Technical data:

Supply voltage:	3 x 220 V +/- 25%
	3 x 380 V +/- 25%
	3 x 400 V +/- 25%
	3 x 415 V +/- 25%
Supply frequency:	50 or 60 Hz
Power consumption:	2,5 VA
Operation temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing
Adjustments:	Potentiometer, scale 5 to 25%.
Hysteresis:	1 - 3,5 %.
Reaction delay:	typ. 1 sec.
Indications:	
Green LED:	Supply voltage connected
Red LED:	Relay aktive
Max. load, relay:	1-pole: 8 A - 250 VAC, ohmic load

EMC and safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.

Functional diagram:
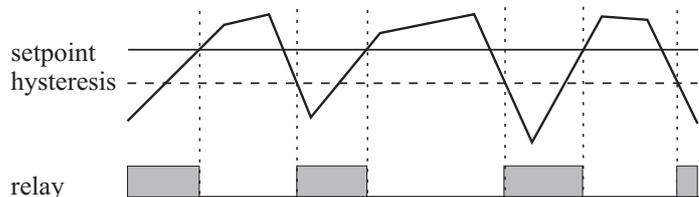
Connections RP31:
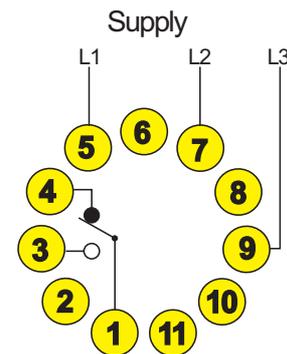
Ordering guide RP31:

Supply	Type no.
3 x 220 V	RP33-1-3-220-50
3 x 380 V	RP33-1-3-380-50
3 x 400 V	RP33-1-3-400-50
3 x 415 V	RP33-1-3-415-50

Note 1: The type numbers are shown for 50 Hz supply. for 60 HZ supply, replace -50 with -60.

Note 2: The unit is also available with supply connections to pins 5-6-7 instead of pins 5-7-9. In this case, the type number is RP31.1-...... instead of RP31-.....

Materials and weight:

Housing:	NORYL-SE-1, grey, self-extinguishing
Housing bottom:	NORYL SE-1, GFN-2, black, self-extinguishing
Terminals:	Nickel-plated brass
Weight:	110 g

3-phase phase sequence / phase breaking module

Monitors correct phase sequence

Secures against phase breaking

1- or 2-pole relay output

AC supply voltages up to 3 x 415 VAC

Made in accordance with the CE and EMC regulations

The C-mac® module type RP32 meters its own 3-phase supply voltage, and checks that all 3 phases are present and the phase sequence is correct, and in that case the output relay is activated.

The module is suitable for the monitoring of motors, as it ensures correct rotation, and in case of a missin phase the relay releases, provided that the possible regenerated voltage from the motor is below the fixed minimum limits..

The module can be used both with and without neutral, but with neutral the unit is most sensitive.

Technical data:

Supply voltage:	3 x 230 V +/- 15%
	3 x 400 V +/- 15%
	3 x 415 V +/- 15%
Supply frequency:	50-60 Hz
Power consumption:	2,5 VA
Operation temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing
Hysteresis:	2% of the nominal supply.
Reaction delay:	approx. 0,2 sec.
Indications:	
Green LED:	Supply voltage connected
Red LED:	Relay aktive
Max. load, relay:	1-pole: 8 A - 250 VAC
	2-pole: 5 A - 250 VAC (RP32.1), ohmic load

EMC and safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.

Sensitivity:
If the unit is connected to 3 phases with neutral, the relay will release, if one or more of the phase-neutral voltages is lower than 75-85% of the nominal voltage.
If the unit is connected to 3 phases without neutral, the relay will release, if one or more of the phase-phase voltages is lower than 60-70% of the nominal voltage

Connections RP32:
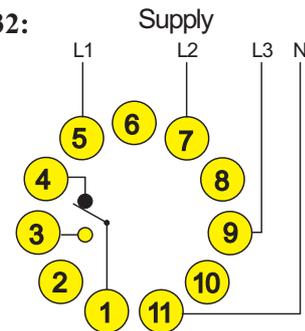
Supply

Connections RP32.1, 1-pole: 2-pole:
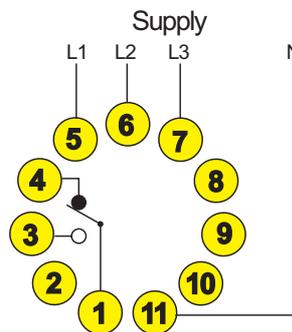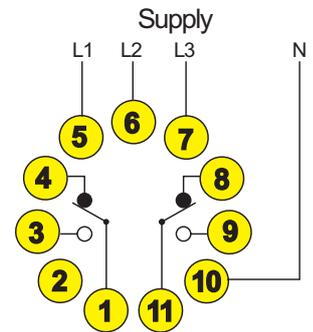
Supply   Supply

Ordering guide RP32:

Supply	Type no.
3 x 230 V (phase-phase)	RP32-1-3-230
3 x 400 V (phase-phase)	RP32-1-3-400
3 x 415 V (phase-phase)	RP32-1-3-415

Ordering guide RP32.1:

Supply	Type no.
3 x 230 V (phase-phase)	RP32.1-x-3-230
3 x 400 V (phase-phase)	RP32.1-x-3-400
3 x 415 V (phase-phase)	RP32.1-x-3-415

x = output relay:
      1 = 1-pole
      2 = 2-pole

Materials and weight: see previous page.

Comadan Produktion a/s

3-phase monitoring of phase-neutral voltages

Built-in adjustable time-delay

Separate adjustments for minimum and maximum limits

1-pole relay output 8 A / 250 V AC

AC supply voltages up to 3 x 415 VAC

Made in accordance with the C€ and EMC regulations

The C-mac® module type RP33 meters its own 3-phase supply voltage, and checks that all 3 phase-neutral voltages are within the adjusted limits, and in that case, the output relay is activated.

If one or more of the voltages are over or under the limits for a period of time, which exceeds the set delay, the relay releases.

The module can operate from 80 to 120% of the nominal supply voltage.

NOTE:
The unit can only be used at 3 phases plus neutral. If neutral is not available, monitoring module type RP30 must be used instead.

Technical data:

Supply voltage:	3 x 230 V +/- 20%
	3 x 380 V +/- 20%
	3 x 400 V +/- 20%
	3 x 415 V +/- 20%
Supply frequency:	45-75 Hz
Power consumption:	2,5 VA
Operation temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing

Adjustments:
Upper limit: Potentiometer, scale 105 to 120%
Lower limit: Potentiometer, scale 80 to 95%
Time-delay: Potentiometer, scale 0 to 10 sec.

Accuracy, scale:
Upper and lower limit: 5 %
Time-delay: 20 %

Hysteresis: 1% factory set.

Indications:
Green LED: Supply voltage connected
Red LED: Relay aktive

Max. load, relay: 1-pole: 8 A - 250 VAC, ohmic load

EMC and safety regulations.

|	
Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

**Approvals:**   The units are produced in accordance with the CE og low voltage regulations.

Connections RP33:
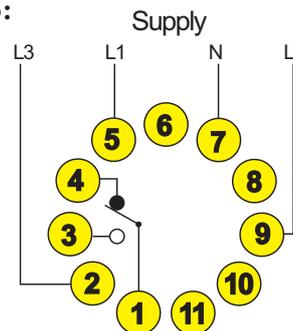
Ordering guide RP33:

Supply	Type no.
3 x 230 V (phase-phase)	RP33-1-3-230
3 x 380 V (phase-phase)	RP33-1-3-380
3 x 400 V (phase-phase)	RP33-1-3-400
3 x 415 V (phase-phase)	RP33-1-3-415

Materials and weight:

Housing:	NORYL-SE-1, grey, self-extinguishing
Housing bottom:	NORYL SE-1, GFN-2, black, self-extinguishing
Terminals:	Nickel-plated brass
Weight:	190 g

Comadan Produktion a/s

C-mac® Programmable 3-phase relay PPR10

Monitoring of all static 3-phase parameters:
Over / Undervoltage, Sequence, Asymmetry, Frequency.

Monitoring of dynamic parameters:
df/dt (ROCOF) and Phase angle fault.

Programmable functions, ranges and reaction delays.

2 independent relay output 8 A / 250 V AC

AC supply voltages up to 3 x 415 VAC

Made in accordance with the CE and EMC regulations

The C-mac® module type PPR10 is a universal 3-phase monitoring relay, particularly suitable for monitoring and protection of the mains supply and connected equipment in connection with generators and portable equipment.

The unit is made in accordance with the new European requirements for connection of micro-generators to the mains supply.

All parameters are programmable, and in order to ensure that unauthorized persons are not able to change the settings, there are no potentiometers on the unit.
The parameters are selected on a PC, and transferred to a small battery operated programming unit, which is then used to program each unit on site.

The unit is supplied with two relay outputs, and you can program which of the parameters are active on each relay. The relays are activated at normal conditions, and releases if one or more of the selected parameters are exceeded.

Reaction delays for each relay are individually selectable, except for the dynamic parameters, where the reaction delay for release is fixed at 100 msec.

Each output relay have a corresponding control input, where you can select between 5 different functions.

Programmable parameters:

Over voltage:	OFF, 3, 4, 5, 7, 10, 15 %
Under voltage:	OFF, 3, 4, 5, 7, 10, 15 %
Asymmetry:	OFF, 3, 4, 5, 7, 10 %
Neutral detect:	OFF, ON
Frequency:	nominal 50, 60, 50...60 Hz
Frequency limits:	OFF, 0,2, 0,3, 0,5, 1, 2, 3, 5 Hz
df/dt (ROCOF):	OFF, 0,3, 0,5, 0,7, 1 Hz/s
Phase shift:	OFF, 2, 5, 10, 15, 20 deg.
Delay, release:	0,1, 0,2, 0,3, 0,5, 0,7, 1, 2, 3, 5, 7, 10 sec.
Delay, activate:	1, 2, 3, 5, 7, 10, 20, 30, 45 sec, 1, 2, 3, 5, 7, 10 min.
Delay, start-up:	1, 2, 3, 5, 7, 10 sec.

During start-up delay, the relay remains activated, also if one of the selected parameters detects a fault. This is to ensure, that the units does not release f.inst. when the generator is connected to the mains.

Functions, control input:

None: Control input not used, relay indicate parameter conditions.

Enable: Relay only active, if input is activated and parameter conditions are OK.

Latch: Relay activates, when the input activates and parameter conditions are OK. During operation, the input must remain activated. If the relay has released after a fault detection, the input must be released and activated again, before the relay can activate.

Reset: Relay activates, when the input activates and parameter conditions are OK. After this, the input can be released. If the relay has released after a fault detection, the input must be activated again, before the relay can activate.

Auto: Relay activates, if the parameter conditions are OK. When the input is activated, the start-up delay starts, and after this delay, the unit operates as in the function "none". A new start-up delay is activated, if the control input releases and activates again.

Programming:

In order to program the unit, you must have a programming unit, INTF3.
Together with the programming unit, you get a corresponding software, which you must install on a PC. You can also download the software from our website: www.comadan.com.

When the program is activated you select all the parameters, which is then transferred to INTF3 via a cable connected to one of the COM-ports.
After this, you disconnect INFT3 from the PC, and you can now transfer the program to the PPR10 via the infrared transmitter in front of INTF3, if the PPR10 is connected to the mains supply.
If the transmission is completed in the correct way, the top LED "control 1" and after this the LED "supply" will flash once.
If the transmission is not OK, the LED's will flash several times.

Comadan Produktion a/s

Technical data:

Supply voltage:	3x220-3x240 VAC +/- 15%
	3x380-3x415 VAC +/- 15%
Supply frequency:	45-65 Hz
Power consumption:	3 VA
Operation temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing
Adjustments:	No adjustments

Indications:

Green LED:	Supply voltage connected
Yellow LED's:	Control 1 and Control 2
Red LED's:	Relay 1 and Relay 2
Max. load, relays:	1-pole: 8 A - 250 VAC, ohmic load

EMC and safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations, as well as the preliminary standard for connection of micro generators to the public low voltage network.

LED functions:

Green Supply LED:
Steady light when the supply is connected and the unit is in normal operation.
Flashing after parameter programming.

Yellow Control LED's:
OFF when the control input is not activated.
Flashing after activation of Control input during Relay activation delay and Start-up delay.
Control 1 LED also flashing after parameter programming.
Steady light after expiration of delays, if the Control input is still activated.

Red Relay LED's:
OFF when the relay is off.
Steady light when the relay is activated.
Flashing during release delay when the relay is still activated.

Activation of Control inputs:

The control input is activated when it is connected to Neutral (pin 2).

PPR10 front.

Connections:
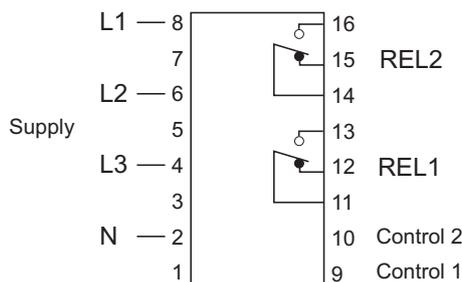
Ordering guide:

Supply	Type no.
3x220, 3x230 and 3x340	PPR10-230
3x380, 3x400 and 3x415	PPR10-400

The above type numbers indicates a complete unit with all functions.
The unit is also available in a reduced version without df/dt and phase shift functions.
In this case you add an "A" to the type number, e.g. PPR10A-400

Materials and weight:

Housing base:	CYCOLOY C2100, grey
Frontplate:	CYCOLOY C2100, black
Terminal cover:	CYCOLOY C2100, black
Terminals:	Zinc-plated brass
Screws:	Zinc-plated iron
Weight:	350 g

Comadan Produktion a/s

Current/voltage relays RC10/RV10

RC10: Current monitoring   RV10: Voltage monitoring

4 metering inputs in each module

Adjustments for setpoint, hysteresis and time delay

Selectable relay inversion, time delay and AC/DC mode

DC supply or AC supplies up to 230 VAC

Made in accordance with the $C\mathcal{E}$ and EMC regulations

C-mac® current monitoring relay, type RC10, and voltage monitoring relay, type RV10, are universal metering relays, each supplied with 4 metering ranges, from 0,4 mA to 6 A or 40 mV to 600 V AC or DC, respectively.

The input range is chosen by use of the appropriate input terminal, and the choice of AC/DC metering is made by connection/disconnection of terminal 8 to common (terminal 7).

By means of 2 push-buttons on the back of the unit you can select relay and time-delay function.

When the module is AC metering, the average value is metered, and the level adjustment is then calibrated to the r.m.s. value of a sinusoidal signal.

Common technical data:

Supply voltage, AC:	24, 115 and 230 VAC +/- 10%
Supply frequency:	40-70 Hz
Variable supply:	12-50 VDC or 48-250 VDC
Isolation voltage:	Supply - input - output: 3.75 kV
Supply voltage, DC:	24 VDC +/- 10%
	Note: With this DC-supply there is no isolation between supply and internal electronics.
Power consumption:	2,5 VA
Operation temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing
Adjustments:	
Level:	Potentiometer, scale 0.4 to 6
Hysteresis:	Potentiometer, scale 5 to 50%
Time-delay:	Potentiometer, scale 0 to 10 sec.
Indications:	
Green LED:	Supply voltage connected
Red LED:	Set-point exceeded
Red LED:	Relay active
Accuracy, scale:	5 %
Temp. coefficient:	typ 0,1 % / °C
Max. load, relay:	1-pole: 8 A - 250 VAC ohmic load

Metering ranges, max. input signals and input impedances (R_{in}):

Module	Range	max. input	input res.
RC 10	0.4 - 6 mA	80 mA	35 Ω
	4 - 60 mA	200 mA	0.5 Ω
	40 - 600 mA	800 mA	0.35 Ω
	0.4 - 6 A	8 A	0.033 Ω
RV 10	40 - 600 mV	20 V	1 kΩ
	0.4 - 6 V	50 V	11 kΩ
	4 - 60 V	150 V	111 kΩ
	40 - 600 V	650 V	1.11 MΩ
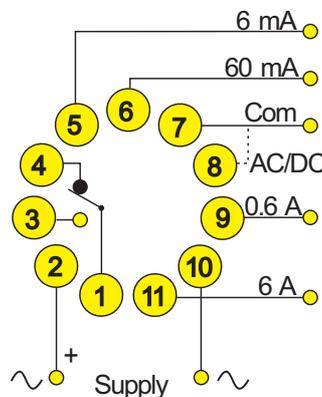
Connections RC10.

DC metering: 7-8 open

AC metering: 7-8 closed
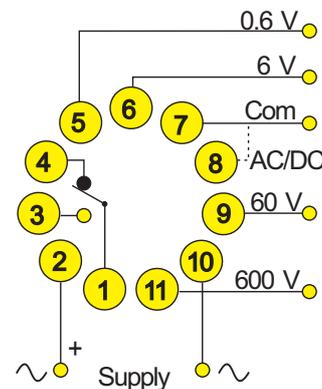
Connections RV10.

DC metering: 7-8 open

AC metering: 7-8 closed

Comadan Produktion a/s

Function selection:

Button 1: Delay on operate / delay on release

Button 2: Relay inversion

Ex 1: 1 on, 2 off.
Delay on release, when level drops below setpoint.

Ex 2: 1 off, 2 on.
Delay on operate, when level drops below setpoint.

Ex 3: 1 off, 2 off.
Delay on operate, when setpoint is exceeded.

Ex 4: 1 on, 2 on.
Delay on release, when setpoint is exceeded.
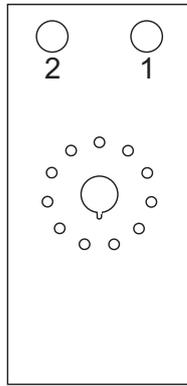
Functional diagram:
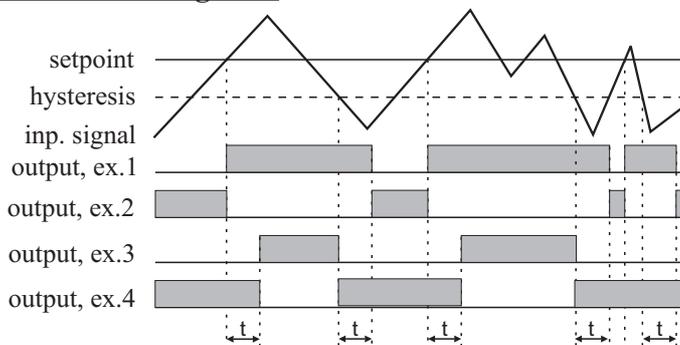
EMC and safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.

Ordering guide, RC10:

supply	type number
12-50 VDC	RC10-1-4-012
24 VDC	RC10-1-0-024
24 VAC	RC10-1-1-024
115 VAC	RC10-1-1-115
230 VAC	RC10-1-1-230

Ordering guide, RV10:

Supply	type number
12-50 VDC	RV10-1-4-012
24 VDC	RV10-1-0-024
24 VAC	RV10-1-1-024
115 VAC	RV10-1-1-115
230 VAC	RV10-1-1-230

Mechanical dimensions:
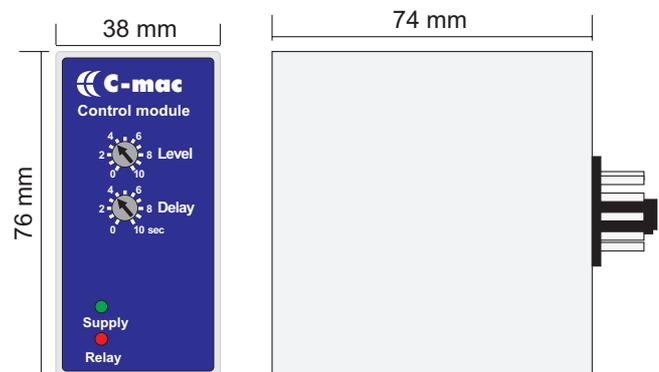
Materials and weight:

Housing:	NORYL-SE-1, grey, self-extinguishing
Housing bottom:	NORYL SE-1, GFN-2, black, self-extinguishing
Terminals:	Nickel-plated brass
Weight:	190 g

Comadan Produktion a/s

RC12: Current monitoring   RV12: Voltage monitoring

3 metering inputs in each module

Adjustments for setpoint and hysteresis

Selectable relay inversion and AC/DC mode

DC supply or AC supplies up to 230 VAC

Made in accordance with the CE and EMC regulations

C-mac® current monitoring relay, type RC12, and voltage monitoring relay, type RV12, are universal metering relays, each supplied with 3 metering ranges, from 4 mA to 6 A or 400 mV to 600 V AC or DC, respectively.

The input range is chosen by use of the appropriate input terminal, and the choice of AC/DC metering and relay inversion is made by connection/disconnection of terminal 5 and 8 to common (terminal 7).

When the module is AC metering, the average value is metered, and the level adjustment is then calibrated to the r.m.s. value of a sinusoidal signal.

Common technical data:

Supply voltage, AC:	24, 115 and 230 VAC +/- 10%
Supply frequency:	40-70 Hz
Variable supply:	12-50 VDC or 48-250 VDC
Isolation voltage:	Supply - input - output: 3.75 kV
Supply voltage, DC:	24 VDC +/- 10% Note: With this DC-supply there is no isolation between supply and internal electronics.
Power consumption:	2,5 VA
Operation temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing
Adjustments:	
Level:	Potentiometer, scale 0.4 to 6
Hysteresis:	Potentiometer, scale 5 to 50%
Indications:	
Green LED:	Supply voltage connected
Red LED:	Relay active
Accuracy, scale:	5 %
Temp. coefficient:	typ 0,1 % / °C
Max. load, relay:	1-pole: 8 A - 250 VAC ohmic load

Metering ranges, max. input signals and input impedances (R_{in}):

Module	Range	max. input	input res.
RC 12	4 - 60 mA	200 mA	3.5 Ω
	40 - 600 mA	800 mA	0.35 Ω
	0.4 - 6 A	8 A	0.033 Ω
RV 12	0.4 - 6 V	50 V	11 kΩ
	4 - 60 V	150 V	111 kΩ
	40 - 600 V	650 V	1.11 MΩ
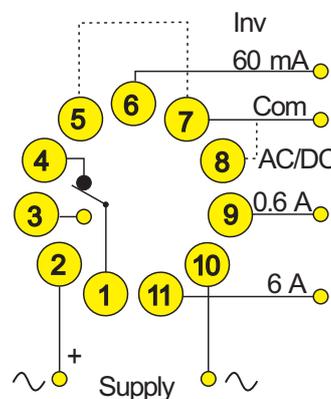
Connections RC12.

DC metering: 7-8 closed
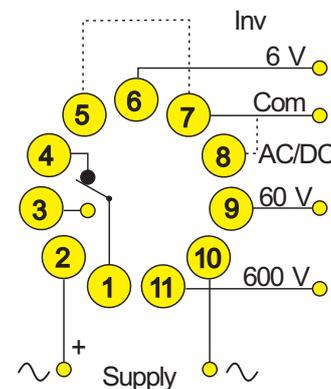
AC metering: 7-8 open

Connections RV12.

