

***Nokeval***

No 02122010 V1.22

# Manual

**Models 2800-2051 and 2800-2251  
Scalable frequency indicators**



**Manufacturer:**

***Nokeval Oy***

**Yrittäjäkatu 12**

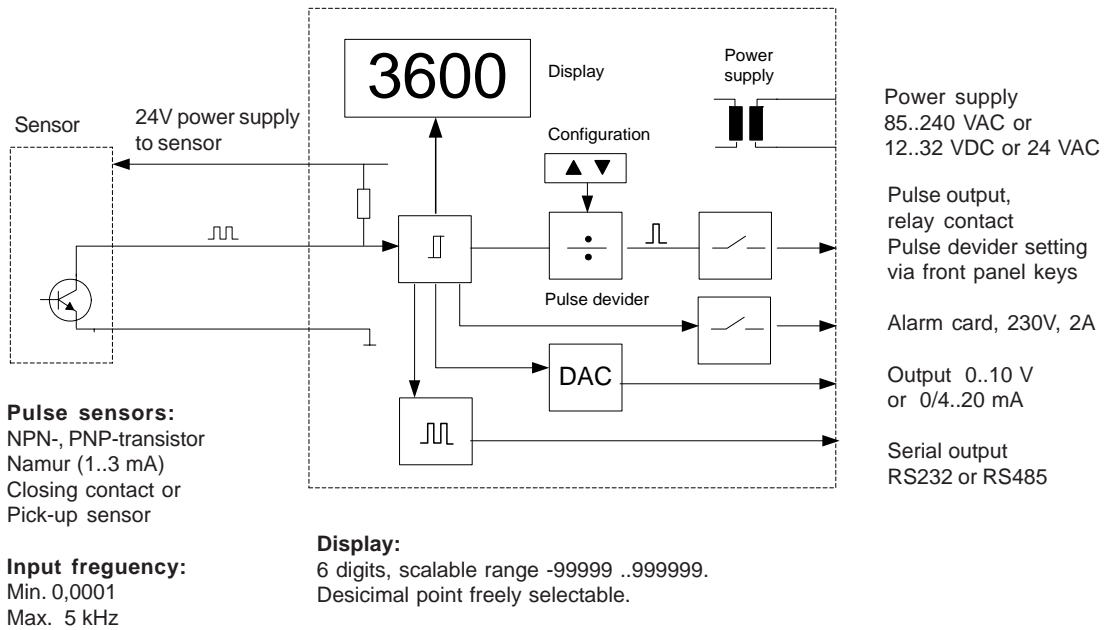
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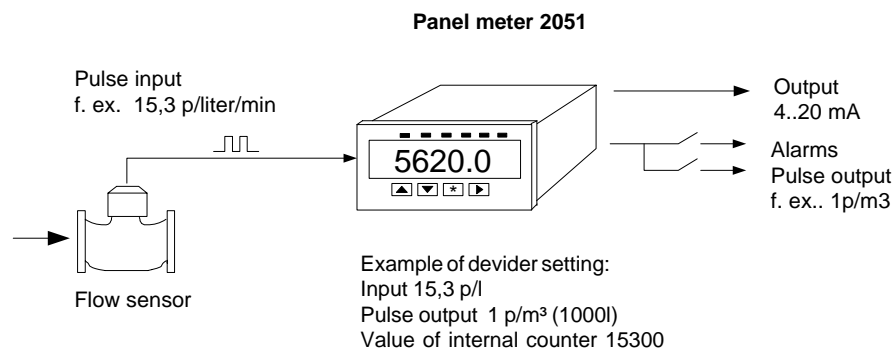
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**<http://www.nokeval.com>**

## Field display 2800-2051



### Typical solution



### General description

Panel meter 2051 is designed for pulse sensors like NPN, PNP, namur, relay contact or pick-up sensors. Input frequency range is 0.0001 Hz..5 kHz. 6-digit digital display is scalable on whole range -99999..999999. Measuring method is counting of time interval between two incoming pulses. Display is updated after each incoming pulse. Input frequency is counted from rising or falling edge of input pulse and is programmable. Meter provides excitation voltage 24 VDC (max. 150 mA) for sensor. Mother card has two additional slots, one for output

signal and one for relay card. Outputs, 0/4..20 mA or 0..10V are isolated from input and power supply. Also serial output cards RS232 and RS485 is available. You may add output afterwards and no calibration is needed. Two alarms, both to set either HI or LO alarm steer optional alarm card with potential free contacts or transistor relays. One alarm relay may be set-up for pulse output f.ex. sending pulse for totalizer when internal counter set value is reached (maximum value 65 534). Meter front cover features rating IP65.

# Specifications:

**Input frequency:**

0.00001..5 kHz

**Scalable range:**

-99999..999999

**Decimal selection:**

0.0001..1

**Response time:**

1-2 incoming pulses

**Measuring method:**

Periode of incoming pulses

**Accuracy:**

0.01 % of span

**Sensor:**

NPN-, PNP-transistor, Namur, Closing contact or Pick-up (For closing contact see page 5)

Pulse voltage level. min 3 V and max. 32V

Pickup: >0,5V

**Power supply to sensor:**

24 VDC  $\pm$  5 %, max. 150 mA

**Output(optional):**

0..20 mA or 4..20 mA Max. load 1000 ohm.

Galvanic isolation (2500 V, 1min.)

Scaling by front panel keys.

Output card may be added later without calibration.

**Alarms:**

Into slot B or C.

Two alarm levels selectable by front panel keys

Relay contacts max. 230 VAC, 2A or

semiconductor relays for output pulse >1 hz ,

max. 60V, 0,5 A

**Pulse output:**

Deviver setting range 1..64000

Output pulse periode selectable 1..100 ms

Relay contact max.230V VAC, 2A or semiconductor relay for output >1 Hz, max 60 V, 05 A.

**Serial output:**

RS-232 or RS485,

Functions: Only for reading measured values

Addresses: 0-127

Baud rate: 300, 600, 1200, 4800, 9600, 19200

Protocol: Nokeval SCL

**General:**

6 digits (-99999..+999999)

Digit size 14.5 mm

Red bright LED, brightness selectable

Power supply 85..240 VAC

or 12..32 VDC, 24 VAC

Front panel rating IP65

**How to order:**

**2800-2051-NPN-OUT1-REL2-24VDC**

Models:

2051 or 2251

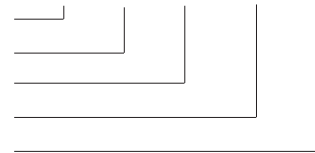
Sensor

Output

Relay card

Power supply

12..32 VDC, 24VAC



**Optional cards:**

Output card 2000-OUT1

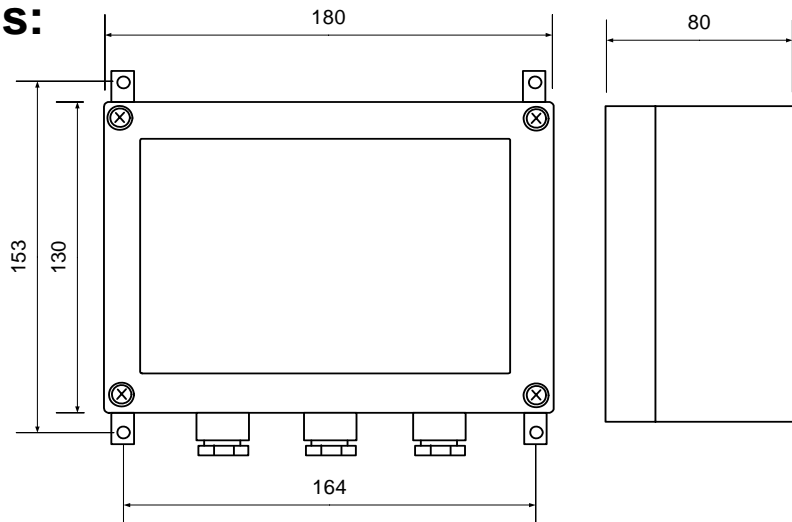
Serial output card 2000-RS232/RS485

Relay card (<1Hz) 2000-REL2

Two optional card available on the mother board for 2051 and one for 2251.

The label of meter shows combination of optional cards, if disparity occurs between label and manual.

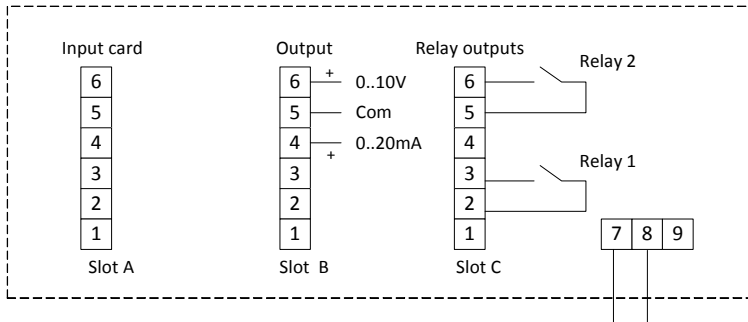
## Dimensions:



Wall mounting brackets at the corners of the case - easily removable.  
Glands 3 x PG11

## Connections:

### Slots A-C



Slot A is always for input cards and slots B and C for optional cards.

Power supply  
85..240 VAC  
Grey connector

### Factory settings:

Analog output is installed into slot B and relay outputs into slot C.

### Relay card ratings:

potential free change-over contacts, max. 230 VAC, 2A (grey connector) or SSR-relay max. 60V, 0,5 A (green connector)

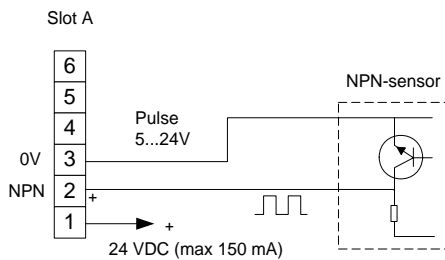
### Note:

Check always the type of relay card and power supply before you apply power. If removable connector colour is different from indicated on this manual, the body colour of connector rules the type of card.