DC metering: 7-8 closed

AC metering: 7-8 open

EMC and safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

**Approvals:** The units are produced in accordance with the CE og low voltage regulations.

Ordering guide, RC12:

supply	type number
12-50 VDC	RC12-1-4-012
24 VDC	RC12-1-0-024
24 VAC	RC12-1-1-024
115 VAC	RC12-1-1-115
230 VAC	RC12-1-1-230

Ordering guide, RV12:

Supply	type number
12-50 VDC	RV12-1-4-012
24 VDC	RV12-1-0-024
24 VAC	RV12-1-1-024
115 VAC	RV12-1-1-115
230 VAC	RV12-1-1-230

Mechanical dimensions:

Materials and weight:

Housing:	NORYL-SE-1, grey, self-extinguishing
Housing bottom:	NORYL SE-1, GFN-2, black, self-extinguishing
Terminals:	Nickel-plated brass
Weight:	170 g

Functional diagram:
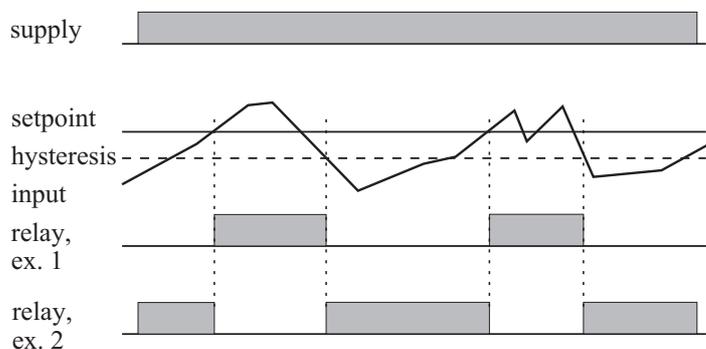
Example 1, undercurrent/voltage monitoring
pin 6-7 not connected

Example 2, overcurrent/voltage monitoring
pin 6-7 connected
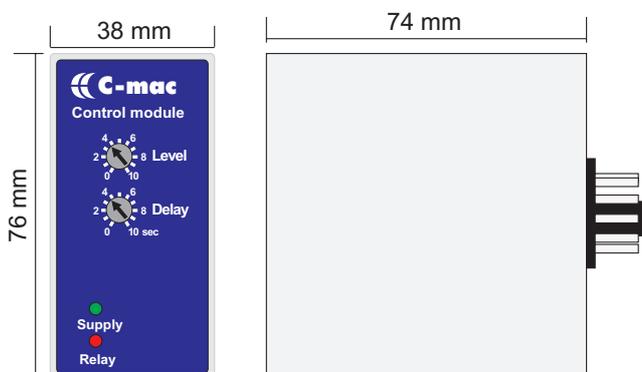
Comadan Produktion a/s

RC30: Current monitoring   RV30: Voltage monitoring

3 metering inputs in each module

Adjustments for setpoint and time delay

Selectable relay inversion, time delay, hysteresis and start-up delay

Automatic detection of AC or DC metering input

DC supply or AC supplies up to 230 VAC

Made in accordance with the $C\epsilon$ and EMC regulations

C-mac® current monitoring relay, type RC30, and voltage monitoring relay, type RV30 are universal metering relays, each supplied with 3 metering ranges, automatic detection of AC or DC input signal, plus a 24 VDC output voltage, for the supply of external sensors or the like.

By means of a DIP-switch in the bottom of the unit you can select between 4 different combinations of relay inversion and reaction-delay, 5 or 15% hysteresis and start-up delay.

On the front of the unit you can adjust the setpoint and reaction-delay between 0 and 10 seconds.

The monitoring relays are each available in 3 different variants, which makes it possible to select current ranges between 0.1 to 2 mA and 0.25 to 6 A, and voltage ranges between 3 to 60 mV and 25 to 600 V.

The start-up has the following function:
When the DIP-switch for selection (switch 4) is off, there will be no start-up delay, which means the monitoring will start, when the supply voltage is connected.
When switch 4 is on, there will be a fixed start-up delay of 10 seconds, and in this period the output relay is in the position, which corresponds to no signal on the input, and after this period, the output corresponds to the actual input signal.
This function is particularly interesting, if you are monitoring a load, which has a very high start-up current.

The units are supplied for 24, 115 or 230 VAC supply or 10-50 VDC supply.

Metering ranges, max. input signals and input impedances (R_{in}):

Module	input a	input b	input c
RC type 1	1-20 mA max. 0,1 A R_{in}=72 Ω	0,5-10 mA max. 80 mA R_{in}=122 Ω	0,1 - 2 mA max. 50 mA R_{in}=524 Ω
RC type 2	25-500 mA max. 0,8 A R_{in}=2,7 Ω	10-200 mA max. 0,5 A R_{in}=3,2 Ω	5-100 mA max. 0,5 A R_{in}=4,7 Ω
RC type 3	0,25-6 A max. 8 A R_{in}=7 mΩ	0,05-1 A max. 3 A R_{in}=40 mΩ	-
RV type 1	3-60 mV max. 1 V R_{in}=10 kΩ	7,5-150 mV max. 2 V R_{in}=25 kΩ	0,05-1 V max. 10 V R_{in}=168 kΩ
RV type 2	0,5-10 V max. 60 V R_{in}=111 kΩ	1-20 V max. 100 V R_{in}=221 kΩ	2,5-50 V max. 150 V R_{in}=553 kΩ
RV type 3	5-100 V max. 200 V R_{in}=1 MΩ	10-200 V max. 400 V R_{in}=2 MΩ	25-500 V max. 600 V R_{in}=5,1 MΩ

Connection diagram:

Common technical data:

Supply, AC:	24, 115 and 230 VAC +/- 10%
Supply frequency:	40-70 Hz
Supply, DC:	12-50 VDC
Isolation voltage:	Supply-input-output: 3.75 kV
Power consumption:	3 VA
Operation temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing
Temp. coefficient:	< 0,01% /°C

Indications:

Green LED, active: Supply ON and input OK

flashing: Supply ON and input signal outside the metering range

Red LED: Relay active

Selection of function:

S1-S2: relay inversion and reaction delay, see functional diagram

S3: Hysteresis: OFF: 5%, ON: 15%

S4: Start-up delay:
  OFF: no delay
  ON: 10 seconds delay

Adjustments:

Potentiometer 1: setpoint , 0-100% of the range

Potentiometer 2: reaction delay, 0-10 seconds

Transducer supply: Pin 8,

V_{out}: 24 VDC +5% -20%

I_{out}: max. 22 mA

Max. load, relay: 8 A - 250 VAC, ohmic load

EMC and safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.

Ordering guide, RC30:

supply	type number
12-50 VDC	RC30-1-4-012-x
24 VAC	RC30-1-1-024-x
115 VAC	RC30-1-1-115-x
230 VAC	RC30-1-1-230-x

x= metering range:
1 = 0,1-2 mA, 0,5 - 10 mA and 1 - 20 mA
2 = 5 - 100 mA, 10 - 200 mA and 25 - 500 mA
3 = 0,05 - 1 A and 0,25 - 6 A

Ordering guide, RV30:

Supply	type number
12-50 VDC	RV30-1-4-012-x
24 VAC	RV30-1-1-024-x
115 VAC	RV30-1-1-115-x
230 VAC	RV30-1-1-230-x

x = metering ranges:
1 = 3 - 60 mV, 7,5 - 150 mV and 0,05 - 1 V
2 = 0,5 - 10 V, 1 - 20 V and 2,5 - 50 V
3 = 5 - 100 V, 10 - 200 V and 25 - 500 V

Functional diagram:
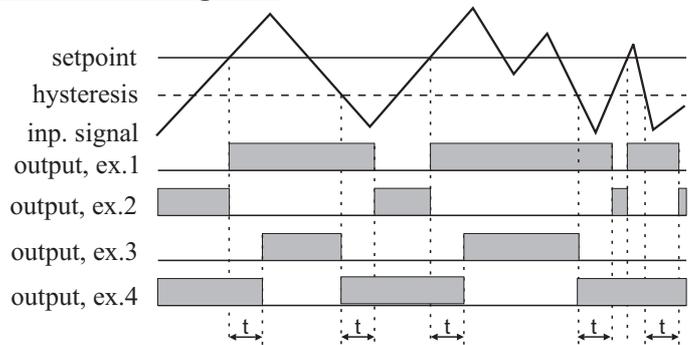
Selection of function:

SW 1	SW 2	ex. no.	function
OFF	OFF	1	Relay activates, when setpoint is exceeded, delay on release
ON	OFF	2	Relay releases, when setpoint is exceeded, delay on activate
OFF	ON	3	Delay on activate, when setpoint is exceeded
ON	ON	4	Delay on release, when setpoint is exceeded

Mechanical dimensions:

Materials and weight:

Housing:	NORYL-SE-1, grey, self-extinguishing
Housing bottom:	NORYL SE-1, GFN-2, black, self-extinguishing
Terminals:	Nickel-plated brass
Weight:	190 g

Comadan Produktion a/s

C-mac®

Current relays RC15/RC20

RC15: AC-current monitor   RC20: DC-current monitor

Adjustment of setpoint and hysteresis

Selectable activation or release of relay

DC supply or AC supplies up to 230 VAC

1- or 2-pole relay output

Made in accordance with the C E and EMC regulations

The C-mac® modules, type RC15 and RC20 are simple current monitoring relays, for AC- and DC input signals, respectively.

The modules are available for several different metering ranges, but the range must be specified at ordering, since each unit has only got one metering range.

By means of a connection at the relay base you can select, it the output relay should activate or release, when the set-point is exceeded, in this way, the module can be used for both over- and under current monitoring.

Common technical data:

Supply voltage, AC:	24, 115 and 230 VAC +/- 10%
Supply frequency:	40-70 Hz
Variable supply:	12-50 VDC or 48-250 VDC
Isolation voltage:	Supply - input - output: 3.75 kV
Supply voltage, DC:	24 VDC +/- 10%
	Note: With this DC-supply there is no isolation between supply and internal electronics.
Power consumption:	2,5 VA
Operation temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing
Relay inversion:	pin 6-7
Open:	Relay releases at undercurrent
Closed:	Relay releases at overcurrent
Adjustments:	
Level:	Potentiometer, scale 5 to 100%
Hysteresis:	Potentiometer, scale 5 to 50%
Indications:	
Green LED:	Supply voltage connected
Red LED:	Relay active
Accuracy, scale:	5 %
Temp. coefficient:	typ 0,1 % / °C
Max. load, relay:	1-pole: 8 A - 250 VAC
	2-pole: 5 A - 250 VAC, ohmic load

EMC and safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.

Metering ranges:

	range	int. shunt	max current
RC15:	0,05 - 1 A AC	0,220 Ω	3 A
	0,25 - 5 A AC	0,033 Ω	8 A
RC20:	0,05 - 1 mA	100 Ω	10 mA
	1 - 20 mA	5,00 Ω	100 mA
	5 - 100 mA	1,30 Ω	500 mA
	25 - 500 mA	0,20 Ω	2 A
	0,1 - 2 A	0,07 Ω	6 A
	0,25 - 5 A	0,03 Ω	10 A

Functional diagram:
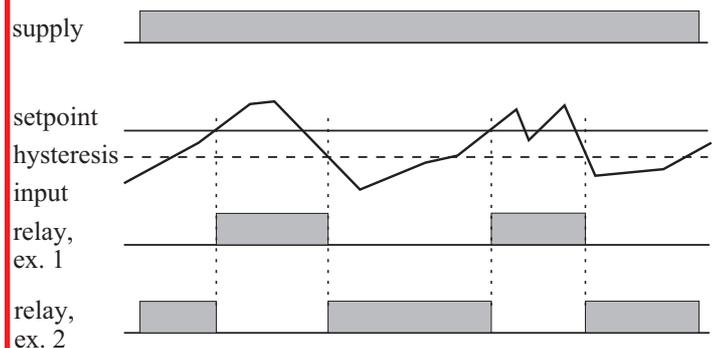
Example 1, undercurrent monitoring pin 6-7 not connected

Example 2, overcurrent monitoring pin 6-7 connected

Comadan Produktion a/s
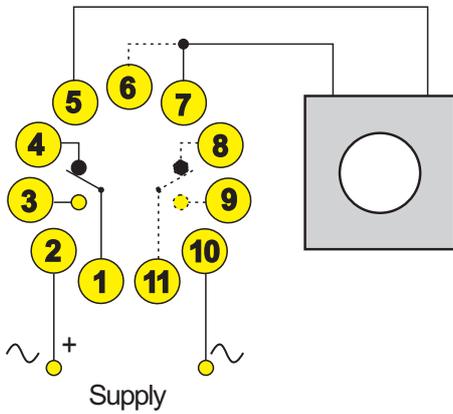
Connections, RC15:

Connections 8-9-11: 2-pole version only.

Connections, RC20:
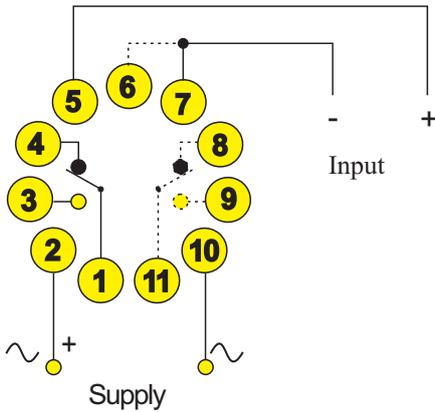
Connections 8-9-11: 2-pole version only.

Ordering guide, RC15:

Supply	Type number.
12- 50 VDC	RC15-x-4-012-y
48-250 VDC	RC15-x-4-048-y
24 VDC	RC15-x-0-024-y
24 VAC	RC15-x-1-024-y
115 VAC	RC15-x-1-115-y
230 VAC	RC15-x-1-230-y

x = output relay: 1 = 1-pole
                    2 = 2-pole

y = metering range: 1 = 0,05 - 5 A AC
                     5 = 0,25 - 5 A AC

Ordering guide, RC20:

Supply	Type number.
12- 50 VDC	RC20-x-4-012-yyy
48-250 VDC	RC20-x-4-048-yyy
24 VDC	RC20-x-0-024-yyy
24 VAC	RC20-x-1-024-yyy
115 VAC	RC20-x-1-115-yyy
230 VAC	RC20-x-1-230-yyy

x = output relay: 1 = 1-pole
                    2 = 2-pole

yyy = metering range: 1M = 0,05 -   1 mA
                        20M =   1 - 20 mA
                        100M =   5 - 100 mA
                        500M = 25 - 500 mA
                        2A = 0,1 -   2 A
                        5A = 0,25 -   5 A

Mechanical dimensions:

Materials and weight:

Housing:	NORYL-SE-1, grey, self-extinguishing
Housing bottom:	NORYL SE-1, GFN-2, black, self-extinguishing
Terminals:	Nickel-plated brass
Weight:	180 g

Comadan
Produktion a/s

DC voltage monitoring relay

Adjustment of setpoint and hysteresis

Selectable activation or release of relay

DC supply or AC supplies up to 230 VAC

1- or 2-pole relay output

Made in accordance with the CE and EMC regulations

The C-mac® module, type RV20 is a simple voltage monitoring relay for DC input signals.

The module is available for several different metering ranges, but the range must be specified at ordering, since each unit has only got one metering range.

By means of a connection at the relay base you can select, it the output relay should activate or release, when the setpoint is exceeded, in this way, the module can be used for both over- and under current monitoring.

Common technical data:

Supply voltage, AC:	24, 115 and 230 VAC +/- 10%
Supply frequency:	40-70 Hz
Variable supply:	12-50 VDC or 48-250 VDC
Isolation voltage:	Supply - input - output: 3.75 kV
Supply voltage, DC:	24 VDC +/- 10% Note: With this DC-supply there is no isolation between supply and internal electronics.
Power consumption:	2,5 VA
Operation temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing
Relay inversion:	pin 6-7
Open:	Relay releases at undervoltage
Closed:	Relay releases at overvoltage
Adjustments:	
Level:	Potentiometer, scale 5 to 100%
Hysteresis:	Potentiometer, scale 5 to 50%
Indications:	
Green LED:	Supply voltage connected
Red LED:	Relay active
Accuracy, scale:	5 %
Temp. coefficient:	typ 0,1 % / °C
Max. load, relay:	1-pole: 8 A - 250 VAC 2-pole: 5 A - 250 VAC, ohmic load

EMC and safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.

Metering ranges RV20:

range	inp. resist.	max voltage
3 - 60 mV	150 Ω	1 V
7,5 - 150 mV	150 Ω	2 V
0,05 - 1 V	1 kΩ	10 V
0,25 - 5 V	3 kΩ	30 V
0,5 - 10 V	10 kΩ	50 V
1 - 20 V	20 kΩ	100 V
2,5 - 50 V	50 kΩ	150 V

## Functional diagram:
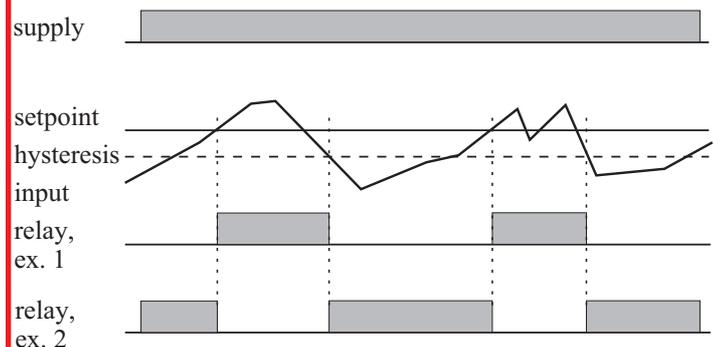
Example 1, undervoltage monitoring
pin 6-7 not connected

Example 2, overvoltage monitoringg
pin 6-7 connected

Connections, RV20:

Connections 8-9-11: 2-pole version only.

Ordering guide, RV20:

Supply	Type number.
12- 50 VDC	RV20-x-4-012-yyy
48-250 VDC	RV20-x-4-048-yyy
24 VDC	RV20-x-0-024-yyy
24 VAC	RV20-x-1-024-yyy
115 VAC	RV20-x-1-115-yyy
230 VAC	RV20-x-1-230-yyy

x = output relay: 1 = 1-pole
                      2 = 2-pole

yyy = metering range: 60M = 3 -   60 mV
                      150M = 7,5 - 150 mV
                        1V = 0,05 -   1 V
                        5V = 0,25 -   5 V
                       10V = 0,5 - 10 V
                       20V = 1   - 20 V
                       50V = 2,5 - 50 V
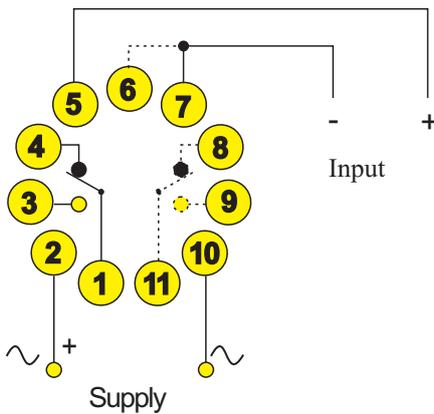
Mechanical dimensions:

Materials and weight:

Housing:	NORYL-SE-1, grey, self-extinguishing
Housing bottom:	NORYL SE-1, GFN-2, black, self-extinguishing
Terminals:	Nickel-plated brass
Weight:	180 g

Comadan
Produktion a/s

Relay for monitoring of the supply frequency

Nominal frequency selectable 50 Hz or 60 Hz

Adjustable bandwidth from 1 to 10 Hz

Selectable reaction delay 0.1 sec. or 1 sec.

1- or 2-pole relay output

Made in accordance with the CE and EMC regulations

C-mac® frequency relay type RF20 is used for monitoring of the supply frequency, f.inst. in connection with generator controls.

By means of connections on the relay base you can select between nominal frequency of 50 or 60 Hz and reaction delay 0.1 sec. or 1 sec.

On the built-in potentiometer, the bandwidth is adjustable between +/- 0.5 Hz and +/- 5 Hz.

If the supply frequency is within the adjusted bandwidth, the relay is activated, and if the frequency is outside the limits, the output relay releases after the selected reaction delay.

Common technical data:

Supply voltage, AC:	24, 115 and 230 VAC +/- 10%
Supply frequency:	40-70 Hz
Isolation voltage:	Supply - input - output: 3.75 kV
Power consumption:	2,5 VA
Operation temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing

Adjustments:
Bandwidth: Potentiometer, scale 1 to 10 Hz (+/-0.5 Hz til +/-5 Hz)

Indications:
Green LED: Supply voltage connected
Red LED: Relay active

Accuracy:
scale: 5 %
min. bandwidth: +/- 0.02 Hz
max. bandwidth: +/- 0.04 Hz

Hysteresis: 10% of the adjusted bandwidth.

Nominal frequency: pin 6-7
open: 50 Hz, closed: 60 Hz

Reaction delay: pin 5-7
open: 1 sec., closed: 0.1 sec.

Max. load, relay: 1-pole: 8 A - 250 VAC
2-pole: 5 A - 250 VAC, ohmic load

EMC and safety regulations.

Emmision: EN 50 081 - 1
**Immunity:**   EN 50 082 - 2
Safety: EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.

Functional diagram:

t = reaction delay (0,1 or 1 sek.)
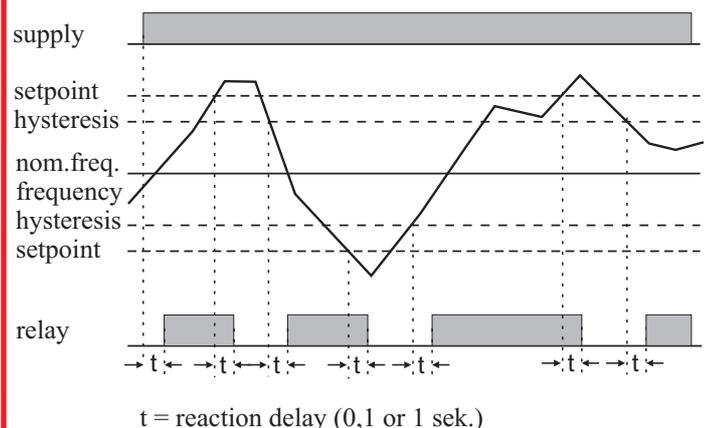
Connections:
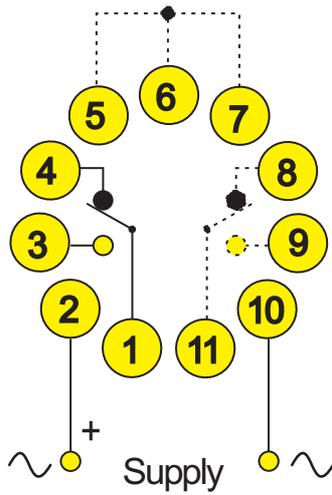
pin 8-9-11:   2-pole version only
pin 5-7:   reaction delay
pin 6-7:   nominal frequency

Ordering guide:

Supply	Type number.
24 VAC	RF20-x-1-024
120 VAC	RF20-x-1-115
230 VAC	RF20-x-1-230

x = relay output: 1 = 1-pole
                                 2 = 2-pole

Mechanical dimensions:
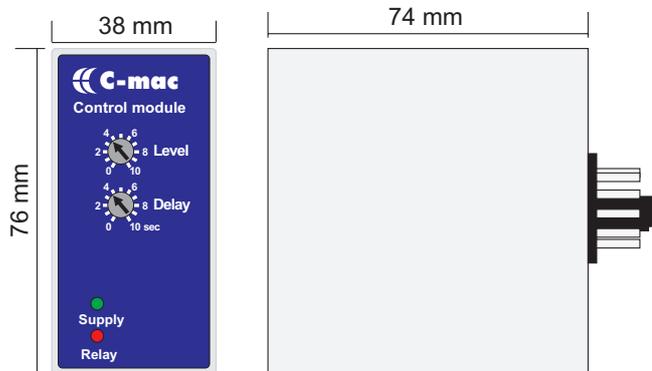
Materials and weight:

Housing:	NORYL-SE-1, grey, self-extinguishing
Housing bottom:	NORYL SE-1, GFN-2, black, self-extinguishing
Terminals:	Nickel-plated brass
Weight:	200 g

Comadan Produktion a/s

C-mac®

Load guard for 3-phase motors
Power factor metering (cos φ)
Adjustable time delay 0-20 sek. at motor start
Selectable release of relay at max. or min. load
1-pole relay output 8A / 250 VAC
Produced in accordance with CE and EMC regulations

C-mac® module type RP81 is used for load monitoring of 3-phase motors, as the phase angle (cos φ) between motor current and -voltage changes in proportion to the mechanical load of the motor.

You will see the biggest change in phase angle, if the motor is loaded between 0 and 60% of nominal load, which makes the RP81 suitable for monitoring of V-belts, pumps running dry, etc. (see page 6-6).

RP81 can be connected directly to motors with nominal current up to 6 A. If the current is bigger, you use a standard current transformer.

The unit is supplied with an adjustable start-up delay, which keeps the output relay activated independant of the power consumption, when the motor is starting.

By connection of pins 7 and 2 you can select if the relay releases at over- or underload.

Start-up: When the supply voltage is connected, the output relay activates, and the start-delay will start, independant of the selected relay function.

Relay function: pins 2-7.
If pin 2 is not connected, the output relay releases immediatly, if the power factor exceeds the set level, provided that the set start-delay has run out.
If pin 2 is connected to pin 7, the relay releases, if the power factor is lower than the set level, and the timer has run out.