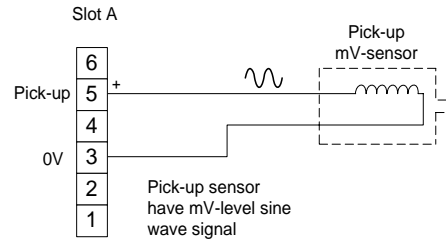
### Power supply 24 VDC

Green connector, 7 and 9, 12..32 VDC, 24 VAC (no polarity)

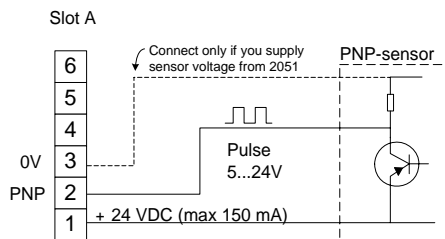
## NPN-sensor



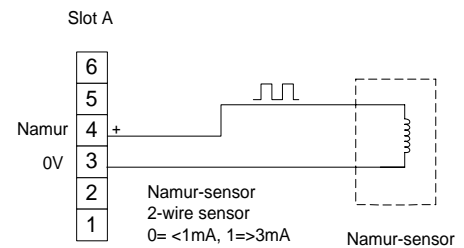
## Pick-up sensor



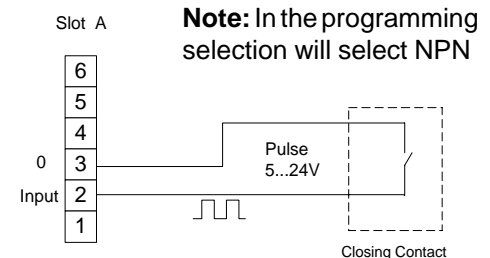
## PNP-sensor



## Namur-sensor

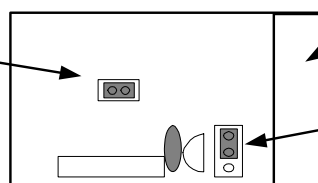


## Closing contact



Jumper setting for contact input.  
Max. input frequency 40 Hz.

Power supply selection  
to sensor:

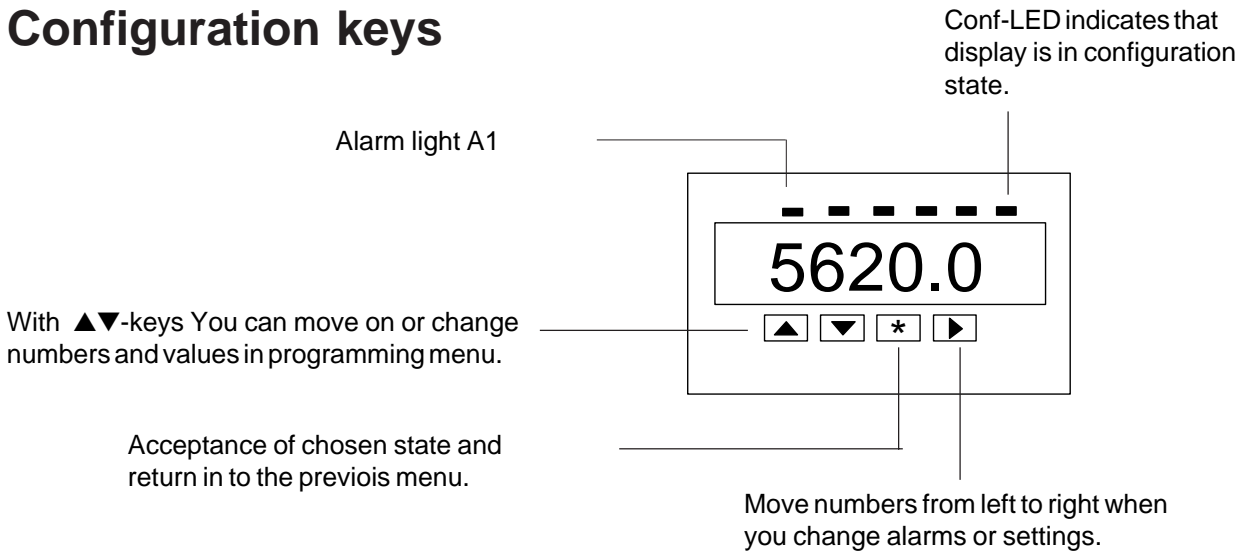


Connector

Power supply 24 V  
Default (max 150 mA)

Powersupply 12 V  
max 50 mA

# Configuration keys



## Configuration

Switch on the power supply. Both displays should display some reading.

**Press and hold ★- and ▲- keys simultaneously to enter the configuration menu. "Dec" is displayed.**

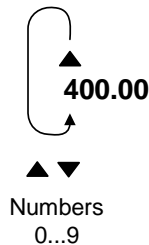
Select a setting using ▲▼ keys. To see or change it's current value, push ► key. If the value needs to be changed, use arrow keys ▲▼ and ►. When done, exit with ★ key.

When all settings are complete, push ★ once more. "Save" is displayed. Push ► to save the settings in to the non-volatile memory.

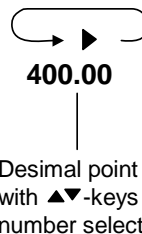
### *Editing numerical settings*

Value change with ▲▼ buttons one number at a time. Changing begins from the most signifigant digit on the left, decimal point is selected last. Next digit to the right is selected with ► button. Accept and exit with ★ button.

Value selection



Selecting next digit



### **Display Filter** (damping)

This function stabilies display value when wide measuring range is used. It is recommended if range is over 5000. Some times when working in sensors maximum limits, it may become unstable, this feature helps to stabilize it again. Filter is mathematical and therefore it doesn't affect to measuring accuracy.

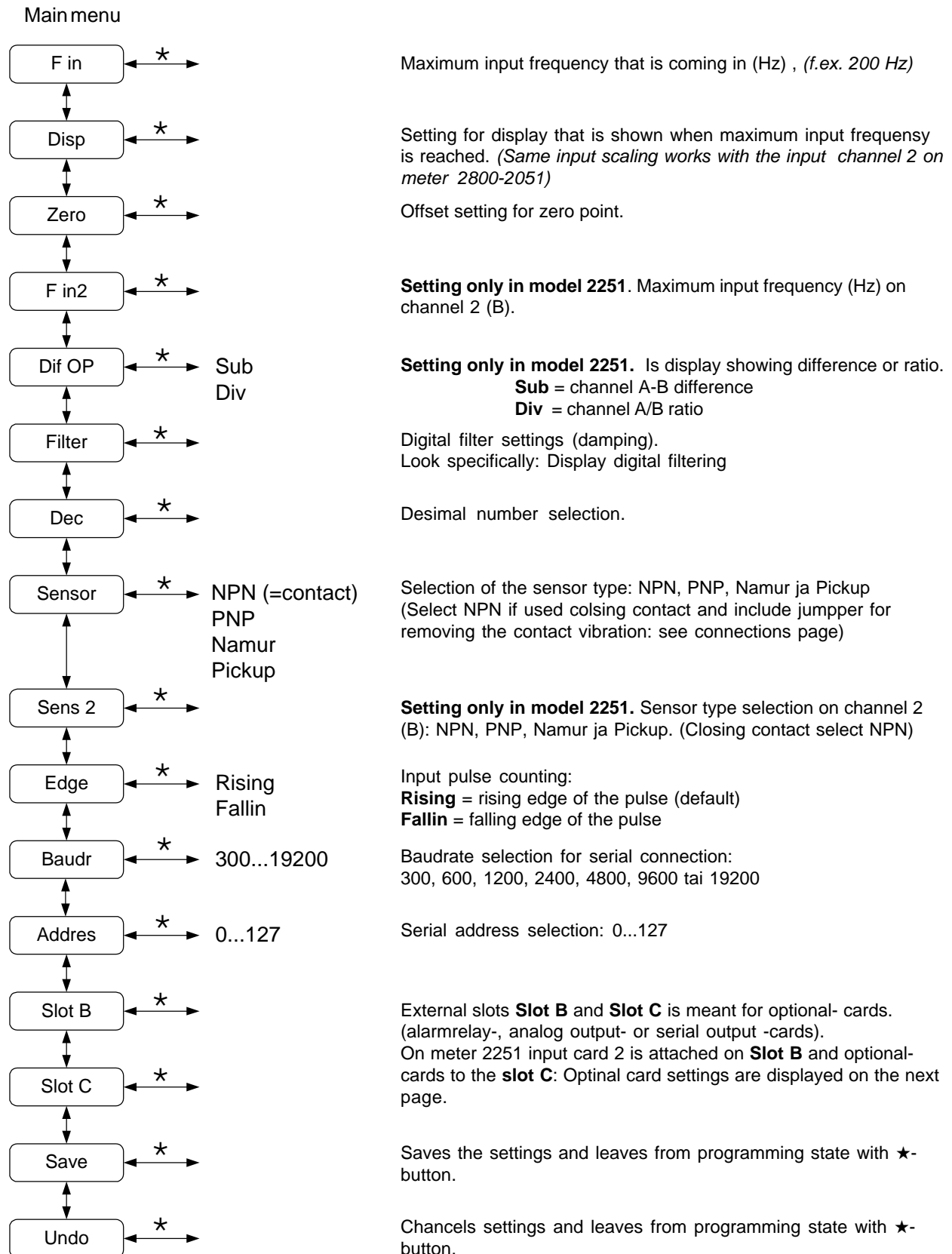
Filter value can be set between 1 (min) ..0.010 (max).

- 1.000 = no filter
- 0.200 = normal filter
- e.g. 0.2 = 1/5 of one new measure ment and 4/5 of old measurement
- 0,1 = (1/10) of new + 9/10 of old value (slower).

# Configuration

In configuration stage you can select sensors, outputs, alarms and set scalings. You enter config.stage by pressing 2 seconds ★-key and ▲-key at the same time. Display shows text Fin. Move by arrow keys ▲ and ▼ in main manu. By I-key you move to setting

stage and also return to main menu. When you have done all settings move forward by down-key until display shows text Save and accept by ★-key. If you like to cancel settings move forward until display shows Undo and accept by ★-key.