Technical data:

Supply voltage:	3 x 230 V +/- 10%
	3 x 400 V +/- 10%
	3 x 415 V +/- 10%
Supply frequency:	40-70 Hz
Power consumption:	2,5 VA
Operation temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing
Monitoring current:	min. 0,5 A, max. 6 A
	At bigger currents use a
	standard current transformer..
Internal shunt:	33 mΩ. At max. current 6 A
	the voltage across the shunt is 0,2 V
Hysteresis:	5% of adjusted level.

Adjustments:

Start delay:	Potentiometer, 0-20 sec.
Level:	Potentiometer, cos.φ 0-0,9

Accuracy, scale:

Start delay:	20%
Level:	5%

Indications:

Green LED:	Supply voltage connected
Red LED:	Relay activated

Functional diagram:

t = selected start-up delay
ex. 1: overload, pins 2-7 open
ex. 2: underload, pins 2-7 connected

Connections:
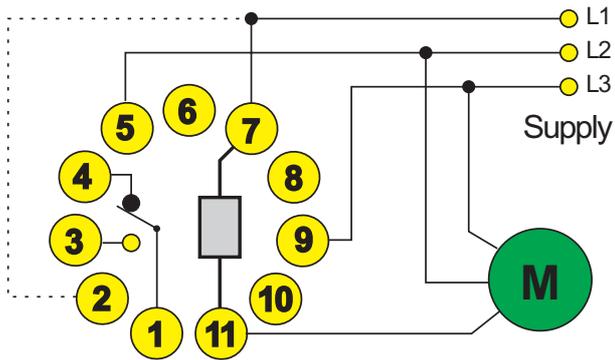
Example 1:   without current transformer.
(motor current smaller than 6 A)
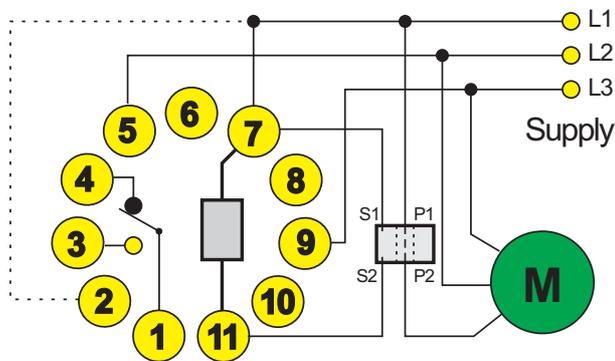
Example 2:   With current transformer.
(motor current bigger than 6 A)

Note: the current transformer must be connected as shown (P1 / P2 and S1 / S2)

Ordering guide:

Supply	Type nr.
3 x 220 V	RP81-1-3-230
3 x 380 V	RP81-1-3-400
3 x 415 V	RP81-1-3-415

Mechanical dimensions:

Materials and weight:

Housing:	NORYL-SE-1, grey, self-extinguishing
Housing bottom:	NORYL SE-1, GFN-2, black, self-extinguishing
Terminals:	Nickel-plated brass
Weight:	110 g

6-2

Comadan
Produktion a/s

C-mac®

Power guard for 1- and 3-phase motors

Power metering (U x I x cos φ)

Adjustable time-delay 0.1-30 sek. at start-up

Adjustable reaction delay 0.1-30 sek

Metering output indicates the power consumption

1-pole relay output 8 A / 250 VAC

Produced in accordance with CE and EMC regulations

C-mac® module type RP91 is used for power monitoring of 1-phase and symmetrical 3-phase loads, f.inst. motors. RP91 can be connected directly to loads with nominal current consumption up to 6 A; If the current is bigger, a standard current transformer is used.

The unit is supplied with an adjustable start-up delay, which ensures that the output relay is activated independant of the load, when the motor is started. RP 91 is supplied for both over- and underload monitoring.

The module is monitoring the total power consumption (U x I x cos φ) which gives a much higher sensitivity than it is possible with the RP81.

The setpoint is coarse adjusted on a 10-position switch, and fine-adjusted on a potentiometer in front of the unit, which gives a very high sensitivity on the adjustment function.

When the setpoint is reached, an adjustable time-delay on 0,1 to 30 seconds starts. After this period, the relay releases, on the condition that the load has been higher than the setpoint in the whole period, in this way it is ensured, that the relay will not release in case of short changes in the power consumption.

In order to get the most accurate setpoint adjustment, especially when very small loads are monitored, the unit is supplied for 4 different current ranges, and all units are available with inverted function, to detect underloads.

Technical data:

Supply voltage:	127 V + N or 3 x 230 V +/- 10%
	230 V + N or 3 x 400 V +/- 10%
	240 V + N or 3 x 415 V +/- 10%
Supply frequency:	40-70 Hz
Power consumption:	2,5 VA
Operation temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing

Metering ranges:

	max. load at supply voltage:			
Current range	230V	400 V	415 V	int. shunt
01: max. 0,6 A	270 W	450 W	480 W	1,200 Ω
02: max. 1,2 A	540 W	900 W	960 W	0,150 Ω
03: max. 2,4 A	1100 W	1800 W	2000 W	0,068 Ω
04: max. 6,0 A	2700 W	4500 W	4800 W	0,033 Ω
Hysteresis:	1,3% of the total metering range			

Latch: pin 8-7.
If pins 8-7 is connected, and the relay releases, it will remain released, no matter if the load changes, until the connection is opened, or the supply voltage is disconnected.

Adjustments:
Start-up delay: Potentiometer, 0.1-30 sec.
Level, coarse: 10-position switch on the top of the unit.
Level, fine: Potentiometer, scale 0-10
Reaction delay: Potentiometer, 0,1-30 sec

Accuracy, scale: 5%

Indications:
Green LED: Supply voltage connected
Red LED: Relay activated

Start-up: start contact, pins 6-7.
If pins 6 and 7 is connected, the relay and the start-up delay is activated, when the supply voltage is connected. This principle is used, if the unit is connected in parallel with the load. If the unit is constantly connected to the supply voltage, the start delay (and the metering) can be separately activated by connecting pins 6 and 7, f.inst. with a spare contact in the motorswitch.

Functional diagram:
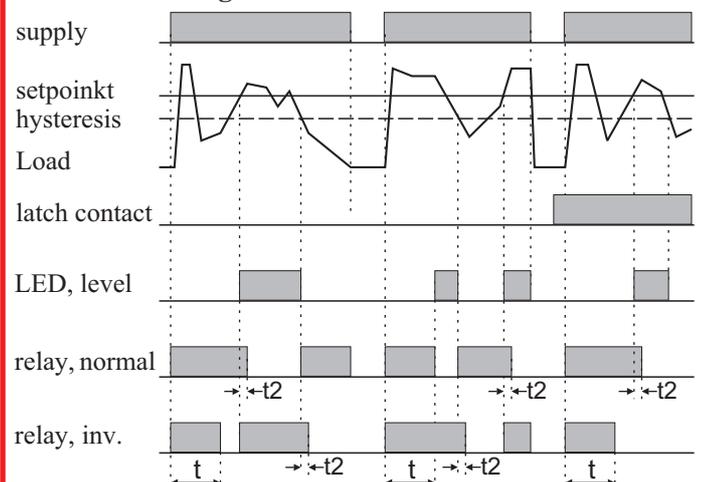
t = selected start-up delay, t2 = reaction delay

Connections:
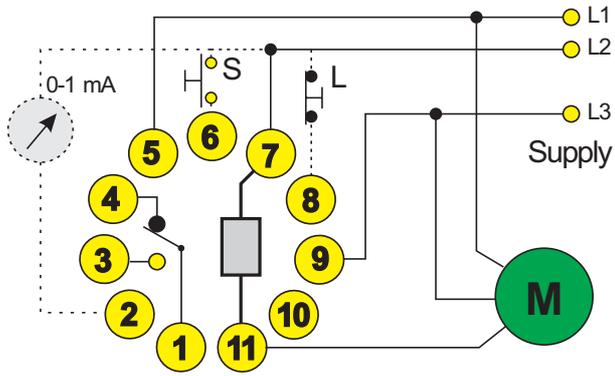
Example 1:   3-phase without current transformer.
(load current smaller than 6 A)
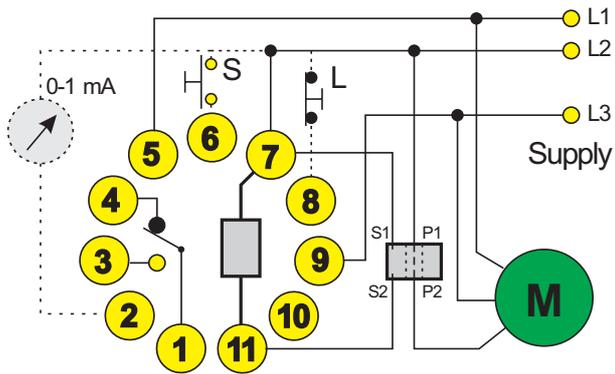
Example 2:   3-phase with current transformer.
(load current bigger than 6 A)

Note: the current transformer must be connected as shown
(P1 / P2 and S1 / S2)
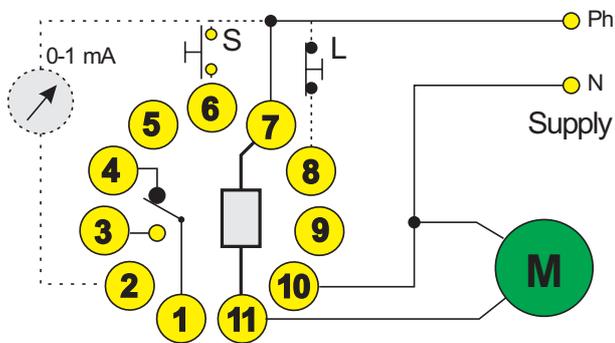
Example 3:   1-phase without current transformer.
(load current smaller than 6 A)

Adjustment of RP91, see next page.

Ordering guide:

Supply	Type nr.
3 x 230 V	RP91-1-3-230-xy
3 x 400 V	RP91-1-3-400-xy
3 x 415 V	RP91-1-3-415-xy

x = function:	0 = normal (overload)
	1 = inverted (underload)
	2 = autostart **

y = current range:	1 = max. 0,6 A
	2 = max. 1,2 A
	3 = max. 2,4 A
	4 = max. 6,0 A

ex: RP91-1-3-400-14

** Description autostart function:

The relay activates, when the supply voltage is connected.
When pins 6 and 7 is connected, the start-up time is activated,
and remains activated during start-up (overload only).

Mechanical dimensions:

Materials and weight:

Housing: NORYL-SE-1, grey, self-extinguishing

Housing bottom: NORYL SE-1, GFN-2, black,
self-extinguishing

Terminals: Nickel-plated brass

Weight: 110 g

Comadan
Produktion a/s

Adjustment of RP90/RP91

coarse adjustment

Start-up delay

Fine adjustment

Reaction delay
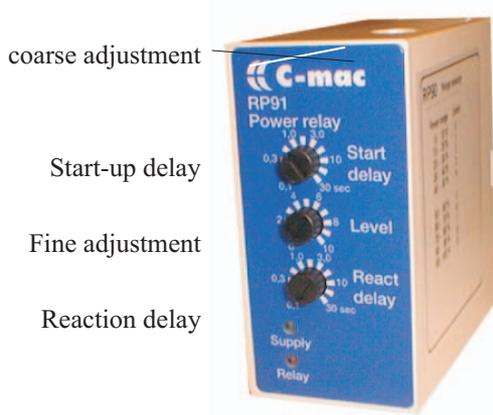
Adjustment, overload function:

A 10-position rotary switch, used for coarse adjustment of the setpoint is placed on top of the unit.
Set the switch on 9.

The potentiometer for start-up delay is set at minimum the time needed for the motor to reach its normal load/speed.

Potentiometer for fine adjustment is set at minimum.

Potentiometer for reaction delay is set at maximum.

The motor is started, and after the start-up delay has expired, the coarse switch is gradually turned down, (9-8-7 etc.), until the relay LED starts flashing.

The potentiometer for fine adjustment is turned against max., until the relay LED stops flashing, and now you have found the normal power consumption of the motor. If wanted, you can now set the fine adjustment a little bit higher, which ensures a reasonable margin of security, before the overload alarm is activated.

Finally the potentiometer for reaction delay is set at the wanted position.

Adjustment, underload function:

If the unit is used for underload monitoring, the coarse adjustment is set at 0 and the fine adjustment at max from the beginning, and instead you will turn up gradually on the coarse switch and down on the fine adjustment in order to find the normal power consumption of the motor.

The other adjustments are exactly as for overload monitoring.

Connection examples:
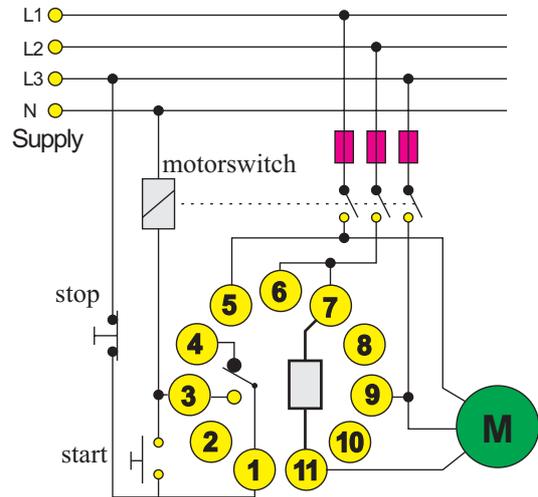
Example 1:
Monitoring of motor with current smaller than 6 A.
When the start contact is activated, the units makes its own latch.
The motor stops by opening the stop contact or in case of over/underloads, detected by RP90.
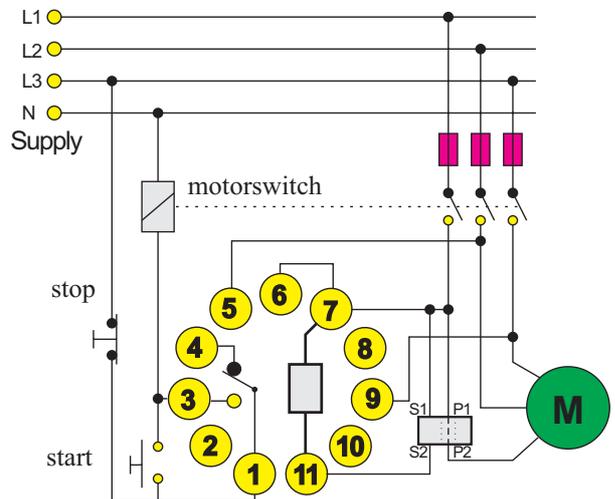
Example 2:
Same function as example 1, but for bigger motors, where a current transformer with 0-5 A output is used.
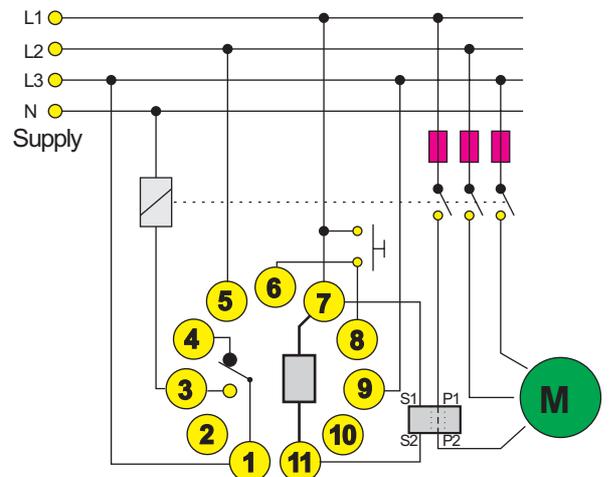
Example 3:
Combined Start/stop contact. The relay remains released in case of errors because the latch contact is activated.

Comadan Produktion a/s

Monitoring and protection of motors and machinery.

Protection of motors and machinery are normally made by means of motor switches or the like, but in many applications, f.inst, if you need a quick reaction in connection with overload, or an alarm in case of underload, it is an advantage to use a monitoring relay.

Please note, that the monitoring relay cannot replace the mandatory motor switch, which is used for safety reasons.

On the figures below you can see, how the different parameters are influenced by the motor load, and which C-mac relays to use for various applications.

The descriptions must be understood as rules of thumb and they are not necessarily correct in all applications as well as the curves are only intended as guide and not covering all motor types.

Phase angle (cos φ)
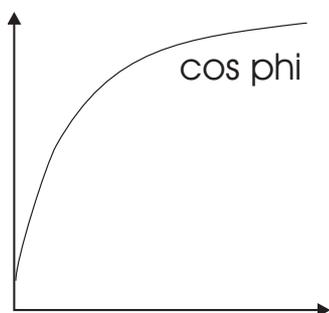
The phase angle between current and voltage (cos φ) is changing a lot between 0 and 60% load, therefore it is an advantage to monitor the phase angle if you want an alarm in connection with underload, f.inst. breakage of belts, pumps running dry, blocking of filters, etc.

Recommended relay type:
RP81 (only 3-phase loads)

Motor current
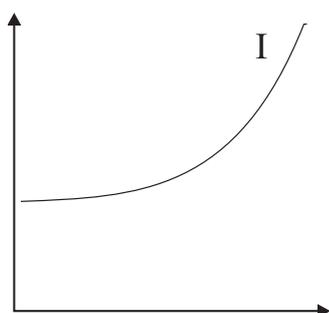
The current consumption of a motor is almost the same from 0 to 50% load, and after that it will increase with increasing load.
Current monitoring is used, if you want to protect the motor against blocking, f.inst. grinding mills, screw conveyors, etc.

Recommended relay types:
RC15 or RC30

Motor power
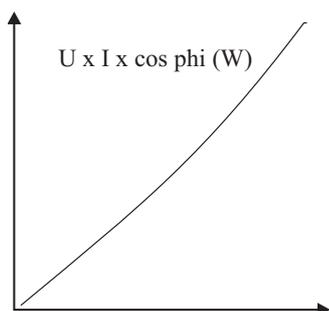
With power monitoring you can monitor all variables (supply voltage, current and phase angle), ensuring a very high sensitivity to even very small load changes, making this principle preferable for both over- and underload monitoring.

Recommended relay type: RP91

6-6

Comadan Produktion a/s

Monitoring of engine torque for 3phase motors

Frequency range 10-400 Hz

Very suitable in connection with frequency converters

Analogue and relay output

Adjustable start-up time, reaction time and setpoint

Selectable current ranges: 1A, 2,5A, 5A and 10A

Produced in accordance with CE and EMC regulations

C-mac® torque monitor type MP92 is used for monitoring of the engine torque on 3-phase motors.

The unit is particularly suitable in connection with frequency converters, and it can be used on all converters using the PWM principle.

Contrary to motors connected directly to the mains frequency, it is not possible to monitor the mechanical load on a motor which is connected via a frequency converter, by means of a standard power monitoring unit, because both voltage, current, phase angle and frequency must be calculated, and MP92 is developed particularly for this purpose.

The torque monitoring principle indicates the correct mechanical load of the motor, independant of the rotation speed, thereby making it suitable in connection with machine monitoring and process control applications.

MP92 can be connected directly to motors with a nominal load current up to 10 A, corresponding to approx. 5 kW.

In order to get the maximum metering accuracy you can select between 4 different current- and 2 voltage ranges by means of DIP-switches.

The unit is supplied with a 0-10 V output, indicating the actual torque in percentage of the metering range, and a 1-pole relay output, which switches if the adjusted setpoint is exceeded.

Technical data:

Supply voltage:	24 VAC/DC +/- 10%
Power consumption:	3,5 VA
Operating temp.:	-20°C to +60°C
Humidity:	0-90%, non-condensing
Ranges, current:	0-1A, 0-2,5A, 0-5A and 0-10A
voltage:	0-250VAC and 0-500VAC
frequency:	10-400 Hz
Accuracy:	<5% (absolute), <1% (repeating)

Adjustments:
Start-up delay:	0,2 - 20 seconds
Reaction delay:	0 - 20 seconds
Setpoint:	10 - 100%

Indications:
Red LED, Load:	Relay active
Red LED. Level:	Set limit exceeded
Red LED, Start:	Start-up delay active

Outputs:
Relay, setpoint:	max. load 5A / 250V

Functional diagram:
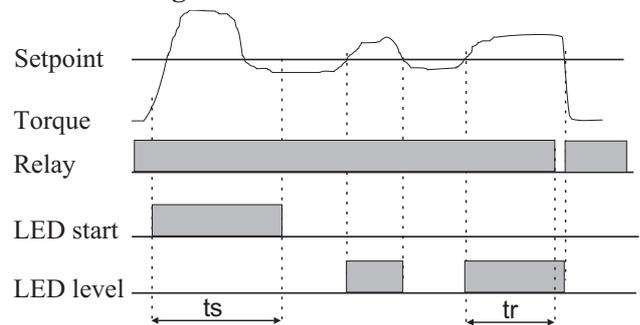
Functional description:

When the supply voltage is connected, the relay is activated.

When the motor starts, and the torque exceeds 5% of the maximum torque, the start-up delay is activated, and in this period the relay will remain activated, no matter if the torque exceeds the adjusted setpoint.

At the end of the start-up time the LED "Level" will indicate a possible exceeding of the set-point, and if the reaction delay "tr" is exceeded, the relay releases.

Please note, that the relay activates again, when the load is below the set limit, which means you must use the relay output in connection with a latch circuit for the motor, if you want the unit to disconnect the motor in case of an overload.

Selection of metering range:

The current range must be selected in such a way, that the normal operation current of the motor equals a metering signal of 50-80% (5-8 volt on the output), in this way you will get the best accuracy.

You can check the operation range by means of a voltmeter, or you can adjust on the level potentiometer to find the operation level. If you do not want the relay to switch during this test, you can set the reaction delay to max.

Selection of metering range:

Behind the frontplate you will find a DIP-switch, which is used to select the current and voltage ranges, see table below:

Metering voltage max 250 V: DIP 1 ON
Metering voltage max 500 V: DIP 1 OFF

on
4
3
2
1
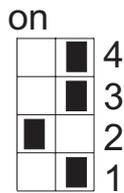
Current	DIP-switch		
	4	3	2
0 - 1 A	ON	OFF	OFF
0 - 2,5 A	OFF	ON	OFF
0 - 5 A	OFF	OFF	ON
0 - 10 A	OFF	OFF	OFF

Connection diagram:

Frequency converter

L1	L2	L3
U	V	W

1	3	5	7	8
U	V	W	W1	W2

MP92

M

NO	C	NC	+ out -	Supply
9	10	11	13	14	15	16
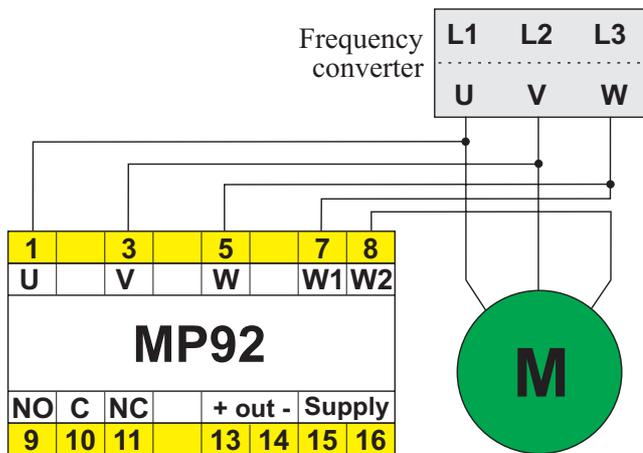
Supply voltage 24 VAC/DC is connected on pins 15-16. Output signal 0-10 VDC on pins 13-14.

Note: Supply voltage, analogue output and metering inputs are galvanically separated.

Ordering guide:

MP92-024

Mechanical dimensions:
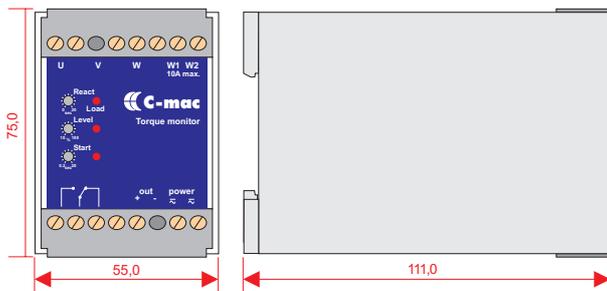
MP92, in brief:

- Torque monitoring with large speed variations (10 - 400 Hz).