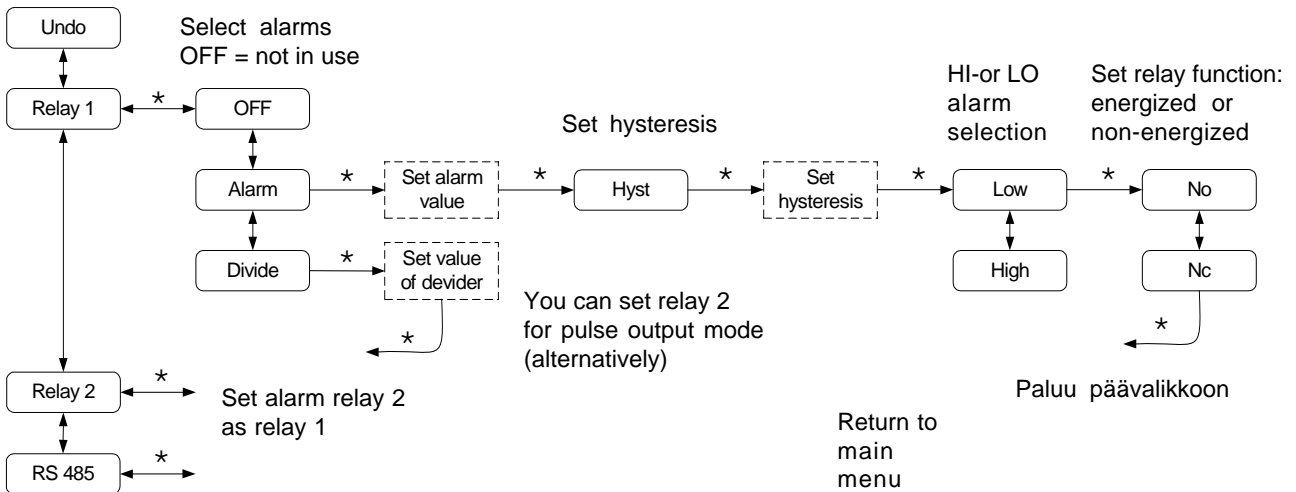


## Setting of alarms and pulse output

Two alarms, both to be set either Hi or Lo alarm steer relays 1 and 2. Indicating LED's on front panel. Alternatively one relay may be set-up for pulse output where incoming pulses are divided with wished number (Devider=dMde).

If divider value is one max. frequency of incoming pulses is 2 Hz (divider should be always >1) Largest divider value is 64000.

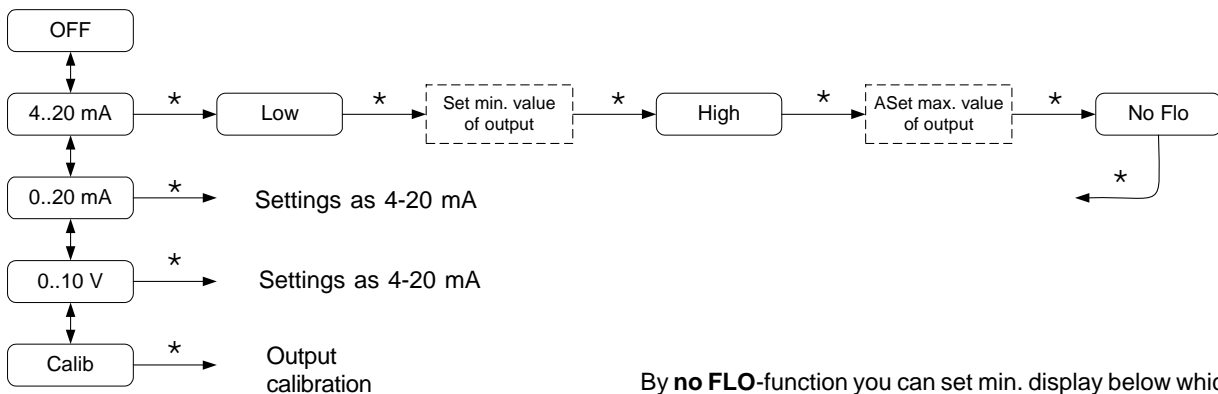
Slot B or C from main menu



## Choose and scaling of output

Slot B or C from main menu

Select first display corresponding min. value f.ex. 0.0=4 mA and then display corresponding max. value, f.ex. 100.0=20 mA. Calibration of output can be done in stage Calib. Output card is always delivered calibrated and no recalibrating is needed when installed to meter.



By **no FLO**-function you can set min. display below which output drops to zero (or to 4 mA). This method fastens updating of output when incoming pulses have stopped.



## Serial output RS-485/RS-232 (option)

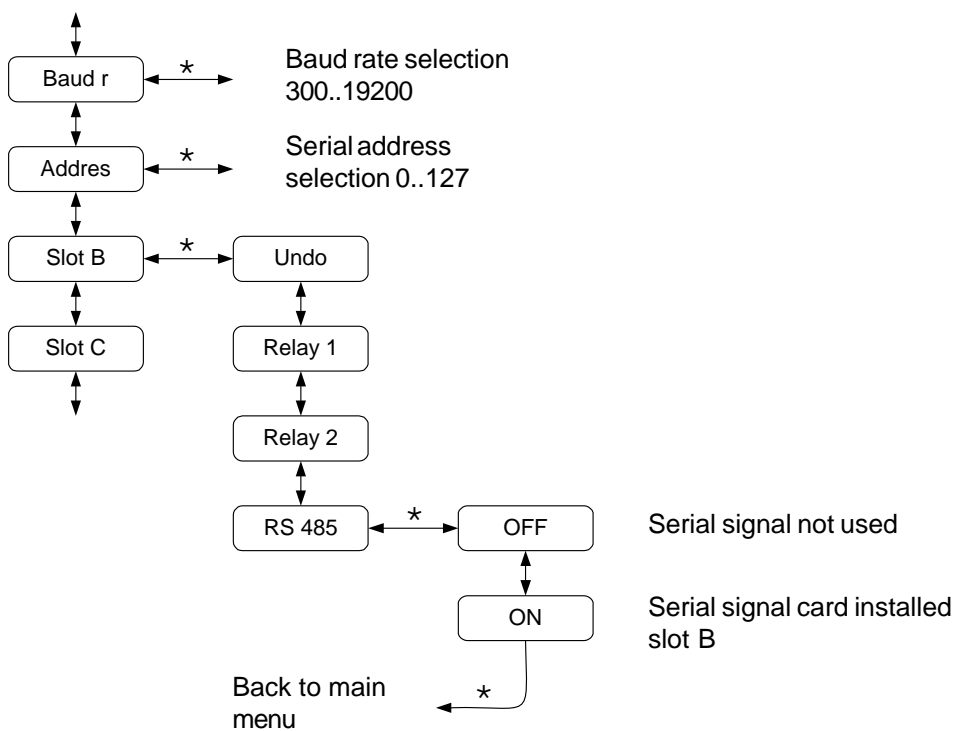
Meter may be provided with optional serial output and you can read measurements by e.g. PC. Display programming can not be made via serial port. Additional card provides serial signal RS-232 and RS-485, only one of those can be selected.