- Monitoring directly on the motor connections eliminates errors because of disturbances and losses before and in the frequency converter.

- Possibility for separate torque monitoring on individual motors, controlled by the same frequency converter.

- Simple to install, also in existing installations, without extra mechanical components. Can be installed directly in the switchboard.

- Galvanically separated 24 VAC/DC supply.

- Both analogue and relay output in the same unit.

- Max. 10 A metering current directly on the unit.

- Protection of all mechanical parts, like gears, couplings, chains, belts and the motor itself against overload.

- Most suitable for conveyors, pumps, stirrers, lifts, etc.

Comadan
Produktion a/s

C-mac ®

Transmitter for kW, 3-phase symmetrical load

Connection to 3-phase net up to 3 x 500 VAC

Monitoring of total power consumption ($\sqrt{3} \times U \times I \times \cos \varphi$)

Built-in current transformer, ranges up to 60 AAC

Analogue output 0-20 mA / 4-20 mA

24 DC supply

Galvanic separation, input - output

Made in accordance with the CE and EMC regulations

FPA38 is monitoring the power consumption on 3-phase symmetrical load, primary motors.

The wanted metering range is selected by means of DIP-switches, from 0-3,46 kW up to 0-41,6 kW at 3x400 VAC supply, proportional to 0-20/4-20 mA on the metering output. 0-10 V is also possible, see below.

The supply voltage, 24 VDC, and the 3 voltage phases are connected to the relevant terminals. The current is monitored by putting the current phase L1 through the built-in current transformer, see connection diagram.

Technical data:

Supply voltage: 24 VDC +/- 5%

Current consumption: max. 60 mA

Operating temp.: -15 to +50°C

Metering rangeV: 3x200 to 3x500 VAC

Metering range I: 5, 10, 20, 25, 40, 60 A

Metering range f: 10-150 Hz

Accuracy: Class 2

Analogue output: selectable 0-20 mA or 4-20 mA
For 0-10 V output,
select 0-20 mA, and then connect
pin 7 and 8 (GND og X1)

Note: **The metering output is not galvanic separated from 24 VDC supply.**

Load, outputs: Current: max. 500 Ohm
Voltage: min. 100 kOhm

Note: Output is short-circuit proof

Reaction time: approx. 200 msec.

Weight: 200 g

Dimensions: 90 x 35 x 57 mm

CE mrk: EN61326A, LVD EN61010

Selection of metering range

The wanted ranges are selected with the DIP-switches on the side of the unit.

Select output signal, 0-20 mA or 4-20 mA with SW1.

SW2, 3 and 4, selection of monitoring current, see table.

SW1	OFF = 4-20 mA			ON = 0-20 mA		
SW2	OFF	ON	OFF	ON	OFF	ON
SW3	OFF	OFF	ON	ON	OFF	ON
SW4	OFF	OFF	OFF	OFF	ON	ON
Amp	5	10	20	25	40	60
kW	3,46	6,92	13,8	17,3	27,7	41,6

Note: The power ranges in the table are calculated and calibrated with a supply voltage of 400 VAC.

Connection diagram.
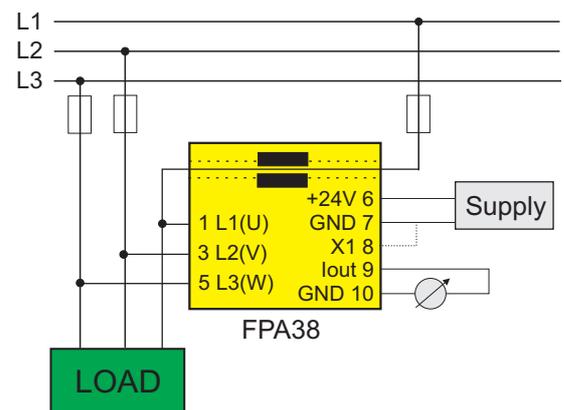
Metering principle.

The FPA 38 is connected to the supply, 3-phase net and load as shown above.

It can also be used together with frequency converters, as it operates in the frequency range 10-150 Hz.

For monitoring of 1-phase loads, connect L2 and L3 to N, and L1 to the phase.

Since the unit is calibrated for 3-phase loads, the output signal must be multiplied with 1.5 in order to get the correct value at 1-phase loads.

Comadan Produktion a/s

kW transmitter FPA96

Transmitter for kW, 3-phase symmetrical load

Connection to 3-phase from 3 x 400 VAC up to 3 x 460 VAC

Monitoring of total power consumption ($\sqrt{3}$ x U x I x cos φ)

Current monitoring with external current transformers

Analogue output 0-20 mA / 4-20 mA and 0-10 / 2-10 V

SO1 and counter outputs for kWh

Galvanic separation, supply - output

Made in accordance with the CE and EMC regulations

FPA96 is monitoring the power consumption on 3-phase asymmetrical loads, and it can be used for all kind of power monitoring within normal supply voltages.
The supply voltage for the unit and the monitoring voltage is the same.
The supply voltages are monitore directly, and the current monitoring is made by means of external current transformers with 1 or 5 A nominal output, so there are no limitations regarding the current ranges.
The unit has both current and voltage outputs, which are selectable as 0-20 mA and 0-10 V or 4-20 mA and 2-10 V. The selection of transformer type and output range is made be means of digital inputs, and it is also possible to select an output filter, which makes the output more stable if the monitored power is very unstable.
The module generates 1000 pulses per hour at 100% load, and these pulses are tresferred to thel SO1 and counter output.
The used can scale the connected PLC or instrument in accordance with the actual current transformers.
The calibrated metering ranges are shown below.

Technical data:

Supply voltage:	3x400-3x460 VAC +/- 10%
Frequency:	45-65 Hz
Operating temp.:	-15 to +50°C
Current input:	External CT: N/1A, N/5A
Input resistance:	10 mOhm
Accuracy:	Clacce 2
Analogue output 1:	0(4)-20 mA, max 300 Ohm
Analogue output 2:	0(2)-10 V, min 10 kOhm
kWh output:	1000 pph/fs, 200 msek.
SO1 output:	passive opto coupler, limited to 25 mA.
Veight:	300 g
Dimensions:	58 x 70 x 86 mm
CE mrk:	EN50081-1, EN50082-2 EN61010-1

Metering ranges.

U nom	400	415	440	460
P nom	0.69	0.72	0.76	0.80

Connections:
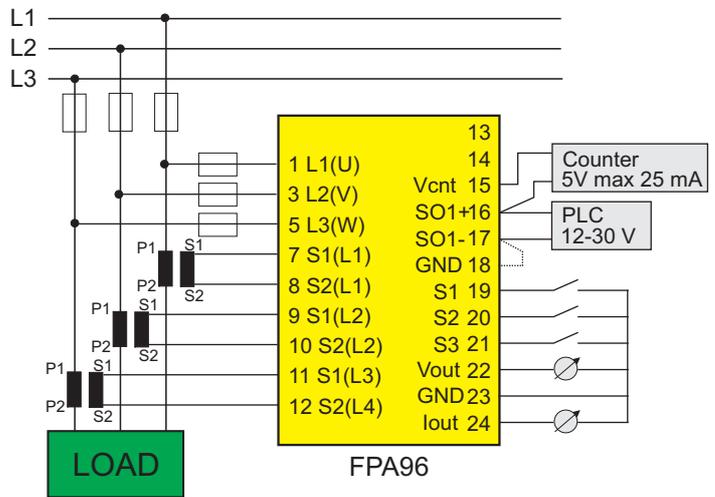
Note:
The connection GND-SO1- is only used together with counter connection.

Digital inputs.

S1	N / 5 A	OFF
	N / 1 A	ON
S2	Filter x 1	OFF
	Filter x 16	ON
S3	4-20 mA (2-10 V)	OFF
	0-20 mA (0-10 V)	ON

Ordering guide:
FPA96-3-400 *
FPA96-3-415
FPA96-3-440
FPA96-3-460

* = stock unit

Comadan Produktion a/s

C-mac® Level relays RL10, RL11 and RL12

> **RL10:** Universal relay for filling or emptying
> **RL11:** Level relay for emptying
> **RL12:** Level relay for filling
> 1 or 2 sensor levels
> Adjustable sensitivity
> 1- or 2-pole relay output
> DC supply (RL10 only) or AC supply up to 230 VAC
> Made in accordance with the CE and EMC regulations

C-mac® level relays, series RL, are made for monitoring and control of the level in conductive liquids. The level is monitored by 1 or 2 electrodes in the liquid.

RL10 is supplied with internal oscillator for the signal to the electrodes, which means the module can be used for both AC and DC supply, and furthermore it is possible to adjust the unit to a very high sensitivity, which means it can be used for very clean liquids, i.e. liquids with low conductivity.

RL11 and RL12 use the frequency of the supply voltage to generate the signal for the electrodes, therefore these units are only available for AC supply, and the sensitivity is not so high as the RL10.

RL11 and RL12 are available with either adjustable or fixed sensitivity.

Common technical data:

Supply, AC:	24, 115 and 230 VAC +/- 10%
Supply frequency:	40-70 Hz
Variable supply:	12-50 or 48-250 VDC (RL10 only)
Isolation voltage:	Supply - input - output: 3.75 kV
Supply voltage, DC:	24 VDC +/- 10% (RL10 only) Note: With this DC-supply there is no isolation between supply and internal electronics.
Optional:	12-50 VDC with internal DC/DC converter and galvanic isolation between supply and internal circuits.
Power consumption:	2,5 VA
Operation temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing

Sensor signal:
RL10: 8 VAC / 70 Hz, max 1 mA
RL11 and RL12: 8 VAC, max 1 mA

Sensor cable: Standard 2- or 3-wire cable max. 100 m.

Adjustments: Potentiometer, scale 1 to 10 (RL11F and RL12F: no adjustment)

Indications:
Green LED: Supply voltage connected
Red LED: Relay active

Sensitivity:

module type	function	potentio-meter	relay activates	relay releases
RL10	filling	min.	> 18 kΩ	< 9 kΩ
		max.	> 100 kΩ	< 66 kΩ
	emptying	min.	< 9 kΩ	> 18 kΩ
		max.	< 66 kΩ	> 100 kΩ
RL11	emptying	min.	< 3,5 kΩ	> 8 kΩ
		max.	< 25 kΩ	> 45 kΩ
RL11F	emptying	-	< 25 kΩ	> 35 kΩ
RL12	filling	min.	> 8 kΩ	< 3,5 kΩ
		max.	> 45 kΩ	< 25 kΩ
RL12F	filling	-	> 35 kΩ	< 25 kΩ

RL10 is a universal relay, with a 3-bit dipswitch in the buttom of the relay, where you can select the function:
Filling: switch 1 ON switch 2 OFF switch 3 ON
Emptying: switch 1 OFF switch 2 ON switch 3 OFF

Max. load, relay: 1-pole: 8 A - 250 VAC
2-pole: 5 A - 250 VAC, ohmic load

EMC and safety regulations.

Emmision: EN 50 081 - 1
Immunity: EN 50 082 - 2
Safety: EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.

Comadan Produktion a/s

Functional diagram 1: 2 electrodes

Supply

Max. (5)
in fluid

Min. (6)
in fluid

Relay,
ex. 1

Relay,
ex. 2
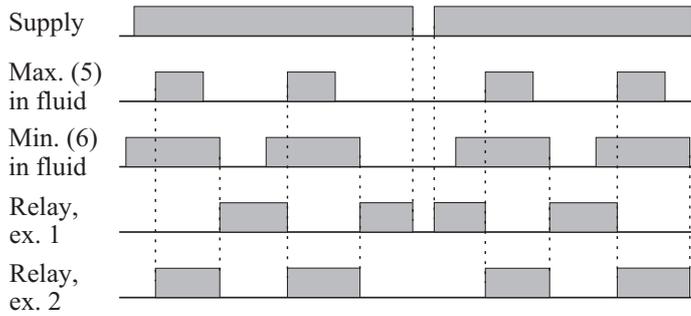
Functional diagram 2: 1 electrode

Supply

electrode
in fluid

Relay,
ex. 1

Relay,
ex. 2
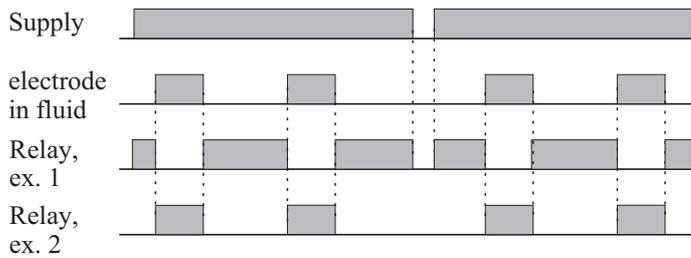
Example 1: Filling
    RL12 or RL10, selector switch in

Example 2: Emptying
    RL11 or RL10, selector switch out

Connections:
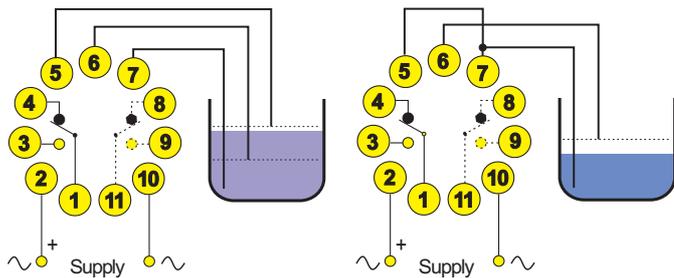
Example 1: 2 electrodes
(max. and min. level)

Example 2: 1 electrode
(ON/OFF control)

Connections 8-9-11:
2-pole version only

Ordering guide:

RL10-x-y-zzz

x = relay output
    1 = 1-pole
    2 = 2-pole

y-zzz = supply voltage:

0-024:	24 VDC	RL10 only
4-012:	12-50 VDC	RL10 only
1-024:	24 VAC	
1-115:	115 VAC	
1-230:	230 VAC	

Ordering example: RL10-2-1-230

The examples are shown for RL10, but the same principle is used for RL11(F) and RL12(F).

Mechanical dimensions:

38 mm

74 mm

76 mm

C-mac
Control module
Level
Delay
Supply
Relay

Materials and weight:

Housing: NORYL-SE-1, grey, self-extinguishing
Housing bottom: NORYL SE-1, GFN-2, black, self-extinguishing
Terminals: Nickel-plated brass
Weight: 190 g

**Comadan
Produktion a/s**

C-mac®

Temperature monitoring relay for Pt100 sensor

4 metering ranges in one module

Adjustments for setpoint and time delay

Selectable range, relay inversion and time delay

Cable resistance compensation

1- or 2-pole relay output

DC supply or AC supplies up to 230 VAC

Made in accordance with the $C\!\!\in$ and EMC regulations

C-mac® monitoring relay, type RM34, is used for temperature metering in conjunction with Pt100 temperature sensors according to DIN 43760. A 3-wire metering principle is used, which means that the module compensates for the external cable resistance. The cable monitoring circuit also ensures that the relay will release in case of short-circuit or cable breakage.

By means of a DIP-switch in the bottom of the unit you can select between 4 metering ranges and 4 different combinations of relay inversion and reaction-delay.

The 4 metering ranges are:
 -50 - 50 °C
   0 - 100 °C
  50 - 150 °C
 100 - 200 °C
With the relay inversion you can select, if the unit is used for heating or cooling.
The time-delay is adjustable between 0 and 10 sec.

The module is available with either 1- or 2-pole relay output.

On the front of the unit you can adjust the setpoint and reaction-delay between 0 and 10 seconds.

The unit is supplied for 24, 115 or 230 VAC supply or 10-50 VDC sypply.

Functional diagram:
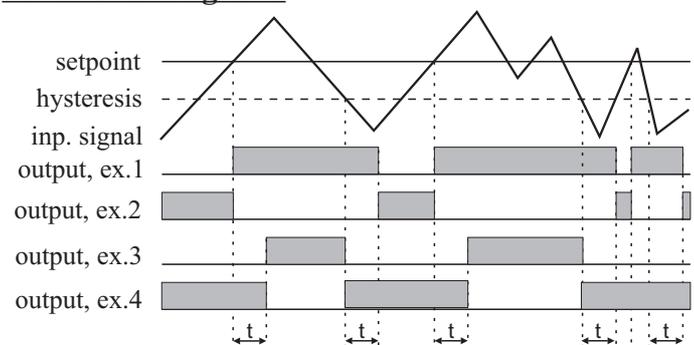
Function and range selection:

SW 1	SW 2	ex. no.	function
OFF	OFF	1	Relay activates, when setpoint is exceeded, delay on release
ON	OFF	2	Relay releases, when setpoint is exceeded, delay on activate
OFF	ON	3	Delay on activate, when setpoint is exceeded
ON	ON	4	Delay on release, when setpoint is exceeded

SW 3	SW 4	Metering range
OFF	OFF	-50 - +50 °C
ON	OFF	0 - 100 °C
OFF	ON	50 - 150 °C
ON	ON	100 - 200 °C

Comadan Produktion a/s

Common technical data:

Supply, AC:	24, 115 and 230 VAC +/- 10%
Supply frequency:	40-70 Hz
Supply, DC:	12-50 VDC
Isolation voltage:	Supply-input-output: 3.75 kV
Power consumption:	3 VA
Operation temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing
Temp. coefficient:	< 0,01% /°C

Indications:
Green LED, active: Supply ON and input OK
       flashing: Supply ON and input signal outside the metering range or cable fault
Red LED: Relay active

Selection of function:
S1-S2:   relay inversion and reaction delay, see table and functional diagram
S3-S4:   Selection of metering range, see table

Adjustments:
Potentiometer 1:   setpoint , 0-100% of the range
Potentiometer 2:   reaction delay, 0-10 seconds

Hysteresis: 1.5 °C

Sensor connections: Pin 5-6-7,
pin 5:   Cable compensation
pin 6-7:   Pt100 sensor

Max. load, relay:
1-pole: 8 A - 250 VAC, ohmic load
2-pole: 5 A - 250 VAC, ohmic load

EMC og safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.

Ordering guide, RM34:

supply	type number
12-50 VDC	RM34-x-4-012
24 VAC	RM34-x-1-024
115 VAC	RM34-x-1-115
230 VAC	RM34-x-1-230

x= relay output:
1 = 1-pole
2 = 2-pole

Connection diagram:

Connection 8-9-11: 2-pole version only

Mechanical dimensions:

Materials and weight:

Housing:	NORYL-SE-1, grey, self-extinguishing
Housing bottom:	NORYL SE-1, GFN-2, black, self-extinguishing
Terminals:	Nickel-plated brass
Weight:	190 g

Comadan Produktion a/s

3 metering ranges, from 10 rpm. to 20.000 rpm.

Adjustable start-up delay, from 0 to 10 seconds.

Universal pulse inputs for contact, NPN/PNP sensor, Namur sensor, etc.

Selectable latch function.

1-pole relay output.

DC supply or AC supplies up to 230 VAC

Made in accordance with the (€ and EMC regulations

The C-mac® tachometer relay type RR10 can be used for many different kinds of speed monitoring. The relay is available in 3 different metering ranges, calibrated in rpm (revolutions per minute).

The relay is supplied with universal pulse inputs, which enables you to use many different types of sensors. In addition, the relay can also deliver the supply voltage to the sensor.

You can select, if you want the output relay to release at too high or too low speed.
You can also select a latch function, which means the relay will stay deactivated, if the set limit has once been exceeded. The latch is cancelled by disconnection of the latch input or the supply voltage.

When the function, where the relay is released at too low speed, is selected, the adjustable time-delay can be used to ensure that the unit, which is monitored, can reach its correct speed, before the module starts monitoring.

Common technical data:

Supply voltage, AC:	24, 115 and 230 VAC +/- 10%
Supply frequency:	40-70 Hz
Variable supply:	12-50 VDC or 48-250 VDC
Isolation voltage:	Supply - internal - output: 3.75 kV
Supply, DC:	24 VDC +/- 10% Note: With this DC supply there is no galvanic isolation between the supply and internal electronics.
Power consumption:	2,5 VA
Operating temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing
Sensor voltage:	
NAMUR sensor:	8,2 VDC, max. 10 mA
NPN / PNP sensor:	24 VDC, max. 10 mA
Contact input:	10 VDC, 2 mA
Reaction delay:	The reaction delay depends on the set value, as the module measures the time between two pulses.
Example:	At 100 rpm: reaction delay 0,6 sek. At 10000 rpm: reaction delay 6 msek.
Minimum pulse time:	minimum pulse- and pause time is 0,3 msek.

Indications:

Green LED:	Supply voltage connected
Red LED:	Relay aktiv

Adjustments:

Start-up delay:	Potentiometer, scale 0-10 sec.
Setpoint:	Potentiometer, scale 1-20 rpm.
Note:	The start-up delay is only active when the unit is used for underspeed detection. (pin 7-11 connected)

Hysteresis.: 3 % of the set level

Temp.coefficient: typ. 0,1% per °C

Max. load, relay: 8 A - 250 VAC, ohmic load

Selection of function: Pin 11.
If the terminal is open, the relay releases, when the speed exceeds the set limit.
If terminal 11 and 7 are connected the relay releases, when the speed is lower than the set limit.

Latch function: Pin 9.
If terminal 9 and 7 are connected, and the relay releases, it will stay released, until 9-7 are disconnected or the supply voltage is interrupted.

EMC og safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.

Metering ranges:	10 - 200 rpm.
	100 - 2000 rpm.
	1000 - 20000 rpm

Comadan Produktion a/s

Functional diagram:

t = adjusted start-up delay

Connections RR10:

Ex 1: NPN/PNP sensor	Ex 2: Namur sensor	Ex 3: Contact
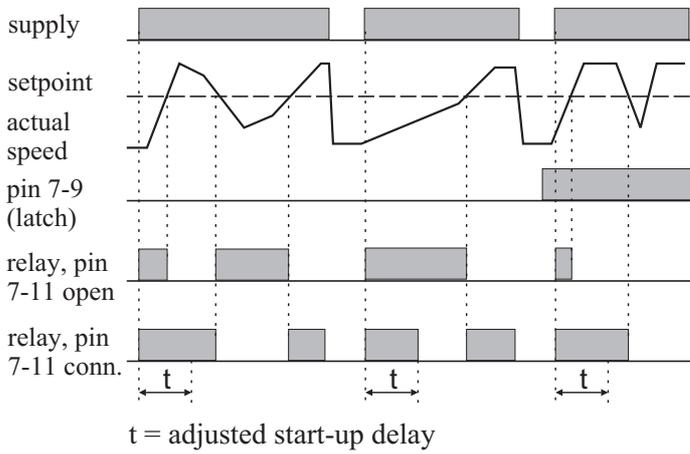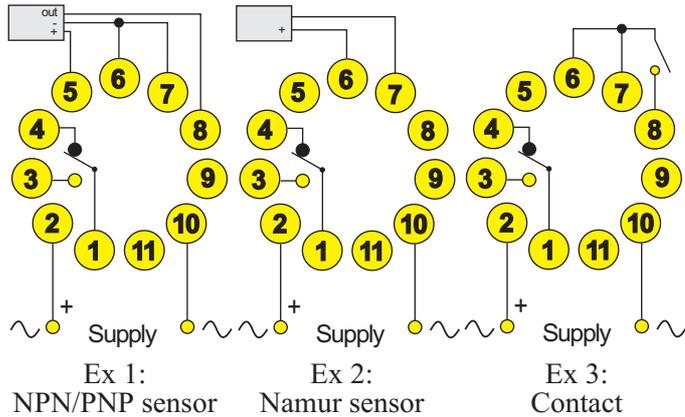
Note:
You can only use NPN/PNP sensors with true open collector outputs.
If the sensor has an internal resistance to plus or minus, the module must be ordered for the actual sensor (NPN or PNP). Alternatively you can insert a diode (e.g. 1N4007) in series with the sensor output, as shown in the examples below.