Serial signal is isolated from both input signal and power supply. Meters with RS-485 can be max. 31 in same loop and longest distance 1000m. RS-232 enables only connection of two devices and max. distance 10..20 m.

In programming stage you can first select card type (serial) mounted to slot B or C and then address and Baud rate. Baud rates are: 300, 1200, 2400, 4800, 9600, 19200 and addresses 0-127.

Accept selection and move forward by ★-key. You come back to previous level always by ★-key. Program remembers card type mounted, if it has been saved by save command when leaving program. In case you can not choose serial card, slot has automatically recognized card (plug and play).

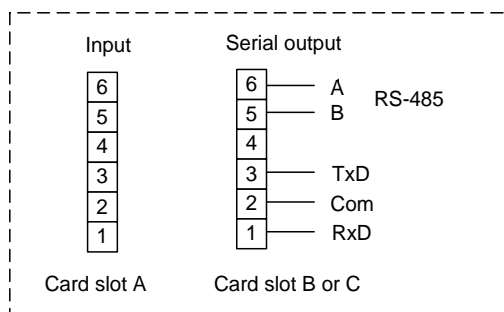
### Main menu



Serial signal not used

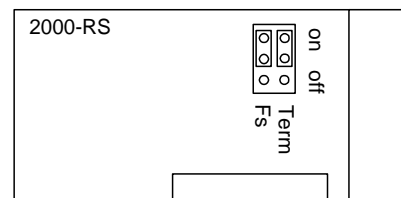
Serial signal card installed slot B

### Terminal connections:



By serial signal RS-485 last unit must be terminated by 110 ohm resistor. you can make termination at terminal connectors or by connecting jumper J1 to ON-position.

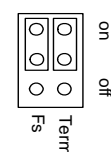
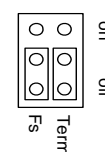
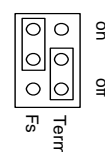
### Serial card

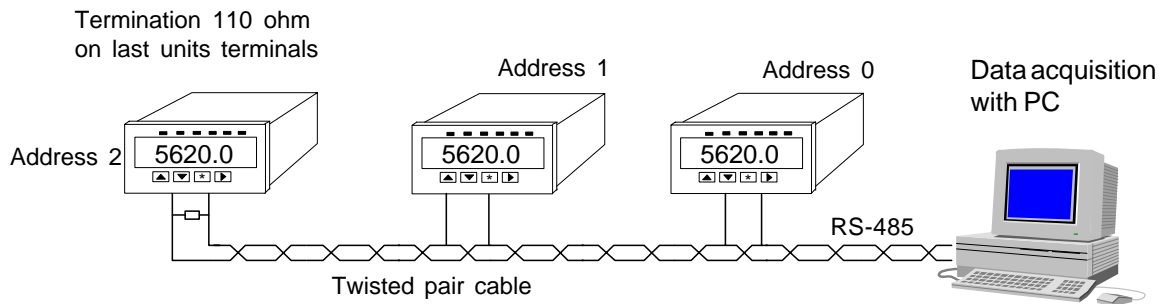


### RS232

RS485 channel's middle unit (Factory settings)

RS485 channel's last unit





## Serial communication

Baudrate: 300, 1200, 2400, 4800, 9600 and 19200  
 1 Start, 8 Data and 1 Stop bit, no parity.

### Serial protocol (SCL):

MESSAGES: When asking the measurement data from the panelmeter 2051 through the serial port, a command sequence which is in accordance with the SCL protocol is used for the inquiry: (Only the measurement results can be asked from the panelmeter 2051)

**<ADDR+80h>COMMAND STRING<ETX><BCC>**

#### <ADDR>

The first byte character to be sent contains the ADDR (0..127) of the address of the destination device and at the same time functions as the start bit of the command. 80H (in a decimal 128) with which an uppermost bit is set as the number one is added to the address.

COMMAND STRING: When measurement data is requested, the actual command is: MEA CH 1 ? , in which 1 means the channel number. (there is only one channel in the panelmeter 2051 so the number is always 1).