Connection PNP sensor: **Connection NPN sensor:**
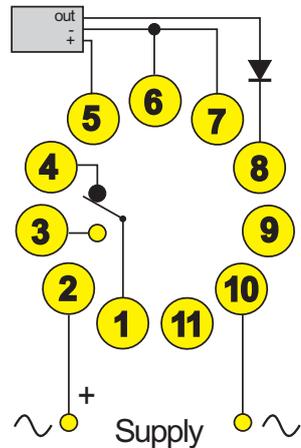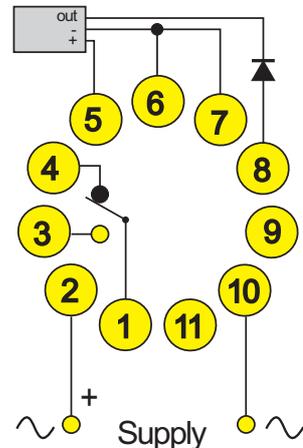
Ordering guide:

RR10-1-x-yyy-zzz

x-yyy = supply voltage:

0-024:	24 VDC
4-012:	12-50 VDC
4-048:	48-250 VDC
1-024:	24 VAC
1-115:	115 VAC
1-230:	230 VAC

zzz = range
200 =	10 -	200 rpm
2k =	100 -	2000 rpm
20k =	1000 -	20000 rpm

Ordering example: RR10-1-1-024-2k

If you want the module specifically for NPN or PNP sensor, it is added to the number,
e.g.: RR10-1-1-024-2k-NPN

Mechanical dimensions:
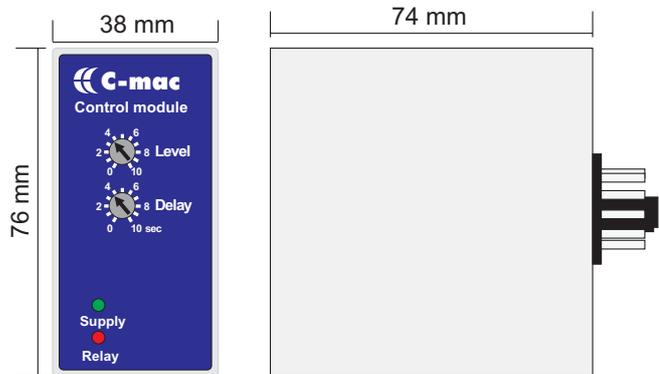
Materials and weight:

Housing:	NORYL-SE-1, grey, self-extinguishing
Housing bottom:	NORYL SE-1, GFN-2, black, self-extinguishing
Terminals:	Nickel-plated brass
Weight:	210 g

Comadan Produktion a/s

Preselection relay / pulse divider

Digital adjustment between 2 and 999

Pulse inputs for contact, NAMUR or NPN transistor.

Transistor output for connection to "slave module"

1-pole relay output

DC supply or AC supplies up to 230 VAC

Made in accordance with the CE and EMC regulations

C-mac® module type RD53 is a digital pulse counter module, selectable as pulse divider or preselection relay. The pulse inputs can be activated from a mechanical contact, a transistor or a NAMUR sensor, and the reset input can be activated from a mechanical contact or a transistor. The unit is supplied with a "slave" transistor output, in this way several units can be connected to the same pulse sensor.

Common technical data:

Supply voltage, AC:	24, 115 and 230 VAC +/- 10%
Supply frequency:	40-70 Hz
Variable supply:	12-50 VDC or 48-250 VDC
Isolation voltage:	Supply - internal - output: 3.75 kV
Supply, DC:	24 VDC +/- 10% Note: With this DC supply there is no galvanic isolation between the supply and internal electronics.
Power consumption:	2,5 VA
Operating temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing
Counter inputs:	pins 5-6-7
NAMUR input:	pins 6-7, pin 6 positive, pin 5 and 7 connected together.
Contact/transistor:	pins 5 and 7, pin 5 positive.
Reset input:	pins 7-8, pin 8 positive.
Counter output:	pins 7-11, pin 11 positive. If the same sensor is used for several units, pin 7 on all units are connected together, pin 11 on the first unit is connected to pin 5 on the next, etc.
Minimum pulse time:	minimum pulse- and pause time is 15 msec.
Indications:	
Green LED:	Supply voltage connected
Red LED:	Relay active
Adjustments:	3-digit digital switch
Selection of function:	pins 7-9.
pins 7-9 open:	Preselection relay
pins 7-9 connected:	Pulse dividing relay.

Max. load, relay: 8 A - 250 VAC, ohmic load

EMC og safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.

Functional diagram: (selector switch set on 3)
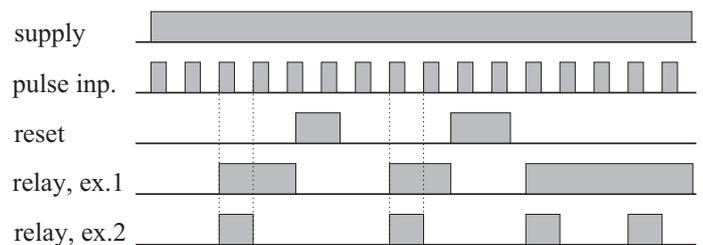
Ex.1: Preselection relay, pins 7-9 open
Ex.2: Pulse dividing relay, pins 7-9 connected

Connections:
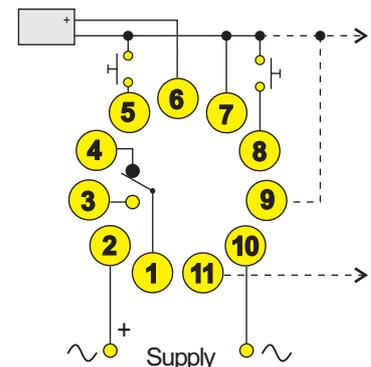
Ordering guide:

RD53-1-x-yyy

x-yyy = supply voltage:

0-024:	24 VDC
4-012:	12-50 VDC
4-048:	48-250 VDC
1-024:	24 VAC
1-115:	115 VAC
1-230:	230 VAC

Ordering example: RD53-1-1-024

Amplifying relay RD20

Amplifying relay for external sensor

Applicable for NPN, PNP and NAMUR sensors

Selectable activation or release of relay

1-pole relay output

DC supply or AC supplies up to 230 VAC

Made in accordance with the CE and EMC regulations
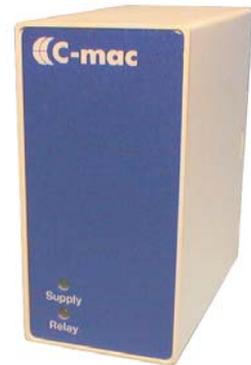
The C-mac® module type RD20 is a universal amplifying module, to be used together with inductive, capacitive or optical sensors.
The module has inputs fo NPN, PNP and NAMUR sensors, and delivers the necessary power for these sensors.

Common technical data:

Supply voltage, AC:	24, 115 and 230 VAC +/- 10%
Supply frequency:	40-70 Hz
Variable supply:	12-50 VDC or 48-250 VDC
Isolation voltage:	Supply - internal - output: 3.75 kV
Supply, DC:	24 VDC +/- 10% Note: With this DC supply there is no galvanic isolation between the supply and internal electronics.
Power consumption:	2,5 VA
Operating temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing

Sensor connections:
Common minus:	pin 7
24 VDC outputg:	pin 5, max. load current 20 mA
NAMUR input:	pin 6
NPN input:	pin 8
PNP input:	pin 9

Indications:
Green LED:	Supply voltage connected
Red LED:	Relay acttivated

|	
Relay inversion:	Pin 7-11.
Max. load, relay:	8 A - 250 VAC, ohmic load

EMC og safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.

Functional diagram:
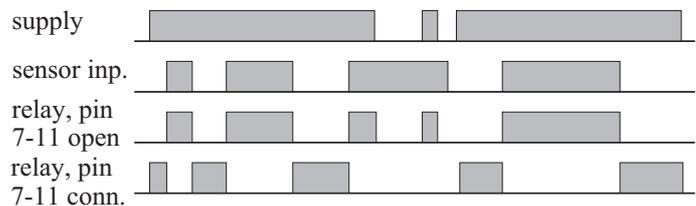
Connections:
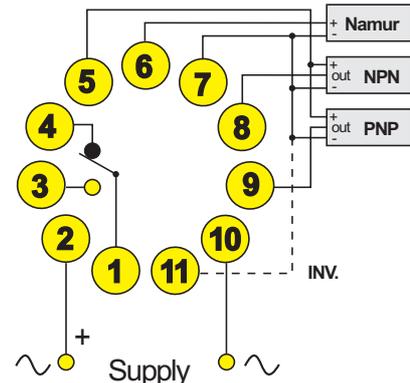
Ordering guide:

RD20-1-x-yyy

x-yyy = supply voltage:

0-024:	24 VDC
4-012:	12-50 VDC
4-048:	48-250 VDC
1-024:	24 VAC
1-115:	115 VAC
1-230:	230 VAC

Ordering example: RD20-1-1-024

Materials and weight RD20 and RD53:

Housing:	NORYL-SE-1, grey, self-extinguishing
Housing bottom:	NORYL SE-1, GFN-2, black, self-extinguishing
Terminals:	Nickel-plated brass
Weight:	180 g

Mechanical dimensions: see page 8-4

Comadan Produktion a/s

Logic relays RD11 and RD15-RD18

RD11: Flip-flop relay with phase-neutral or ph-ph supply.

RD15 and RD16: Flip-flop relay without or with memory.

RD17 and RD18: Bistable relay without or with memory.

Inputs:
>   RD11: contact input
>   RD15-18: contact, NPN or PNP input

1- or 2-pole relay output.

DC supply or AC supplies up to 415 VAC (RD11)

Made in accordance with the $C\epsilon$ and EMC regulations

The C-mac® logic relays, series RD, are available with 2 functions:
The flip-flop relays have 1 control input, and the relay changes its position, when the input is activated.
The bistable relays have 2 control inputs. The relay activates, when the "set" input is activated, and releases, when the "reset" input activates.
If the relay has a memory function, it remains in the same position, if the supply voltage is disconnected.

Common technical data:

Supply, RD11:	24 VAC/DC
	24 VAC,
	127 or 230 VAC
	230 or 400 VAC +/- 10%
Supply, RD15-18:	24, 115 and 230 VAC +/- 10%
Supply frequency:	40-70 Hz
Variable supply:	12-50 VDC or 48-250 VDC
Isolation voltage:	Supply - internal - output: 3.75 kV
Supply, DC:	24 VDC +/- 10%
	Note: With this DC supply there is no galvanic isolation between the supply and internal electronics.
Power consumption:	2,5 VA
Operating temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing

Indications:
Green LED: Supply voltage connected
Red LED: Relay acttivated

EMC og safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

**Approvals:** The units are produced in accordance with the CE og low voltage regulations.

Control inputs.

RD11:	pin 5-10
	Note: The control input is connected to phase.
RD15-16:	pin 5-7
RD17-18:	pin 5-6-7
	pin 5-7: set, ben 6-7: reset

Connections RD11:
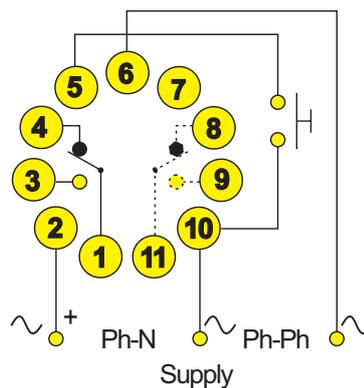
Note:

pin 8-9-11, 2 pole version only.

At 24 V versions, pin 6 is not connected.

Connections RD15-16:   RD17-18:
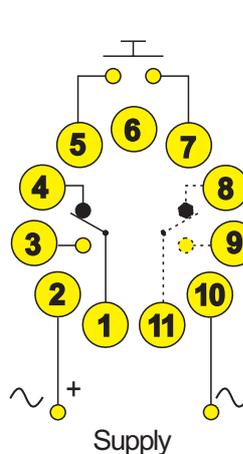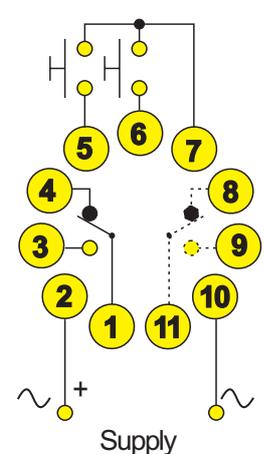
Note:

If you use transistor activation instead of contact, the emitter must be connected to pin 7.

Comadan Produktion a/s

Functional diagram RD11 and RD15-16:

supply

pulse inp.

relay RD11
and RD15

relay RD16

Functional diagram RD17-18:

supply

inp.5-7
(set)

inp.6-7
(reset)

relay RD17
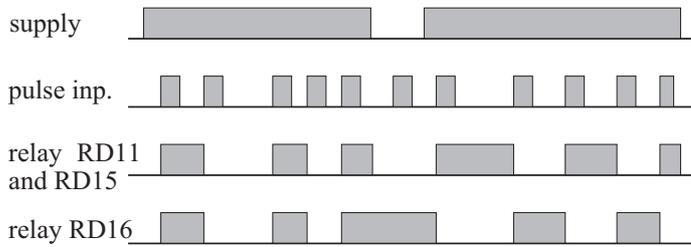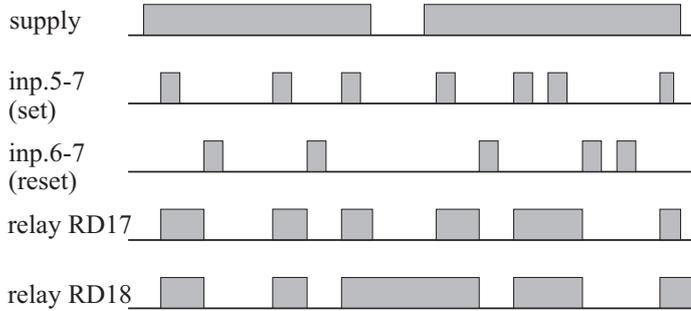
relay RD18

Ordering guide RD11:

RD11-x-y-zzz

x = relay output:

1 = 1-pole
2 = 2-pole

y-zzz = supply voltage:

2-024:   24 VAC/DC
1-024:   24 VAC
1-127:   127 or 230/240 VAC
1-230:   230 or 380/415 VAC

Ordering example: RD11-1-1-230

Ordering guide RD15-RD18:

NOTE:
RD15 and RD17: without memory.
RD16 and RD18: with memory.

RD15-wx-y-zzz

w = relay output:

1 = 1-pole
2 = 2-pole (not RD16 and RD18)

x = transistor logic:

1 = NPN
2 = PNP

y-zzz = supply voltage:

0-024:   24 VDC
4-012:   12-50 VDC
4-048:   48-250 VDC
1-024:   24 VAC
1-115:   115 VAC
1-230:   230 VAC

Ordering example: RD15-12-1-230

Mechanical dimensions:
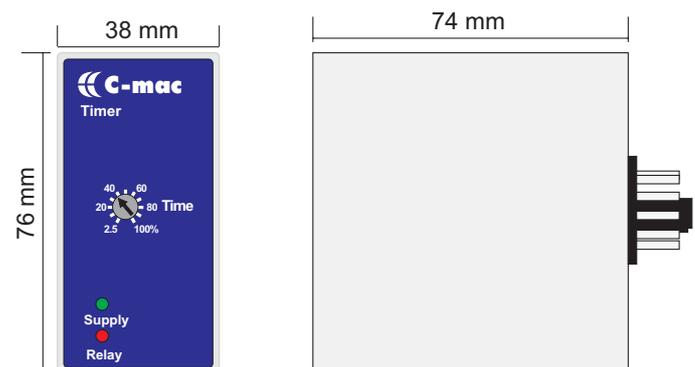
38 mm

74 mm

76 mm

C-mac
Timer

40   60
20   80 Time
2.5 100%

Supply
Relay

Materials and weight:

Housing:	NORYL-SE-1, grey, self-extinguishing
Housing bottom:	NORYL SE-1, GFN-2, black, self-extinguishing
Terminals:	Nickel-plated brass
Weight:	150 g

**Comadan
Produktion a/s**

Digital limit switch for current or voltage signals

Setpoint adjustment by built-in digital switches:
   RM15.2: 2-digit, resolution 1%
   RM15.3: 3-digit, resolution 0.5%
Selectable activation or release of relay

1-pole relay output

DC supply or AC supplies up to 230 VAC

Made in accordance with the CE and EMC regulations

C-mac® module type RM15 is used in connection with standard current- or voltage signals, where a relay output is wanted, if a preset limit is exceeded.

The module is available with either 2- or 3-digit digital setpoint adjustment.

By means of a push-button on the back of the module you select either activation or release of the relay, when the setpoint is exceeded.

Common technical data:

Supply voltage, AC:	24, 115 and 230 VAC +/- 10%
Supply frequency:	40-70 Hz
Variable supply:	12-50 VDC or 48-250 VDC
Isolation voltage:	Supply - internal - output: 3.75 kV
Supply, DC:	24 VDC +/- 10%
	Note: With this DC supply there is no galvanic isolation between the supply and internal electronics.
Power consumption:	2,5 VA
Operating temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing

Resolution, setpoint adjustment:
   2 digit, RM15.2:   1% (00 to 99)
   3 digit, RM15.3:   0.5% (000 to 200).

Accuracy, setpoint:	0.2%.
Hysteresis:	1% of metering range, factory set.

Indications:
   Green LED: Supply voltage connected
   Red LED: Relay active

Temp. coefficient: Typ. 0.03% /°C

Metering range	Input resistance
0-20 mA	50 Ohms
4-20 mA	50 Ohms
0-10 V	100 kOhms

Selection of relay function:
Pushbutton on back of the module.

OFF: Relay is activated, when setpoint is exceeded.
ON: Relay releases, when setpont is exceeded.

Max. load, relay: 8 A - 250 VAC, ohmic load

EMC og safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.

Functional diagram:
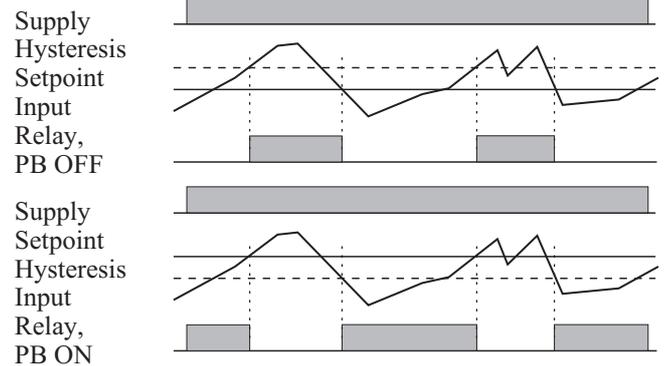
Connections:
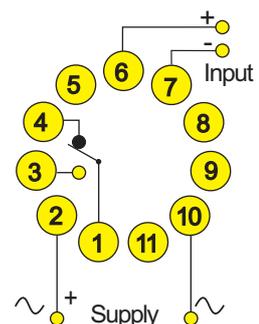
Ordering guide:

RM15.2-1-x-yyy-z   or   RM15.3-1-x-yyy-z

x-yyy = supply voltage: z = metering range

x-yyy		z	
0-024:	24 VDC	1 = 0-20 mA	
4-012:	12-50 VDC	2 = 4-20 mA	
4-048:	48-250 VDC	3 = 0-10 V	
1-024:	24 VAC		
1-115:	115 VAC		
1-230:	230 VAC		

Ordering example: RM15.3-1-1-230-2

Comadan Produktion a/s

Double limit switch FCD25

Programmable double limit switch

Analogue input 0(4) - 20 mA

Selectable min- or max limits

Start-up and reaction timer

Supply voltage 24 VDC

Programmable inputs

Made in accordance with the CE and EMC regulations

FCD25 is a double limit switch for monitoring of current signals, f.inst. from 2-wire transmitters with 4-20 mA output or other units with current output.

Analogue input
The analogue input is programmable for either 0-20 mA or 4-20 mA. The input range is adjustable too, down to 10 mA for 100% input range.

Digital inputs
The digital inputs are programmable for either positive or negative logic. The inputs are programmed for either active low or active high.
At positive logic, input signals from 5-30 VDC are accepted.
At negative input, the input is connected to ground f.inst. with a contact or an NPN output from a sensor.

Relay outputs
The unit is supplied with 2 relays, one for each limit.
Both relays have NO-contacts, and both of them are programmable for either activation or release, when the set limit is exceeded.
The alarms can be reset with the "Mode" button or input "S1".

Setpoints
The unit have two independent setpoints, programmable as either min. or max. setpoint.
The setpoints are selected as a percentage of the range.
It is possible to cancel the monitoring with the input S2.

Start up timer
The start up timer is used if the start-up of a process is unstable and you do not want an alarm during start-up.
It is activated when the input signal exceeds approx. 5 % of the metering range.
If the start-up timer is set at 0, this function is cancelled.

Reaction delay
For each setpoint you can program a reaction delay in order to avoid alarm in case of only a short exceeding of the setpoint.

Hysteresis
The hysteresis can be used on both limits.
The hysteresis band is always above a min-limit and under a max-limit.
If the hysteresis function is used, an internal auto-reset function is used.
If you use the hysteresis at a min. setpoint, at the input signal goes to zero, you can reset the alarm by pressing the "Mode" button or activate input S1.

Technical data:

Supply voltage:	24 VDC +/- 10%
Current consumption:	max. 60 mA
Operating temp.:	-15°C to +50°C
Humidity:	0 - 90% RH, non-condensing
Max. load, relays:	1-pole: 5 A - 250 VAC, ohmic load
Analogue input:	0(4) - 20 mA, 70 Ohm
Digital inputs:	pos. logic: 5-30 VDV neg. logic: 0 V
Indput S1:	External reset
Input S2:	Alarm blocking
Veight:	200 g
Dimensions:	58 x 36 x 86 mm

EMC og safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

**Approvals:** The units are produced in accordance with the CE og low voltage regulations.

Connections:

FCD25

Reset

Blok.

1 R1 R2 6
2   7
3 S1   +I in 8 — 0-20 mA
4 S2   GND 9
5 GND +24V10 — Supply
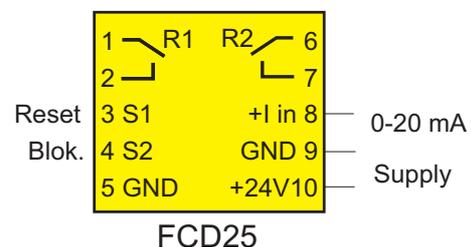
Selection of parameters.

In the scheme you can see the 11 user programmable parameters.
To get into the programming mode, press 'Mode' until the 'Setup'-LED is on and the display shows 'P00'.
Then you used the 'Up' and 'Down' for selection of the wanted parameter followed by 'Mode'.
Now the wanted parameter is selected, and you can change the value by pressing 'Up' and 'Down'.
The new value is stored by pressing 'Mode', and then you can select a new parameter.
To end the programming mode you select **Par. no. 00** and when you press 'Mode' you return to normal function.

Par. no. 1. Select input 0-20mA or 4-20mA.

Par. no. 2. Setpoint relay 1: Off, min. or max.

Par. no. 3. Setpoint relay 2: Off, min. or max.

Par. no. 4. If wanted the input range can have a reduced scale. You can program 100% input signal between 10 and 20mA.

Par. no. 5. Hysteresis for limit 1, see figure below to see the placement of the hysteresis band. Please note that an internal auto-reset function is activated when you use the hysteresis.

Par. no. 6. Hysteresis for limit 2.

Par. no. 7. Polarity for relay 1: Inverted / not inverted

Par. no. 8. Polarity for relay 2: Inverted / not inverted

Par. no. 9. Auto-Shut-Down is aktived (On), if the unit itself should block for min.-alarms, if the input goes to 0.
As an alternative, the input S2 can be used to block an alarm.

Par. nr. 10. De digitale indgange kan konfigureres til at være aktive høje (Hi) eller aktive lave (Lo).

Par. nr. 11. Programming lock, in order to avoid unwanted programming.
If activated, all parameters can be seen, but not changed

Parameter list

Nr	Parameter	Description	Range	Def.
01	Input	Analogue input	0-20mA, 4-20mA	0.20
02	Limit 1	setpoint type	Off, min (Lo), max (Hi)	Hi
03	Limit 2	setpoint type	Off, min (Lo), max (Hi)	Lo
04	Zoom	Scaling of input signal	10..20mA	20
05	Hysteresis 1	Hysteresis for limit 1	Off, 1..50	Off
06	Hysteresis 2	Hysteresis for limit 2	Off, 1..50	Off
07	Polarity 1	Polarity relay 1	Inverted / not inverted	n.in
08	Polarity 2	Polarity relay 2	Inverted / not inverted	n.in
08	Auto-Shut-Down	Blocks at stop	Off, On	Off
10	Logic	Logic digital inputs	Negative (Lo), Positive (Hi)	Lo
11	Lock	Lock parameters	Off, On	Off

In addition the the parameters above, the FCD25 has also got a number of direct accible parameters. For access, use 'Mode' until the LED for the wanted parameter is on, and then you use the 'Up' and 'Down' to modify the parameter, see the next scheme.