#### <ETX>

<ETX> mean the end mark of the command, ASCII character 03h.

#### <BCC>

Finally the checksum is calculated using the XOR operation on the byte characters of the actual command including the ETX. In the example the ASCII codes have been presented in hexadecimal.

#### e.g.

One wants the measurement result from the display unit address 1. To the channel an inquiry is sent: MEA CH 1 ? (ASCII codes shown for <BCC> calculation)

M E A C H 1 ? <ETX> <BCC>  
 4Dx45x41x20x43x48x20x31x20x3F x03 = 6F

(Presented the XOR operation with a character x)  
 (ASCII code 20h corresponds to space character)

So the following bytes are sent to 2051:

81 4D 45 41 20 43 48 20 31 20 3F 03 6F

RETURN MESSAGE: The answer from the panelmeter 2051 is obtained in the following format:

**<ACK>RETURN MESSAGE<ETX><BCC>**

#### <ACK>

The first byte of the answer contains the start of the answer <ACK> (ASCII-code 06h) and the answer itself, endmark <ETX> (ASCII- 03h) and the checksum of the answer which is calculated from all the byte characters of the answer including <ACK> and <ETX>. 2051 counts the checksum in which case the receiver does not need necessarily to care about it,

#### e.g.

e.g. When a measurement result is for example 21.3, it will be obtained from the panelmeter in the following form

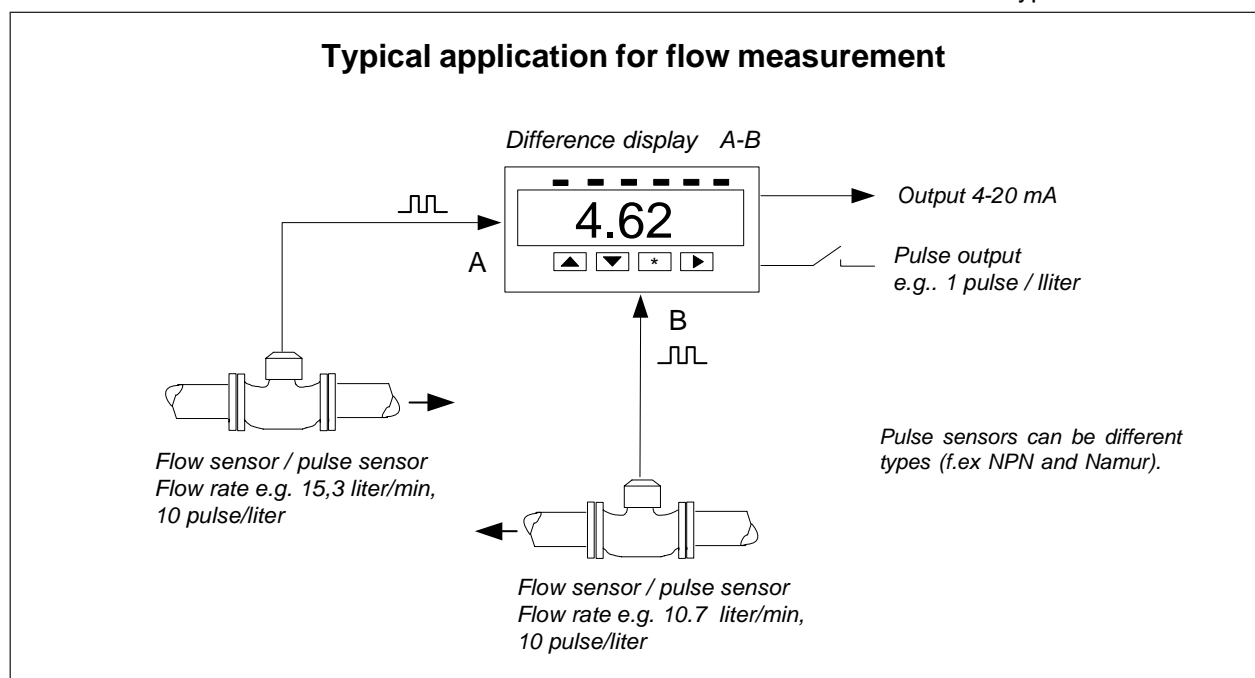
<ACK> 2 1 . 3 <ETX> <BCC>  
 Answer: 06 32 31 2E 33 03 1B

# Frequency difference- or ratio display 2251

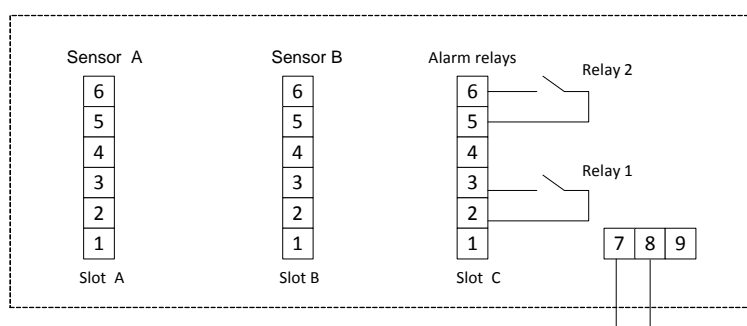
Panelmeter 2051 can be change to frequency difference display including second input card in to the meter on slot B (card 2251-PU). Inputchannel difference is shown in the display (A-B). Boht channels can be scaled differently (Fin ja Fin2). Only one outputcard is possible to attach on this model: alarm-, analog output- or serial outputcard. One channel model can obtain two optional cards.