Parameter	Description	Range	Def
Ts [s]	Start-up timer	0,0 .. 999s	2.0
Limit 1	Setpoint relay 1	5.. 99%	80
Limit 2	Setpoint relay 2	5.. 99%	20
Tr [s] (Limit 1)	Reaction delay limit 1	0,00 .. 655s	0,10
Tr [s] (Limit 2)	Reaction delay limit 2	0,00 .. 655s	1,00

Peak-detectors

FCD25 is supplied with a max.- and a min.-peak detektor.
You can see the value by pressin 'Up' for max.-peak and 'Down' for min.-peak under 'Input [%]'.
The peak detektors are reset after the time Ts, or by pressing 'Up'+'Mode' simultaneously for max.-peak and 'Down'+'Mode' for min.-peak.

Function:

On the drawing below you can see a curve, which could be the start for anAC-motor (f.inst a pump) . In this example the curve indicates the power consumption.

Example

In the example, the FCD25 is set to a max limit on limit 1 and a min limit on limit 2.

The start-up power peak should be filtered out, and to do this, the programmable start up timer (Ts) is used;
When the input signal exceeds 5%, Ts is activated. As long as Ts is active, the monitoring function is cancelled.

Reaction timer and Hysteresis

You can see how the reaction timers (Tr Max and Tr Min) are activated, after the limit is exceeded. Tr is used to avoid alarms in case of only a short-time exceeding of the limit.

Comadan
Produktion a/s
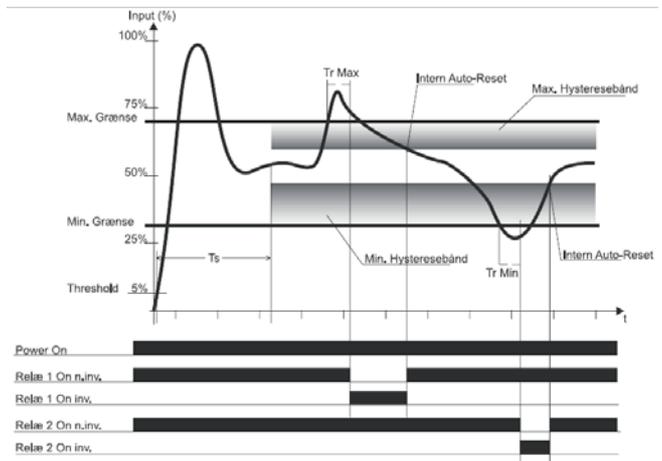
Electronic timers RT10, RT12, RT14, RT15 and RT16

Timing function controlled by the supply connection

RT10: Delay on operate   RT12: Interval timer

RT14: Symmetrical recycler   RT15: One-shot timer

RT16: Delay on release

1- or 2-pole relay output

DC supply or AC supplies up to 230 VAC

Made in accordance with the CE and EMC regulations
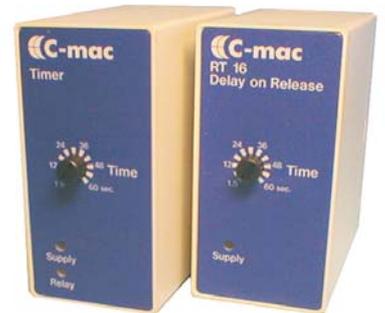
C-mac® timers type RT10, RT12, RT14, RT15 and RT16 covers all the basic timing function, used in a countless number of applications.

All units have automatic function, which means the time function starts, when the supply voltage is connected and/or disconnected.

Common technical data:

Supply, AC:	24, 115 and 230 VAC +/- 10%
Supply frequency:	40-70 Hz
Isolation voltage:	supply - internal - output: 3.75 kV
Supply, DC:	24 VAC/DC +/- 10%
	Note: With this type of supply,there is no galvanic isolation between supply and internal electronics.
Power consumption:	2,5 VA
Operation temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing
Indications:	
Green LED:	Supply voltage connected
Red LED:	Relay active (not on RT16).
Time adjustment:	2,5 - 100 % of the range
	Internal or eksternal 0-1 MΩ poten-tiometer, dependent on type.
	(RT15: fixed time, no adjustment)
Accuracy, scale:	5 %.
Repeatability:	0,1 %
Reset of time	Supply voltage interruption
and/or relay:	for more than 0,2 sec.
RT16:	Supply voltage connection for more than 0,2 sec.
Max. load, relay:	1-pole 8 A - 250 VAC
	2-pole: 5 A - 250 VAC, ohmic load

EMC og safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.

All units are supplied with either 1- or 2-pole relay output, or with 2 separate relays, (relay 1, pins 1-3-4, has the normal time function, and relay 2, pins 8-9-11, indicates that the supply voltage is applied).

Specifications RT10, RT12 and RT16.

Connections:
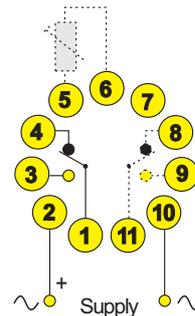
Note:
Connections 8-9-11: 2-pole version only

Connections 5-6: Only versions with eksternal potentiometer (not RT16)

Functional diagram:
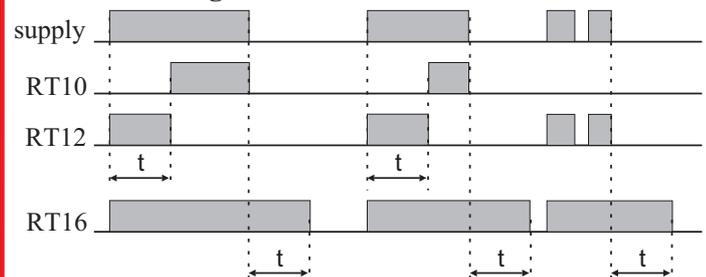
Time ranges: 0,08 -   3 sec
0,4 - 15 sec
1,5 - 60 sec
0,1 -   3 min (RT16 only)
0,25 - 10 min (not RT16)
1,5 - 60 min (not RT16)
0,25 - 10 hours (not RT16)

Comadan Produktion a/s

Specifications RT14.

Connections:
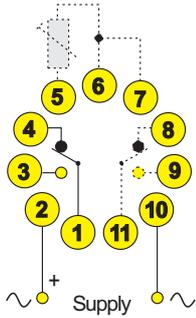
Note:

Connections 8-9-11:
2-pole version only

Connections 5-6: Only versions with eksternal potentiometer

Connections 6-7: Start position, see diagram

Functional diagram:
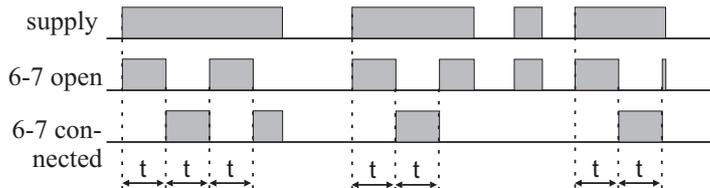
Time ranges:
- 0,08 - 3 sec
- 0,4 - 15 sec
- 1,5 - 60 sec
- 0,25 - 10 min
- 1,5 - 60 min
- 0,25 - 10 hours

Specifications RT15.

Connections:
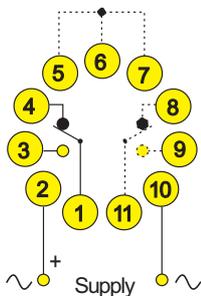
Note:

Connections 8-9-11:
2-pole version only

Connections 5-6-7: pulse funktion, see diagram

Functional diagram:
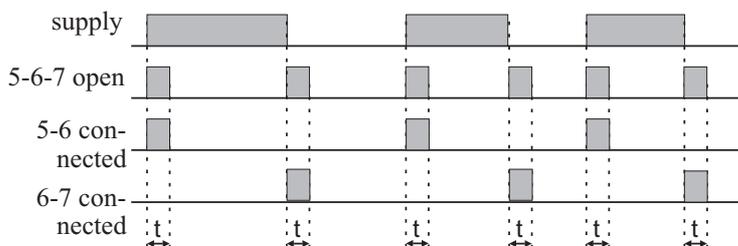
Pulse length (t): 0,5 sec. +/- 20%

Ordering guide:

Supply	Type number
24 VAC/DC	RT1X-y-2-024-zzz
24 VAC	RT1X-y-1-024-zzz
115 VAC	RT1X-y-1-115-zzz
230 VAC	RT1X-y-1-230-zzz

X = Timer type
- RT10: delay on operate
- RT12: interval timer
- RT14: symmetrical recycler
- RT15: one-shot
- RT16: delay on release

y = output relay
- 1: 1-pole
- 2: 2-pole
- 4: 2 separate relays

zzz = time range
- see table for each type

Ordering example:
RT12-2-1-230-10M

For versions with external potentiometer an E is added to the type number (RT10, RT12 and RT14 only)

ex: RT10E-2-1-230-60S

Mechanical dimensions:
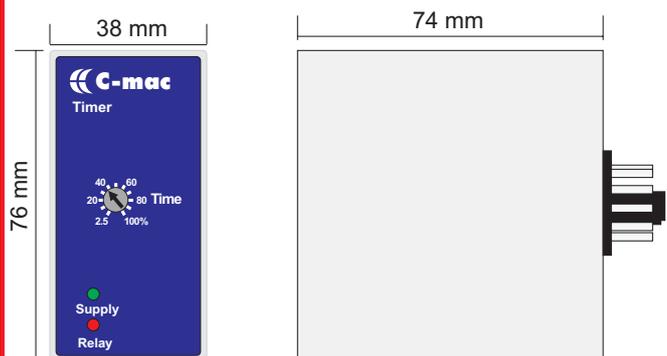
Materials and weight:

Housing: NORYL-SE-1, grey, self-extinguishing

Housing bottom: NORYL SE-1, GFN-2, black, self-extinguishing

Terminals: Nickel-plated brass

Weight: 140 g

Comadan Produktion a/s

Delay on operate timers type RT10.6, RT10.7 and RT10.8

Interval timers type RT12.6, RT12.7 and RT12.8.

Timing function controlled by external commands.

Time ranges from 0,08 seconds to 10 hours.

1- or 2-pole relay output.

DC supply or AC supplies up to 230 VAC.

Made in accordance with the $C\!\epsilon$ and EMC regulations
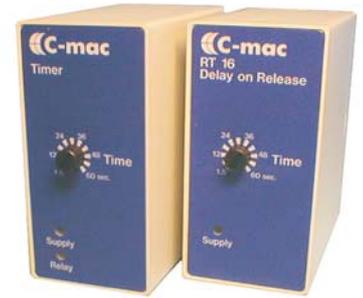
C-mac® externally controlled timers type RT10.6, RT10.7, RT10.8, RT12.6, RT12.7 and RT12.8 are used in a large amount of applications, where you need a more advanced control of the time functions.

Common technical data:

Supply, AC:	24, 115 and 230 VAC +/- 10%
Supply frequency:	40-70 Hz
Isolation voltage:	supply - internal - output: 3.75 kV
Supply, DC:	24 VAC/DC +/- 10% Note: With this type of supply, there is no galvanic isolation between supply and internal electronics.
Power consumption:	2,5 VA
Operation temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing

Indications:
Green LED: Supply voltage connected
Red LED: Relay active

Time adjustment: 2,5 - 100 % of the range
Internal or eksternal 0-1 MΩ potentiometer, dependent on type.
(External time adjustment: 1-pole versions only)

Accuracy, scale: 5 %.

Repeatability: 0,1 %

Reset of time and/or relay:
a: supply   Supply voltage interruption for more than 0,2 sec.
b: contact   Contact activation for more than 10 msec.

Max. load, relay: 1-pole 8 A - 250 VAC
2-pole: 5 A - 250 VAC, ohmic load

EMC og safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.

All units are supplied with either 1- or 2-pole relay output, except versions with external time adjustment.

Time ranges, all versions:

```
0,08 -  3 sec
0,4  - 15 sec
1,5  - 60 sec
0,25 - 10 min
1,5  - 60 min
0,25 - 10 hours
```

Specifications RT10.6.

Connections:

ex.1   ex.2   ex.3

Functional diagram:

Comadan Produktion a/s
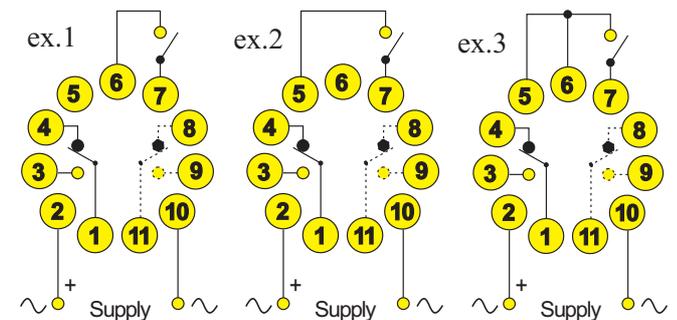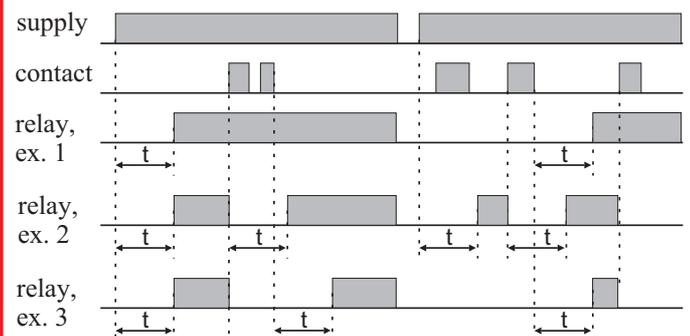
Specificationer RT12.6.

Connections:

ex.1   ex.2   ex.3

Functional diagram:

supply

contact

relay, ex. 1   t   t   t

relay, ex. 2   t   t

relay, ex. 3   t   t
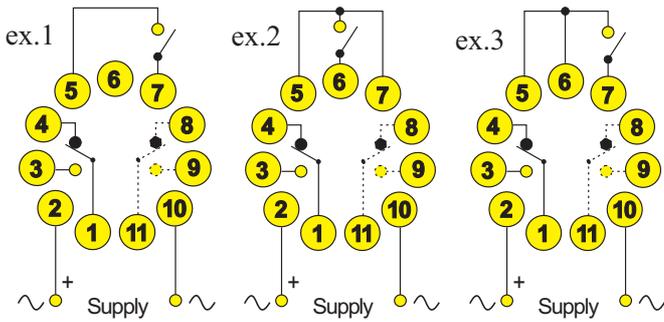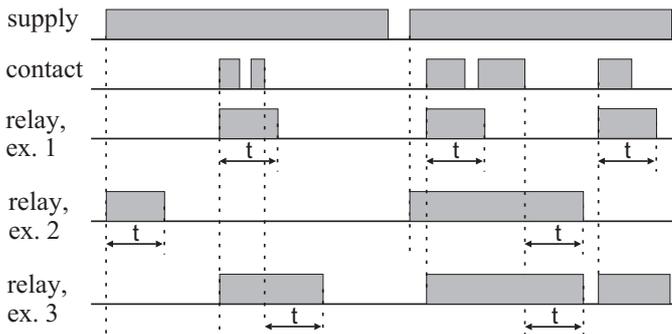
Specifications RT10.7, RT10.8, RT12.7 and RT12.8.

Connections:

NPN sensor   contact

NPN

Functional diagram:

supply

contact

relay, RT10.7   t   t   t   t

relay, RT10.8   t   t   t

relay, RT12.7   t   t   t   t

relay, RT12.8   t   t   t
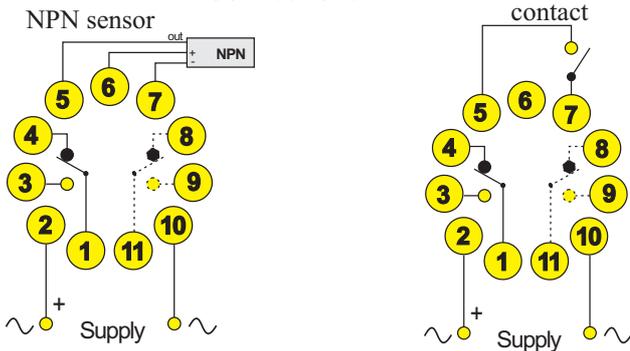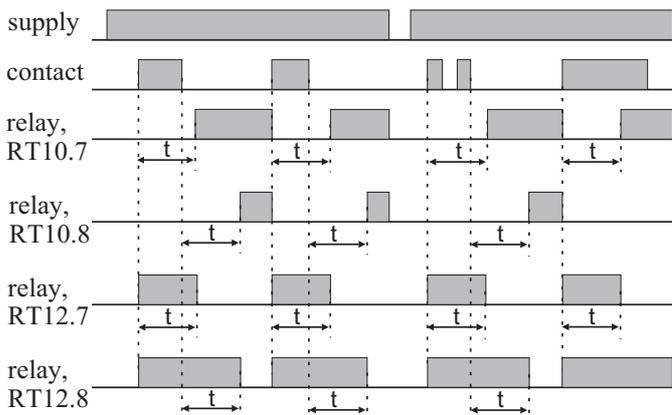
Time adjustment with external potentiometer:

Potentiometer 0-1 MOhm, connected between pins 8 and 9.

Note: These versions are only supplied with 1-pole relay output. (add E in the type number)

Ordering guide:

Supply	Type number
24 VAC/DC	RT1X.X-y-2-024-zzz
24 VAC	RT1X.X-y-1-024-zzz
115 VAC	RT1X.X-y-1-115-zzz
230 VAC	RT1X.X-y-1-230-zzz

X.X = Timer type

    RT10.6: delay on operate, 3 different selections for reset of time and/or relay.

    RT10.7: delay on operate, reset of time and relay with NPN-sensor or contact.

    RT10.8: delay on operate, reset of time and relay with NPN-sensor or contact.

    RT12.6: interval timer, 3 different selections for reset of time and/or relay.

    RT12.7: interval timer, reset of time and relay with NPN-sensor or contact.

    RT12.8: interval timer, reset of time and relay with NPN-sensor or contact.

y = output relay

    1: 1-pole

    2: 2-pole

zzz = time range

    see table for each type

Ordering guide:

    RT10.6-2-1-230-10M

Mechanical dimensions:
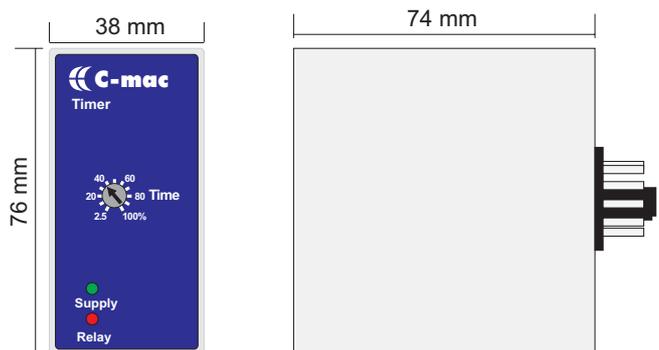
38 mm   74 mm

76 mm

C-mac

Timer

40   60
20   80   Time
2.5   100%

Supply

Relay

Materials and weight:

Housing: NORYL-SE-1, grey, self-extinguishing

Housing bottom: NORYL SE-1, GFN-2, black, self-extinguishing

Terminals: Nickel-plated brass

Weight: 140 g

Comadan Produktion a/s

C-mac®

Star/delta relay type RT18

Timing relay for star-delta switches

Automatic start

4 time ranges from 0,4 sec. to 10 min.

Time adjustment on built-in potentiometer

1-pole relay output with neutral centre position

100 msec. fixed neutral time

Phase-neutral or phase-phase supply voltage

Made in accordance with the CE and EMC regulations

C-mac® time relay type RT18 is particularly made for the control of star-delta contactors.

When the supply voltage is connected, the relay activates in position 1-4, and the time period starts.

At the end of the set delay, the relay switches to neutral centre position for approx. 100 msec. Then it switches to position 1-3 and stays in this position, until the supply voltage is interrupted.

Technical data:

Supply voltage	24 VAC/DC
	127 VAC / 220 VAC
	230 VAC / 400 VAC
	240 VAC / 415 VAC
Power consumption:	max. 2 W
Operation temp.:	-20°C til +60°C
Humidity:	0 - 90% RH, non-condensing
Indications:	
Green LED:	Relay, position 1-4
Red LED:	Relay, position 1-3
Time adjustment:	2,5 - 100 % of the range
Accuracy, scale:	5 %.
Repeatability:	0,1 %
Reset of time and/or relay:	Supply voltage interruption for more than 0,2 sec.
Max. load, relay:	1-pole 8 A - 250 VAC
	2-pole: 5 A - 250 VAC, ohmic load

EMC og safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.

Time ranges:

0,4 - 15 sec
0,8 - 30 sec
1,5 - 60 sec
0,25 - 10 min

Connections:
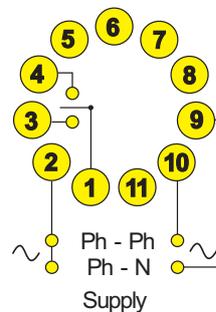
Note:
At 24 V AC/DC supply, pin 9 is not connected. (pin 2 is +)

Functional diagram:
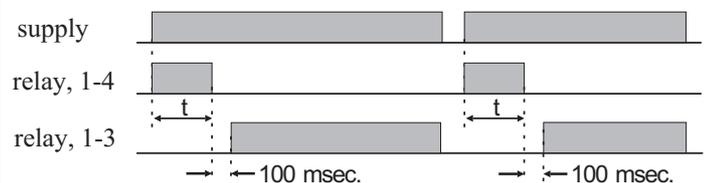
Ordering guide:

Supply	Type number
24 VAC/DC	RT18-2-2-024-xxx
127 / 220 VAC	RT18-2-1-127/220-xxx
230 / 400 VAC	RT18-2-1-230/400-xxx
240 / 415 VAC	RT18-2-1-240/415-xxx

xxx = time ranges
        see table on previous page

Ordering example:
   RT18-2-1-230/400-60S

Mechanical dimensions.: see pagee 9-2

Comadan Produktion a/s

Multifunction timers RT20/RT31

C-mac®

RT20: 4 functions in the same unit:
   Delay on release, delay on operate,
   interval timer and symmetrical recycler.

RT31: Asymmetrical recycler, 4 different funtcions.

16 time ranges/combinations in the same unit.

1- or 2-pole relay output.

DC supply or AC supplies up to 230 VAC

Made in accordance with the CE and EMC regulations

Technical data, RT20:

By means of a rotary switch on top of the module, the timer can be programmed to 4 different functions and 4 time ranges. The unit is available with 3 different supply voltages and 3 time combinations, see specifications and table.

Supply voltage:	24 V AC/DC, 115 and 230 VAC +/- 10%
Power consumption:	Max. 2 W
Operation temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing
Indications:	
Green LED:	Supply voltage connected
Red LED:	Relay active
Time adjustment:	2,5 - 100 % of the range
Accuracy, scale:	5 %.
Repeatability:	0,1 %
Max. load, relay:	1-pole 8 A - 250 VAC 2-pole: 5 A - 250 VAC, ohmic load

EMC og safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.
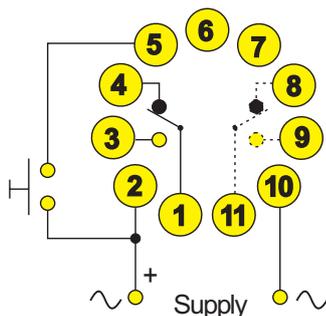
Connections:

Note:
Delay on release function must be controlled by the contact input, with supply voltage permanently connected.
The other functions can be controlled by the supply voltage alone (pins 2 and 5 connected), or combined with the contact input.