**Settings for difference display, look at the main menu on page 6**

- F in** Channel A inputfrequency / Hz *f.ex 200 Hz*
- F in2** Channel B inputfrequency / Hz *f.ex 100 Hz*
- Dif OP** Selection wich is shown in display, channel A and B difference or ratio (A/B).
- Disp** Scaling for input frequencies that are shown in the display  
*f.ex channel A 200 Hz correspond in display 5000, and the same time channel B 100 Hz correspond 5000 in the display.*
- Sensor** Channel A sensor type selection
- Sens 2** Channel B sensor type selection



## Card slots in model 2251:



Outputcard or relaycard is installed on slot C.

Alarm card can be used relay card 2000-REL2 (contacts) below 1 Hz frequencies or 2000-I/O card when output frequency must exceed over 1 Hz.

Inspect from the sticker on top of the electronics what combination your model is compiled.

Card slot A and B is meaned for sensor input cards and card slot C is for optional cards (model 2251)

Input card type symbols:

Slot A = 2051-PU, input on channel A

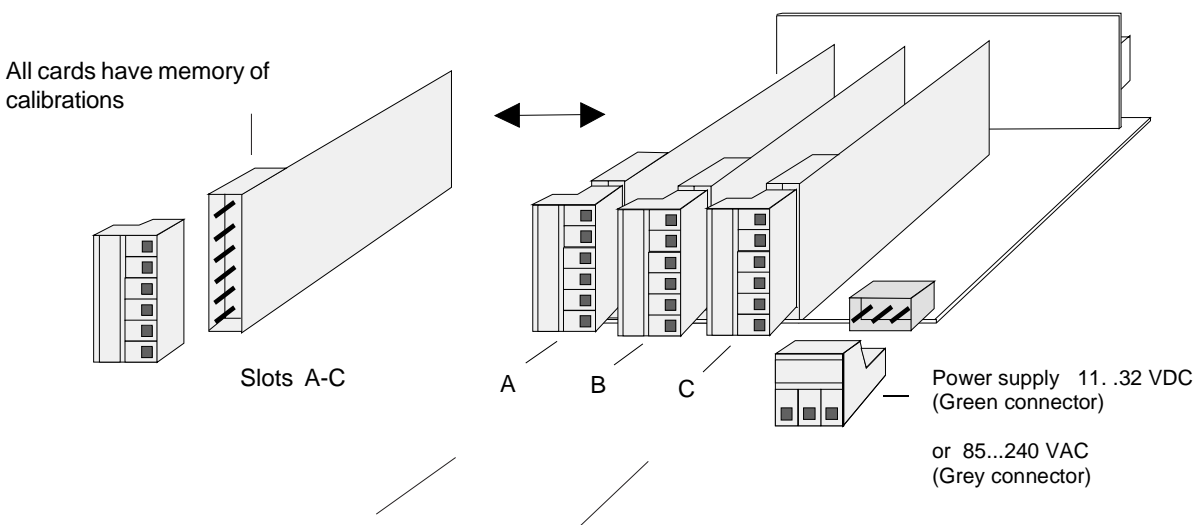
Slot B = 2251-PU, input on channel B

**Boht channels are wired exactly the same as channel A, see more information on page 5.**

# Construction of panelmeter 2000

The 2000 series panelmeters are modular and easy to be assembled. According to customers wishes. The basic construction consists of mother board with three slots, A, B and C. Slot A determines meter type and provides always input signal. Slot B and C are interchangeable. As factory delivery input signal is always installed into slot A, mA output into slot B and alarms into slot C. In case of f.ex 4 alarms and relay card with 2 change-over contact (2 + 2 relays) are used, you must place second relay card into slot B. If

you accept only closing or opening relay contacts, you need only one relay card with 4 relays placed into slot C. The slot B is now usable for other optional outputs. You can have different types of meters by only changing the input card in slot A. Data sheet of each type of meter dictates the possible combinations. Recalibration of card is not needed; only scaling and other settings must be set by front panel keys.



### Change of meter type:

Input card is placed always to slot A. By changing input card you can get another type of meter. You can change meter with pulse input to meter with current input, thermocouple, strain gage etc.

### Additional slots:

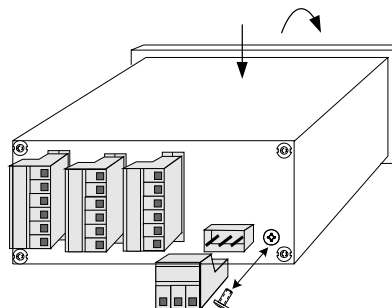
Additional cards provide output 4..20 mA, alarms, serial interface, BCD output etc. Meter data sheet dictates possible combinations. Grey connectors allow line voltage 110...230 VAC (relay contacts).

### Power supply:

There are two different mother boards power supply 85..230VAC and 12...32 VDC. VDC-mother board accepts 24 VAC. Connectors are colour coded.

### Removal of meter from case:

Loose connectors and fastening screw beside power connector. Loose front panel and draw meter out from front. You may remove mother board from rear by opening four screws in corners of case



Press gently case behind front panel and draw frame outwards gripping upper part of frame.