Time ranges and selection of function

switch	function	Time ranges, type variant		
		M1	M2	M3
0 1 2 3	Delay on release	0,06- 2,5 s. 0,25- 10 s. 2- 80 s. 16- 640 s.	0,4- 15 s. 1,5- 60 s. 0,2- 8 m. 1,6- 64 m.	0,06- 2,5 m. 0,25- 10 m. 2- 80 m. 16- 640 m.
4 5 6 7	Delay on operate	0,06- 2,5 s. 0,25- 10 s. 2- 80 s. 16- 640 s.	0,4- 15 s. 1,5- 60 s. 0,2- 8 m. 1,6- 64 m.	0,06- 2,5 m. 0,25- 10 m. 2- 80 m. 16- 640 m.
8 9 A B	Interval timer	0,06- 2,5 s. 0,25- 10 s. 2- 80 s. 16- 640 s.	0,4- 15 s. 1,5- 60 s. 0,2- 8 m. 1,6- 64 m.	0,06- 2,5 m. 0,25- 10 m. 2- 80 m. 16- 640 m.
C D E F	Symme- trical recycler	0,06- 2,5 s. 0,25- 10 s. 2- 80 s. 16- 640 s.	0,4- 15 s. 1,5- 60 s. 0,2- 8 m. 1,6- 64 m.	0,06- 2,5 m. 0,25- 10 m. 2- 80 m. 16- 640 m.

Functional diagram:

supply

contact 2-5

Relay,delay on release.   t   t   t

Relay, delay on operate.   t   t   t

Relay,inter-val timer   t   t   t   t

Relay, recycler.   t   t   t t   t t t

Comadan Produktion a/s
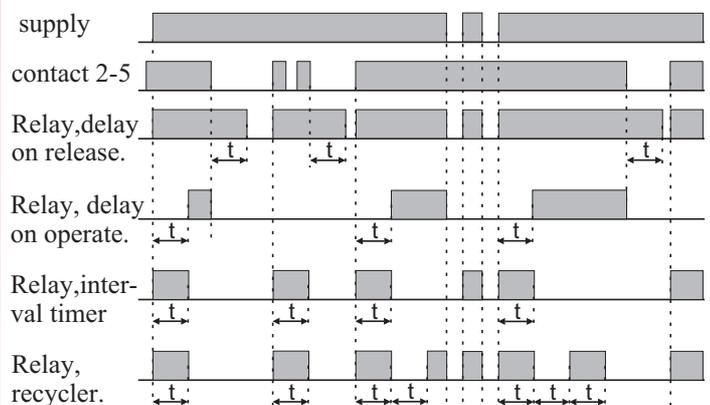
Technical data, RT31:

By means of a rotary switch on top of the module, the timer can be programmed to 16 different time combinations.
The unit is available with 3 different supply voltages and 3 time combinations, see specifications and table.

Supply, AC:	24, 115 and 230 VAC +/- 10%
Supply frequency:	40-70 Hz
Universal supply:	12-50 VAC/DC
Isolation voltage:	Supply - internal - output: 3.75 kV
Supply, DC:	24 VAC/DC +/- 10% With DC-supply there is no isolation between supply and internal electronics.
Power consumption:	2.5 VA
Operation temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing
Indications:	
Green LED:	Supply voltage connected
Red LED:	Relay active
Time adjustment:	2 potentiometers, scale 2,5 - 100 % of the range, for separate adjustments of pause- and pulse time.
Accuracy, scale:	5 %.
Repeatability:	0,1 %
Max. load, relay:	1-pole 8 A - 250 VAC 2-pole: 5 A - 250 VAC, ohmic load

EMC og safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

**Approvals:** The units are produced in accordance with the CE og low voltage regulations.

Connections:
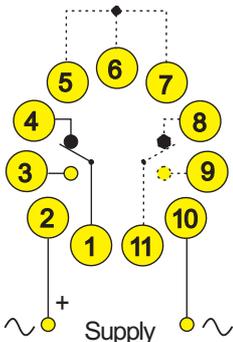
Time adjustment with external potentiometers:

ON request, the RT31 is available for 2 external potentiometers (0-1 M). The type number is RT31E. This variant is only available with 1-pole relay output.

Selection of function:

On pins 5, 6 and 7, the recycler is programmable for 4 different functions :

ex. 1: Asymmetrical recycler, start with pause: no connections.

ex. 2: Asymmetrical recycler, start with pulse time: connect pins 6 and 7.

ex. 3: Delayed interval timer: connect pins 5 and 7.

ex. 4: Interval timer + delay on operate: connect pins 5, 6 and 7.

Time combinations				
switch	**variant M1 (seconds) or M3 (minutes)**		**Variant M2**	
	Pause time	**Pulse time**	**Pause time**	**Pulse time**
A 9 8 B	0,06- 2,5	0,06- 2,5 0,25- 10 2- 80 16- 640	0,4- 15 s.	0,4- 15 s. 1,5- 60 s. 0,2- 8 m. 1,6- 64 m.
6 5 4 7	0,25- 10	0,06- 2,5 0,25- 10 2- 80 16- 640	1,5- 60 s.	0,4- 15 s. 1,5- 60 s. 0,2- 8 m. 1,6- 64 m.
2 1 0 3	2- 80	0,06- 2,5 0,25- 10 2- 80 16- 640	0,2- 8 m.	0,4- 15 s. 1,5- 60 s. 0,2- 8 m. 1,6- 64 m.
E D C F	16- 640	0,06- 2,5 0,25- 10 2- 80 16- 640	1,6- 64 m.	0,4- 15 s. 1,5- 60 s. 0,2- 8 m. 1,6- 64 m.

Functional diagram:

$t 1$ = pulse time $t 2$ = pause time

Ordering guide:

Supply	Type number
12-50 VDC	RT31-x-4-012-yy (RT31 only)
24 VAC/DC	RT31-x-2-024-yy
24 VAC	RT31-x-1-024-yy
115 VAC	RT31-x-1-115-yy
230 VAC	RT31-x-1-230-yy

x = output relay	1: 1-pole	
	2: 2-pole	
yy = time range	M1: 0,06 - 640 sec.	
	M2: 0,4 sek. - 64 min.	
	M3: 0,06 - 640 min.	

Note: The type number is shown for RT31, but the same principle is used for RT20.

Ordering example:
    RT20-2-1-230-M2

Mechanical dimensions etc.: see page 9-2

Comadan Produktion a/s

C-mac®

RT40: Universal pulse continuity module
   Automatic start or start at first pulse
   With or without latch function

RT41: Delay-ON / delay OFF function in one module

16 time ranges/combinations in one unit

Inputs for many sensor types

1-pole relay output

DC supply or AC supplies up to 230 VAC

Made in accordance with the CE and EMC regulations

Technical data, RT40:

The unit is used for speed monitoring, where the output relay is activated, if the unit receives input pulses with an interval, which is shorter than the selected time.

By means of a rotary switch on top of the module you can select between 3 different functions and 4 time ranges. The module is available in 3 supply voltage and 3 time range variants, see specifications and table.

Supply, AC:	24, 115 and 230 VAC +/- 10%
Supply frequency:	40-70 Hz
Isolation voltage:	Supply - internal - output: 3.75 kV
Supply, DC:	24 VAC/DC +/- 10% With DC-supply there is no isolation between supply and internal electronics.
Power consumption:	2.5 VA
Operation temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing
Indications:	
Green LED:	Supply voltage connected
Red LED:	Relay active
Sensor inputs:	
Namur sensor:	8,2 V / max. 10 mA
NPN / PNP sensor:	24 V / max. 10 mA
Contact input:	10 V / 2 mA
Time adjustment:	Potentiometer, scale 2,5 - 100 % of the selected range
Accuracy, scale:	5 %.
Repeatability:	0,1 %
Max. load, relay:	1-pole 8 A - 250 VAC ohmic load

EMC og safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.

Time ranges and selection of function, RT40				
switch	function	Time ranges, type variant		
		M1	M2	M3
D E C F	Automatic start	0,06- 2,5 s. 0,25- 10 s. 2- 80 s. 16- 640 s.	0,4- 15 s. 1,5- 60 s. 0,2- 8 m. 1,6- 64 m.	0,06- 2,5 m. 0,25- 10 m. 2- 80 m. 16- 640 m.
9 A 8 B	Start first pulse	0,06- 2,5 s. 0,25- 10 s. 2- 80 s. 16- 640 s.	0,4- 15 s. 1,5- 60 s. 0,2- 8 m. 1,6- 64 m.	0,06- 2,5 m. 0,25- 10 m. 2- 80 m. 16- 640 m.
5 6 4 7	Automatic start + latch	0,06- 2,5 s. 0,25- 10 s. 2- 80 s. 16- 640 s.	0,4- 15 s. 1,5- 60 s. 0,2- 8 m. 1,6- 64 m.	0,06- 2,5 m. 0,25- 10 m. 2- 80 m. 16- 640 m.

Connections RT40:

Ex 1: NPN/PNP sensor   Ex 2: Namur sensor   Ex 3: Contact
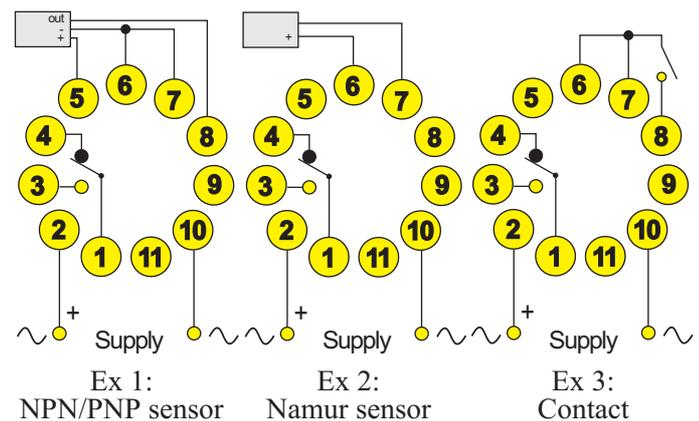
Note:
You can only use NPN/PNP sensors with true open collector output.
If the sensor has an internal pull-up or pull-down resistor, you must order the module for the actual sensor type (NPN or PNP). Alternatively you can insert a diode in series with the sensor output
(see RR10, page 8-4)

Comadan Produktion a/s

Functional diagram RT40:
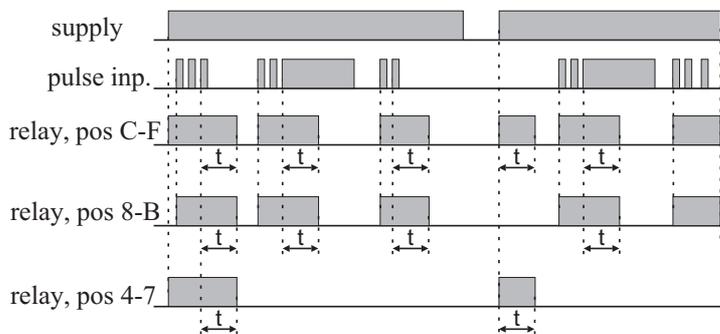
Technical data, RT41:

By means of a 16-position rotary switch on top of the module, the delay-ON and delay-OFF ranges can be independantly selected.

The module is available in 3 supply voltage and 3 time range variants, see specifications and table.

Supply, AC:	24, 115 and 230 VAC +/- 10%
Supply frequency:	40-70 Hz
Isolation voltage:	Supply - internal - output: 3.75 kV
Supply, DC:	24 VAC/DC +/- 10% With DC-supply there is no isolation between supply and internal electronics.
Power consumption:	2.5 VA
Operation temp.:	-20°C to +60°C
Humidity:	0 - 90% RH, non-condensing
Indications:	
Green LED:	Supply voltage connected
Red LED:	Relay active
Voltage output:	pin 5, 24 VDC, max. 20 mA
Time adjustment:	2 potentiometers, scale 2,5 - 100 % of the range, for separate adjustments of delay-ON and delay-OFF.
Accuracy, scale:	5 %.
Repeatability:	0,1 %
Max. load, relay:	1-pole 8 A - 250 VAC, ohmic load

EMC og safety regulations.

|	
Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.

Connections:
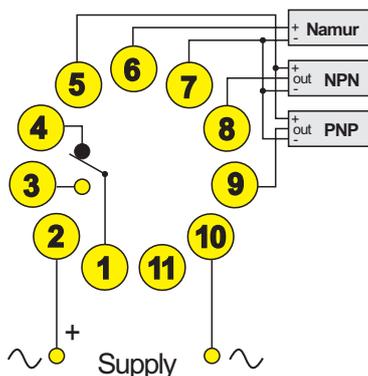
Time combinations, RT41

switch	variant M1 (seconds) or M3 (minutes)		Variant M2	
	Delay on release	Delay on operate	Delay on release	Delay on operate
A 9 8 B	0,06- 2,5	0,06- 2,5 0,25- 10 2- 80 16- 640	0,4- 15 s.	0,4- 15 s. 1,5- 60 s. 0,2- 8 m. 1,6- 64 m.
6 5 4 7	0,25- 10	0,06- 2,5 0,25- 10 2- 80 16- 640	1,5- 60 s.	0,4- 15 s. 1,5- 60 s. 0,2- 8 m. 1,6- 64 m.
2 1 0 3	2- 80	0,06- 2,5 0,25- 10 2- 80 16- 640	0,2- 8 m.	0,4- 15 s. 1,5- 60 s. 0,2- 8 m. 1,6- 64 m.
E D C F	16- 640	0,06- 2,5 0,25- 10 2- 80 16- 640	1,6- 64 m.	0,4- 15 s. 1,5- 60 s. 0,2- 8 m. 1,6- 64 m.

Functional diagram RT41:

Ordering guide:

Supply	Type number
24 VAC/DC	RT41-1-2-024-yy
24 VAC	RT41-1-1-024-yy
115 VAC	RT41-1-1-115-yy
230 VAC	RT41-1-1-230-yy

yy = time range   M1: 0,06 - 640 sec.
M2: 0,4 sek. - 64 min.
M3: 0,06 - 640 min.

Note: The type munber is shown for RT41, but the same principle is used for RT40.

Ordering example:
RT40-1-1-230-M2

Mechanical dimensions, etc.: see page 9-2

Comadan Produktion a/s

Programmable multifunction timer
Time ranges from 0.1 sec. to 99:59 hours
14 programmable functions
1-pole relay output
Universal supply voltage 11-253 VAC/DC
17.5 mm wide, 90 mm high, 60 mm deep
Made in accordance with the $C\epsilon$ and EMC regulations

This timer has 14 programmable functions:
5 simple timer functions, controlled by the supply voltage and 7 functions controlled by separate control input.
The timer is programmed directly on the front, and the LCD display will indicate the function and time during programming and operation.

Technical data:

Supply voltage:	15-253 VAC/DC
Isolation voltage:	Supply - output: 2.5 kV
Power consumption:	max 3 VA
Operation temp.:	-5°C to +50°C
Max. load, relay:	1-pole 8 A - 250 VAC ohmic load

Approvals: The unit is produced in accordance with the CE and low voltage regulations.

Functions and connections

Relay, NO contact	**18** **15**	Relay, common
Common, start and reset	**X** **16**	Relay, NC
	Multifunction display, see below	
Master reset	**RESET**	Relay status LED
Prog., function	**MODE** **+**	+/up button
Prog.,OK / stop time	**OK** **-**	-/down button
Reset input	**R** **S**	Start input
Supply voltage (+)	**A1** **A2**	Supply voltage (-)

Display functions

Timer function	F88 T₁ T₂	Timer 1/ timer 2
Status start input		Timer in operation
Selected / aktual time	88:88	
Scale, time	h m s d X100	Special for total time

Timer functions

1: Simple functions, controlled by the supply

- Supply
- **F01**: delay on operate — t1
- **F02**: interval timer — t1
- **F03**: ON/OFF start pulse — t1 t2 t1
- **F04**: ON/OFF start pause — t1 t2 t1
- **F05**: delayed interval timer — t1 t2
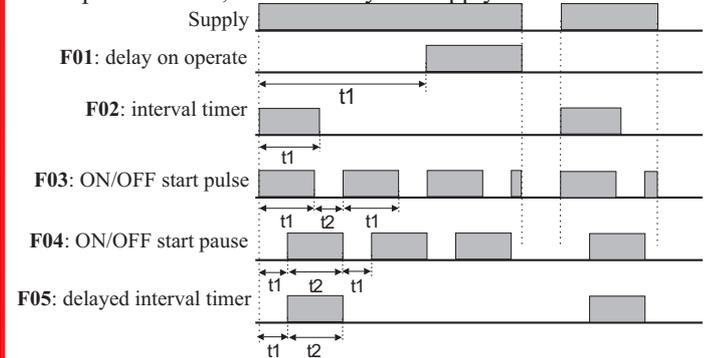
2: Delay on release, controlled by start input

- Supply
- Start input
- **F06** — t1 t1 t1
- **F07** — t1 t1
- **F08** — t1 t1
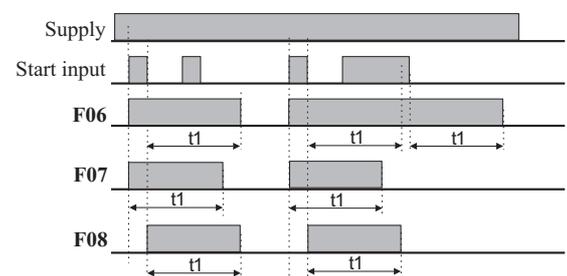
3: Delay on and interval, controlled by start input

- Supply
- Start input
- **F09** — t1 t2 t1 t2
- **F10** — t1 t1 t1 t1 t1 t1
- **F11** — t1 t1 t1
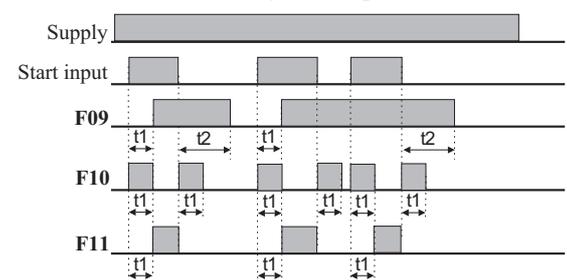
4: Special functions, controlled by start input and supply

- Supply
- Start input
- **F12** — P1 P2, t1+P1+P2, t1
- **F13** — t1+P1+P2, t1
- **F14** — t1 t1

Comadan Produktion a/s
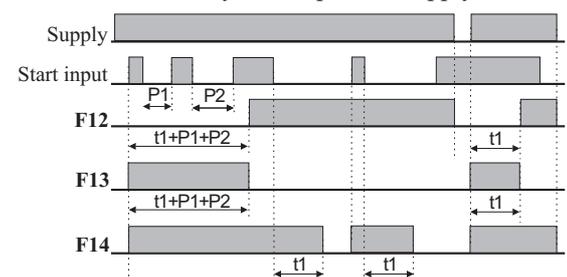
Programming:

The first time the timer is connected, it will perform an automatic test function, and then it changes to *selection of function*

In selection of function, F01 will flash and T1 is on.

Selection of function:

Press + and/or- buttons to select the wanted function.
When you change function the T1, T2 and symbol for start input will go on, if they are used in the selectedfunction.
The selected function is confirmed by pressing the OK button, and then the timer changes to the next step, selection of timing range, this is indicated by flashing of the h, m, s and d indications.

Selection of timing range:

The wanted range is selected by pressing the MODE button.
You can select the following ranges:

	Scale	Adj. range
h	hours	from 1 to 99 hours
hm	hours - minutes	from 0 h 1 m to 99 h 59 m
m	minutes	from 1 to 59 minutes
ms	minutes - seconds	from 0 m 1 s to 59 m 59 s
s	seconds	from 1 to 59 seconds
sd	seconds - tenths of sec.	from 0 s 1d to 59 s 9 d
d	tenths of seconds	from 1 to 9 tenths

The wanted range is confirmed by pressing the OK button, and then the timer changes to selection of time, indicated by flashing of the 4 time digits.

Selection of time:

Set the T1 time with the + and - buttons and confirm by pressing the OK button. If the selected function only uses T1, the programming is finished and the digits will stop flashing.
If T2 is also used in the selected function, the T2 indication goes on and the selected time for T1 is shown on the display.
If you want the same time for T2, you press the OK button, and the programming is finished.
If you want a different time you press the MODE button, and then you can repeat selection of range and time, as for T1, and the programming is finished by pressing the OK button.

Mofidy programming data:

If you want to change the programming, you press the MODE button for 5 seconds, and the timer will start in selection of function.
Then you enter the wanted data as described above.
If the function is changed, all following data must be selected again, but if you only want to change f.inst. a time range, you press the OK button, until you come to the wanted function, and then you can change the selected range.

Note:

When the timer is put in programming mode, all ongoing operations are cancelled, and the relay releases.

Normal function:

When the timer is in operation but not activated, the following is shown on the display:
Aktual funkction number
Status start input (if it is used in the actualk function)
Selected time range and value for timer 1.
If the function uses both T1 and T2, both T1 and T2 will be activated if the selected time is the same, otherwise the display changes every 5 second, showing the value for T1 and T2.

When the timer is activated the function number will be flashing, T1 or T2 is active, the "clock" for timing function is active, the display indicated the remaining time, and the decimal point is flashing.
Furthermore the LED for relay status is on, if the relay is activated.

Total counter:

The timer is supplied with a total counter, indicating the total amount of hours, the relay has been activated, this is indicated by pressing the OK button for 5 seconds.
The display will then indicate the actual value in hours.
If the value is higher than 9999 hours, the X100 indication is activated and the display will then show the amount of hours divided with 100.
After 10 seconds the timer returns to normal indication.
Reset of hours counter.
If you want to reset the hours counter you press the OK botton once again for 5 seconds when the timer ishows the total counter.

Master reset:

If the timer is not correct you can reset it by activated the hidden reset button with a paper clips.
This function will reset the internar processor, but it will not erase the programmed data.

Connection diagram

Comadan
Produktion a/s

Temperature sensors
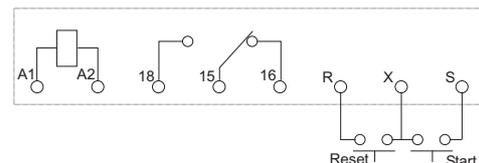
Pt100 sensors according to DIN IEC751

TC sensor type J (Fe-CuNi)

TC sensor type K (NiCr-Ni)

With cable or B-head

Special sensors on request

	Type no.	Sensor type	Temp. range	Housing/ dimensions	Cable	Description
	Temperature sensor for wall mounting					
	Y017-A1	Pt100	-20 - +60°C	Polycarbonate 63x58x35 mm		In-door (up to 6 sensors)
	Y017-U1	Pt100	-40 - +60°C	Polycarbonate 63x58x35 mm		Out-door
	Temperature sensor with cable					
	PT101	Pt100	-50 - +170°C	Stainless steel Ø6 x 60 mm	2 m silicone	
	PT102	Pt100	-50 - 300°C	Stainless steel Ø6 x 60 mm	2 m fibre glass	
	PT111	Pt100	-50 - +170°C	Stainless steel Ø6 x 60 mm	2 m silicone	With holes for air temperature
	SR-150-L	Pt100	-100 - +300°C	Stainless steel Ø3 x 60 mm Handle: teflon Ø10 x 100 mm	1,5 m teflon PTFE	Suitable for food proces- sing
	Temperature sensor with cable and protective spring					
	PT201	Pt100	-50 - +350°C	Stainless steel Ø6 x 100 mm	3 m	
	J201	Thermo couple type J (Fe-CuNi)	-40 - +333°C	Stainless steel Ø6 x 100 mm	3 m	
	K201	Thermo couple type K (NiCr-Ni)	-40 - +333°C	Stainless steel Ø6 x 100 mm	3 m	

Special sensors are produced on request.

The standard Pt100 sensor element is DIN kl. B thin film

C-mac®   Pt100 temp. sensors w/ B-head

Type ME 50	Type ME 90	Type ME 92

L1

L2
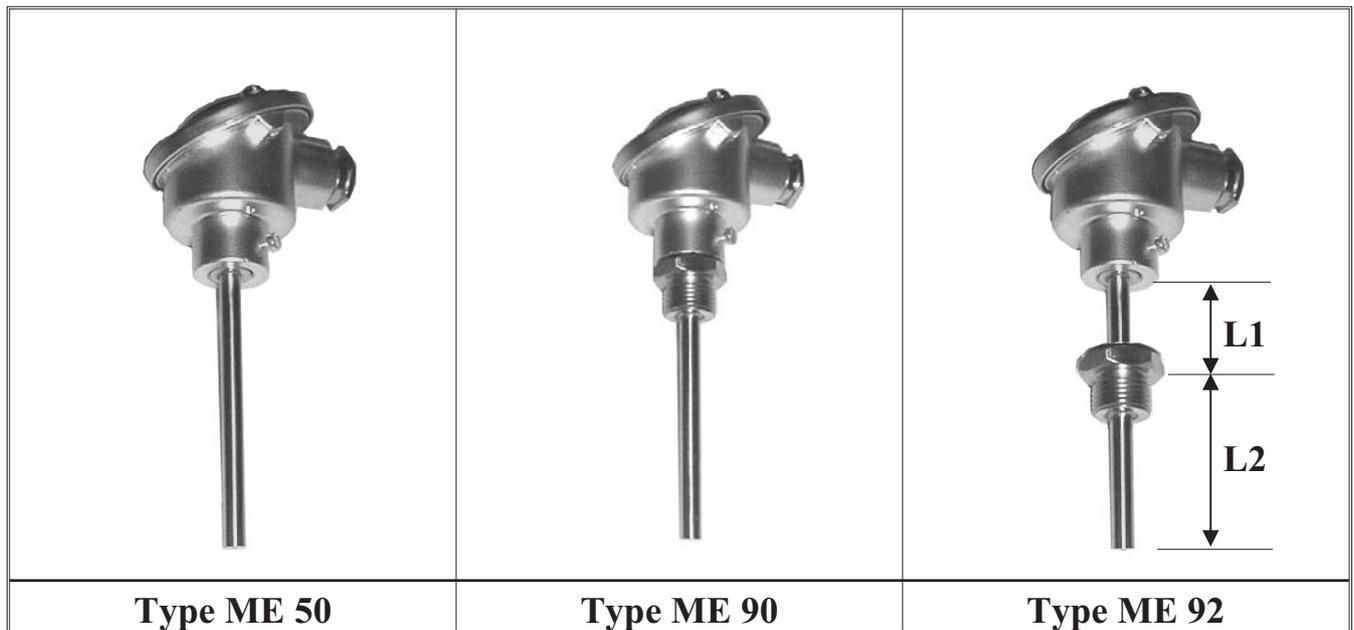
Sensor element: Pt 100   1 DIN, kl. B
Connection head: Form B   DIN 43729
Ceramic base: Steatit 220
Temperature range: -50 - +400°C

Ordering guide: MEaa-b-c

aa = type	b = element	c = length
ME50	1 = 1 x Pt100	1 = 100 mm
ME90	2 = 2 x Pt100	2 = 150 mm
ME92		3 = 200 mm
		4 = 300 mm
		x = special

Ex: ME90-1-3

Note 1: when ordering ME92 the two lengths L1 and L2 must be specified.

Note 2: The above sensors are also available with thermocouple sensors type J or K.

10-2

Comadan Produktion a/s

C-mac®

Humidity sensor HS14

Monitoring of relative humidity

In- or external sensor

Output signal selectable with jumpers

18-30 VDC supply

Internal Pt100 sensor possible

Made in accordance with the CE and EMC regulations

The C-mac® humidity sensor HS14 is monitoring the relative humidity in air. You can select between 3 different output ranges.

The unit is also available with an immersion tube, which is useful, if f.inst. you want to monitor the humidity in ventilation channels.

The unit is also available with an internal Pt100 sensor, for connection to temperature converter or relay.

Technical data:

Supply voltage:	18-30 VDC
Metering range:	10 - 90% RH
Output ranges:	(0 - 100 % RH)
	0-20 mA, 0-5 V or 0-10 V
Power consumption:	0,5 W - 0,9 W
	depending on the input signal
Operating temp.:	-20°C to +60°C
Accuracy:	(5 - 95% RH) +/- 2%
Linearity:	+/- 2%

EMC og safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.

HSR 14 sensor

Connections and jumpers:
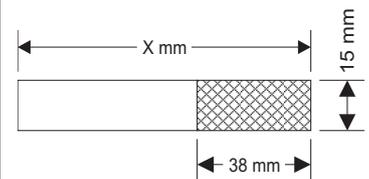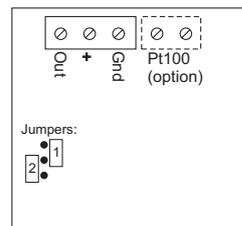
Output signal:
0-20 mA
0-5 V
0-10 V

Jumpers:
No jumpers
Jumper in pos. 1
Jumper in pos. 2

Ordering guide:

	Type nr.
Without immersion tube	**HS14-1**
With immersion tube 96 mm	**HSR14- 1**
With immersion tube 250 mm	**HSR14-1-250**
With Pt100 sensor	**HST14- or HSTR14-**

Mechanical dimensions:
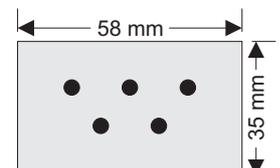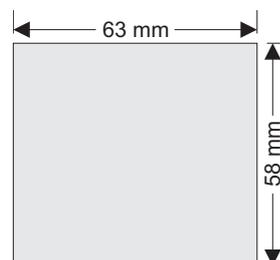
Materials and weight:

Housing:	Polycarbonate, grey
Terminals:	Nickel-plated brass
Weight:	80 g

Humidity/temperature sensor HS16

C-mac®

- **2-wire monitoring of relative humidity and temperature**
- **In- or external sensors**
- **2 separate loop-powered circuits**
- **4-20 mA current consumption proportional to humidity and temperature**
- **Made in accordance with the CE and EMC regulations**

The C-mac® combined humidity and temperature sensor HS16 consists of 2 independant loop-powered circuits for monitoring of relative humidity and temperature, respectively. HS16 is available in 2 versions either with internal sensors or with an immersion tube, which is useful, if f.inst. you want to monitor the humidity and temperature in ventilation channels.

Technical data:

Supply:	4-20 mA current loop
Voltage drop:	< 7 V
Supply voltage:	7-30 VDC (available in loop)
Metering ranges:	
Humidity	4-20 mA = 0-100% RH
Temperature:	4-20 mA = 0-50°C
Operating temp.:	-20°C to +50°C
Accuracy	
Humidity:	(10 - 90% RH) +/- 2%
Temperature:	+/- 1.5°C
Linearity:	+/- 0,5%

EMC og safety regulations.

Emmision:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.


HSR 16 sensor

Connections:
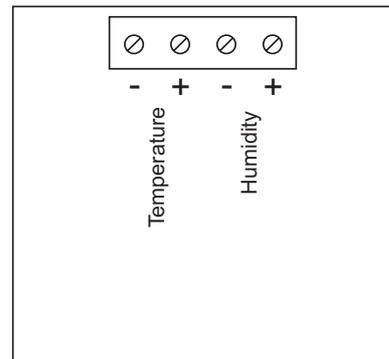
Ordering guide:

	Type nr.
With internal sensors	**HS16**
With immersion tube 96 mm	**HSR16**
With immersion tube 250 mm	**HSR16-250**
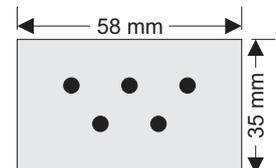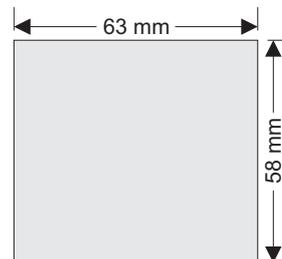
63 mm 58 mm

58 mm 35 mm

Materials and weight:

Housing:	Polycarbonate, grey
Terminals:	Nickel-plated brass
Weight:	200 g

10-4

Comadan Produktion a/s

Current transformers with built-in control electronics

Selectable metering ranges

Current switches with AC/DC output, max 500 mA, or AC output, max 1 A.

Current sensors with 4-20 mA output

Made in accordance with the C€ and EMC regulations

Description:

The C-mac current switches / current sensors are combined current transformers and control electronics with analogue or switch output.

In a lot of applications this combination eliminates the need for external control relays and/or signal converters, because the output of the unit can be connected directly to the input of standard process control equipment.

The units can monitor up to 200 Amps continuous. The current sensors are jumper selectable in 3 ranges, and the current switches are either jumper selectable or multirange.

The current switches are supplied with setpoint adjustment and switch output, which makes them very useful in applications where you want a signal, if a preset current level is exceeded, and you do not need to readjust this setpoint very often.

The current sensors are supplied with a 4 - 20 mA loop-powered analogue output. The output is proportional with the RMS value of the primary current. The units can be used to monitor motors, pumps, conveyors, machine tools or other electrical loads, where an analogue representation is required over a range of currents.
The current sensors are available in 2 variant, each with 3 selectable ranges, in order to achieve a good resolution in the selected metering range.
Accuracy, current sensors: +/- 1% FS at 5-100% load.

Available variants:

1. Solid core switch units, primary hole = Ø 19 mm

type no.	output	max. voltage	max. current
CS410	AC/DC switch	30 VAC/40 VDC	500 mA
CS325	AC switch	250 VAC	1 A

2. Split core switch units, hole = 19 x 24 mm

type no.	output	max. voltage	max. current
SC510	AC/DC switch	30 VAC/40 VD	500mA
SC325	AC switch	250 VAC	1 A

3. Current sensors.

type no.	primary hole	output	supply
CS475	solid core	4 - 20 mA	10 - 42 VDC
SC575	split core	4 - 20 mA	10 - 42 VDC

Technical data:

Range selection, CS325 and SC325:

Range	Jumper	Max. cont.	6 sec's	1 sec.
1.25 - 6 A	none	60 A	100 A	175 A
6 - 40 A	mid	100 A	150 A	240 A
40 - 200 A	high	210 A	450 A	550 A

Range selection, CS475-1 and SC575-1:

Range	Jumper	Max. cont.
0 - 10 A	none	80 A
0 - 20 A	mid	120 A
0 - 50 A	high	180 A

Range selection, CS475-2 and SC575-2:

Range	Jumper	Max. cont.
0 - 50 A	none	120 A
0 - 100 A	mid	200 A
0 - 200 A	high	325 A

Hyst., react. delay, ON-voltage and leakage current:

type	hysteresis	delay	Von,	I Leakage
CS410	2 %	<200 ms	<0.1 V	<25 µA
CS325	2 %	<300 ms	<0.5 V	< 5 mA
SC510	2 %	<300 ms	<0.1 V	<25 µA
SC325	2 %	<400 ms	<0.5 V	< 5 mA

Frequency, metering signal: 10 - 400 Hz

Isolation
  Primary - secondary circuit: 2,5 kV AC

Operation temperature: 0 - 70°C

Operating humidity: 0 - 95 % RH

Material: Self- extinguishing ABS

LED's:
  CS325, CS475
  SC325, SC575: No LED's

  CS410, SC510: power and status LED

Comadan Produktion a/s

Connection examples:

CS410 and SC510

Secondary unit

Output load

Primary circuit

V AC

Output supply
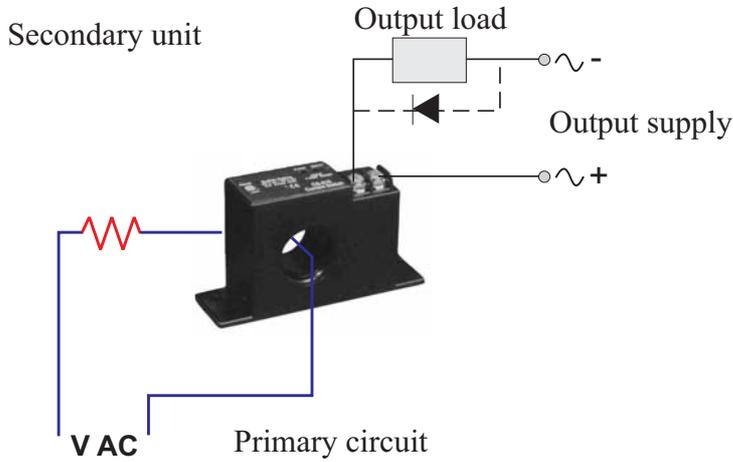
Note:

If the output load is inductive (i.e. relay, solenoid) you must connect a diode across the load, as indicated.

The CS325 and SC325 has a built-in snubber circuit.

CS475 and SC575

Secondary unit

Output load
+   -

Metering load

Primary circuit

V AC
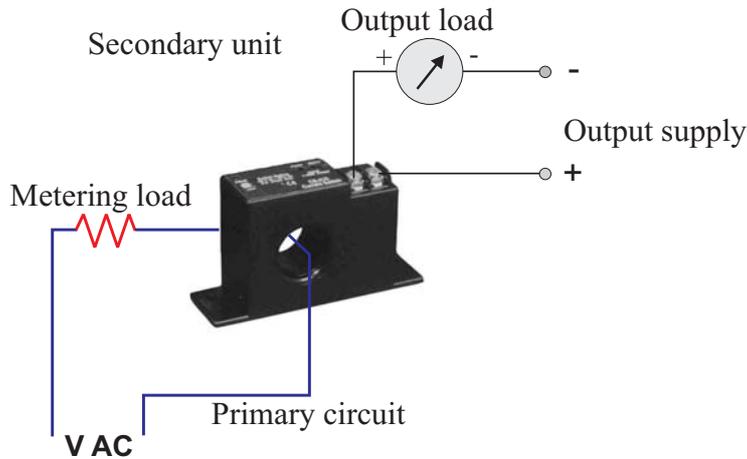
Output supply
+

**Note:**

The unit requires 10 VDC for the internal electronics.
The output supply must be 10 VDC +(RL x 20 mA).
If. f.inst. the output load (instrument) has an internal resistance of 250 , the suppy must be at least 15 VDC.

Mechanical dimensions

CS4xx-units

49 mm

87 mm

25 mm

SC-units

70 mm

87 mm

30 mm

CS325

70 mm

89 mm

28 mm

Diff. pressure sensors series DC

C-mac®
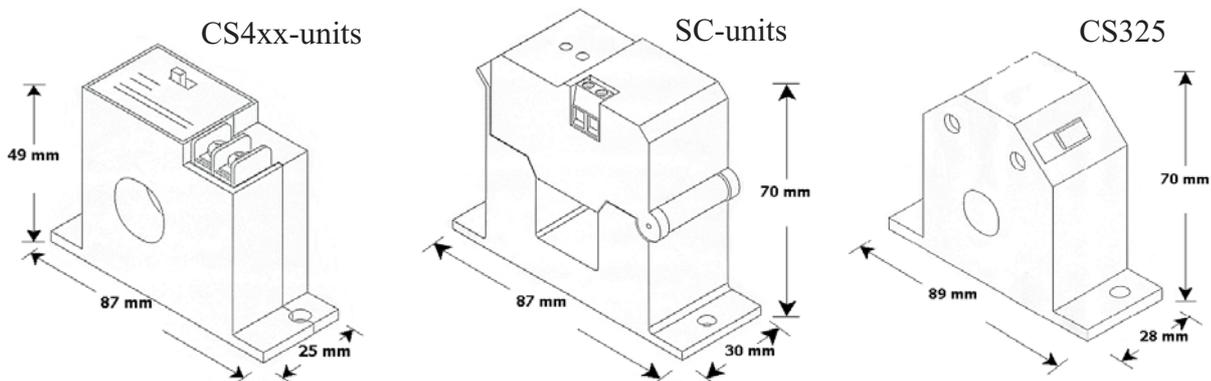
Standard metering ranges up to 500 mm H₂O

Max. pressure 3 x metering range

Loop-powered 4-20 mA

12-30 VDC supply

DC66 EX approved (ATEX Zone 22 cl. 3D)

In accordance with CE and EMC regulations

DC 51   DC 66

The pressure sensors series DC are used for monitoring of pressure in various applications.

DC51 is connected with tubes and used for standard applications where there are no specific demands for materials, etc.

DC66 is made in stainless steel 304 and the electronic cirrciut is moulded, which makes it suitable even in very harsh environments.
The unit is also ATEX approved for zone 22 class 3D.

DC66 is supplied with a 6W heating element, which can be used at very low temperatures, if there is a possibility for condensation.
DC 66 can be connected through a 17 mm hole, with 16 mm male thread, 3/8" female thread, or via connection tubes.

It is possible to fine-adjust the range on both units.

Technical data:

Supply:	2-wire loop 12-30 VDC
Current consumption:	4-20 mA
Metering ranges:	0-50 mm H₂O
	0-125 mm H₂O
	0-250 mm H₂O
	0-500 mm H₂O
Max. pressure:	3 x metering range

Operation temp.:
DC 51:   -20°C to +50°C
DC 66:   -20°C to +60°C

Accuracy:	< 1% FS
Linearity:	< 0,1%
Temp. drift:	0,01% FS / °C
Fine adjustment:	min. and max. +/- 5%

Connections:
DC 51:   2 screw terminals + and -
DC 66:   4-wire cable, 2 m
black = + metering signal
blue = - metering signal
brown: + 10-30 VDC heating
beige: - heating.

Protection:
DC 51:   IP 54
DC 66:   IP 60 (with tube IP 65)

Mechanical dimensions:
DC 51:   115 x 90 x 55 mm
DC 66:   Ø 66 mm

Weight:
DC 51:   250 g
DC 66:   600 g

EMC and safety.
Emmision: EN 50 081 - 1
Immunity: EN 50 082 - 2
Safety: EN 60 730

Approvals: The units are produced in accordance with the CE og low voltage regulations.

Connection:

+
12-30 VDC
-
4-20 mA
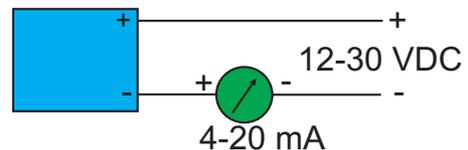
Ordering guide	
Type	Metering range
DC51-050	0 - 50 mm
DC51-125	0 - 125 mm
DC51-250	0 - 250 mm
DC51-500	0 - 500 mm
DC66-050	0 - 50 mm
DC66-125	0 - 125 mm
DC66-250	0 - 250 mm
DC66-500	0 - 500 mm

Special ranges up to 2000 mm H₂O on request

Comadan Produktion a/s

Wind speed and wind direction

Brass housing, suitable for offshore

Supertight design, patented

Contact free metering - very long life time

DWC-INA: range <1 - 30 m/s, pulse output

DWC-VXV: analogue output 0-360°

In accordance with $C\epsilon$ and EMC regulations
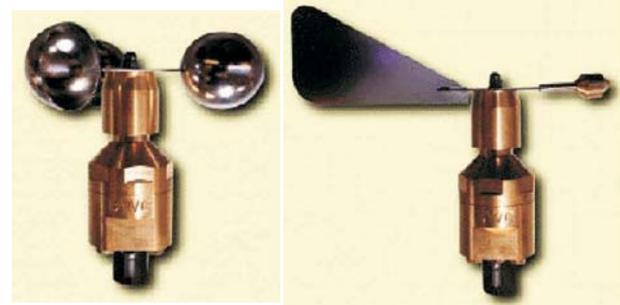
DWC-INA   DWC-VXV

These wind speed and wind direction sensors are made in brass, and therefore extremely rugged.

It is possible to mount heating elements in the sensor housing, which ensures correct function also under extreme weather conditions.

The system has no friction, which gives a very high accuracy.

Technical data:

Anemometer DWC-INA:

Supply voltage:	10-40 VDC
Output:	PNP
Metering range:	0,5 - 30 m/s
Resolution:	0,1 m/s, equals f. inst. 100 Hz at 10 m/s
Max. wind speed:	> 60 m/s
Operating temp.:	-25 to +70°C
Mechanical dim.:	Ø60 x 153 mm
Mounting:	M12 x 20 hole
Elec. connection:	2,5 m cable
	+ = brown
	- = blue
	output = black
Weight:	approx. 1350 g

Wind direction DWC-VXV:

Supply voltage:	12-30 VDC
Output:	analogue 4-20 mA
Metering range:	0 - 360°
Resolution:	0,09° (12 bit 360°)
Accuracy:	+/-0,35°
Operating temp.:	-40 to +85°C
Mechanical dim.:	Ø60 x 193 mm
Mounting:	M12 x 20 hole
Elec. connection:	2,5 m cable
	+ = red
	- = black
	output = white
Weight:	approx. 1350 g

Mechanical dimensions:

DWC-INA:

DWC-VXV:

Comadan Produktion a/s
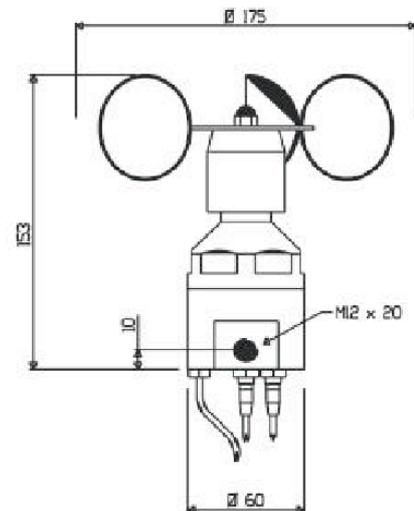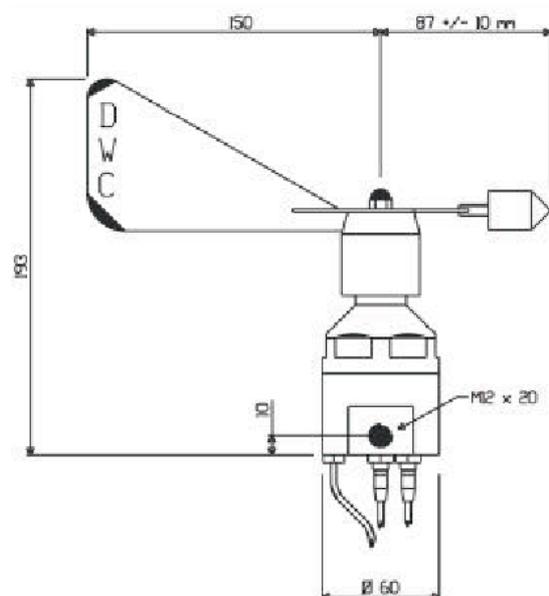
PSD18   PSD30 and PSD60   PSD120

Switch-mode supplies,

Output 18, 30, 60 or 120 W

Short-circuit and over-load protected.

High efficiency, 77 to 86%

Supply voltage 90 to 265 VAC, except PSD120: 115 and 230 VAC

DIN-rail mounting.

Made in accordance with the CE and EMC regulations

These switch-mode regulated power supplies are made particularly for industrial applications.
The units have a very high efficiency and therefore also small dimensions compared with the output power.

Common Technical data:

Supply frequency: 47 - 63 Hz

Operating temp.:   -10°C to +50°C with full output. At ambient temperatures between 51 and 71°C, the max. output power derates with 2% / °C

Isolation voltage:	Supply - output: 3 kVAC
Humidity:	20-95% RH, non-condensing.
Switching frequency:	100 kHz (PSD18)
	50 kHz (PSD30 and PSD60)
	80 kHz (PSD120)
Ripple/noise:	Max. 50 mVpp.
Material:	
PSD120:	Metal housing
other units:	NORYL
Installation:	25 mm free space recommended for ventilation above / below unit.

Approvals and standards:

UL/cUL	UL508 / UL1310 / UL1950
TÜV	IEC60950
EMC	EN50081-1 / EN55022 for EMI
	EN50082-1 / EN55024 for EMS
PSD120 only:	EN61000-4-2, EN61000-4-3
	EN61000-4-4, EN61000-4-5
	EN61000-4-6, EN61000-4-8

Other voltages available on request

Type	Output power	DC-output	Max. current	Fine adjustment	Efficiency	Inrush current	Mech. dimensions	Weight
PSD18-5	18 W	5 V	3.6 A	90-120%	77%	18 A	90 x 115 x 22.2	240 g
PSD18-12	18 W	12 V	1.5 A	90-120%	77%	18 A	90 x 115 x 22.2	240 g
PSD18-24	18 W	24 V	0.75 A	90-120%	77 %	18 A	90 x 115 x 22.2	240 g
PSD30-12	30 W	12 V	2.5 A	100-117%	84 %	32 A	90 x 115 x 40.5	290 g
PSD30-24	30 W	24 V	1.25 A	100-117%	84 %	32 A	90 x 115 x 40.5	290 g
PSD60-12	60 W	12 V	5.0 A	100-117%	84 %	32 A	90 x 115 x 40.5	360 g
PSD60-24	60 W	24 V	2.5 A	100-117%	86 %	32 A	90 x 115 x 40.5	360 g
PSD120-24	120 W	24 V	5.0 A	93-125%	86 %	48 A	124 x 136 x 63.4	860 g