Nokeval

No 290507

Manual

Model 575F-2071, 1000F-2071, 1100F-2071 and 1800X-2071

Serial input RS232 / RS485

Contents

Manufacturer:
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Model XX-2071 for serial data

General Description

The large field display series 2071 for serial communication is designed for applications where a readability of 20 to 100 metres is required. Configuration is easy with keys and a 6-digit minidisplay inside the case.

The displays use the simple Nokeval SCL protocol where only the address, value and check sum are sent. The displays come standard with both the serial inputs RS-232 and RS-485. The serial bus is galvanically isolated from the processor and the power supply. In the configuration mode you can set the address, baud rate and the type of number value that you want to appear on the display after power connection.

In industrial environments use of the addressable serial signal RS-485 is always recommended. 31 displays can be connected to one bus and by using a serial data converter (721R), another 31 displays can be added on. The maximum distance of the bus is 1 km. Serial input RS-232 only accepts one display connected to the bus the maximum distance being 15 m.

The displays can also be used outdoors if exposure to direct sun light is prevented by using a sun cover. Case protection is IP65.

Types:

575F5-2071	Digit height 57 mm, 5 digits, red LED Dark grey plastic enclosure
1000F4-2071	Digit height100 mm, 4 digits, red Black steel enclosure
1100F6-2071	Digit height 100 mm, 6 digits, red Black steel enclosure
1800Fx-2071	Digit height 180 mm, 1-5 digits, red Black steel enclosure

Technical specifications:

Input: selection with	serial signal RS-485 and RS-232, terminal connections, galvanically isolated
Max. distancies:	1000 m with RS-485 20 m with RS-232
Number of meters in one loop:	1with RS-232; 1-31 with RS-485
Data	8 characters, 1 stop, no parity
Addresses:	0...99
Baud rate: and	300, 600, 1200, 2400, 4800, 9600 19200 baud

General:

Configuration	keys and a minidisplay inside the case
Operating temp.	-35..+50 °C
Terminals	removable, wire 2,5 mm²
Power supply	85..240 VAC or 24 VDC ±15%
Case protection	IP65
Weight	575F: 3 kg, 1000F: 5 kg, 1100F: 8 kg, 1800F:18 kg

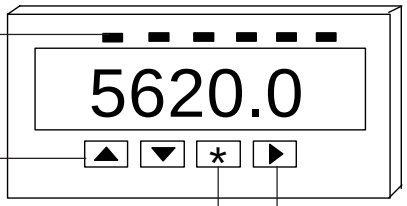
Readability of displays:

Digit size	57 mm	20..30 metres
	100 mm	40..50 metres
	180 mm	ca. 100 metres

How to order: **1100F5-2071-230VAC**

Type
Number of digits
Input card
Power supply
85-240VAC
or 24 VDC

Front panel



Conf-LED
Unit is in configuration mode

User controllable indicators.

Arrow-buttons(▲▼) are used to change numerical values and when moving in menu-structure.

Star-key (★) accepts selected function (enter).

Moving into selected menu title.

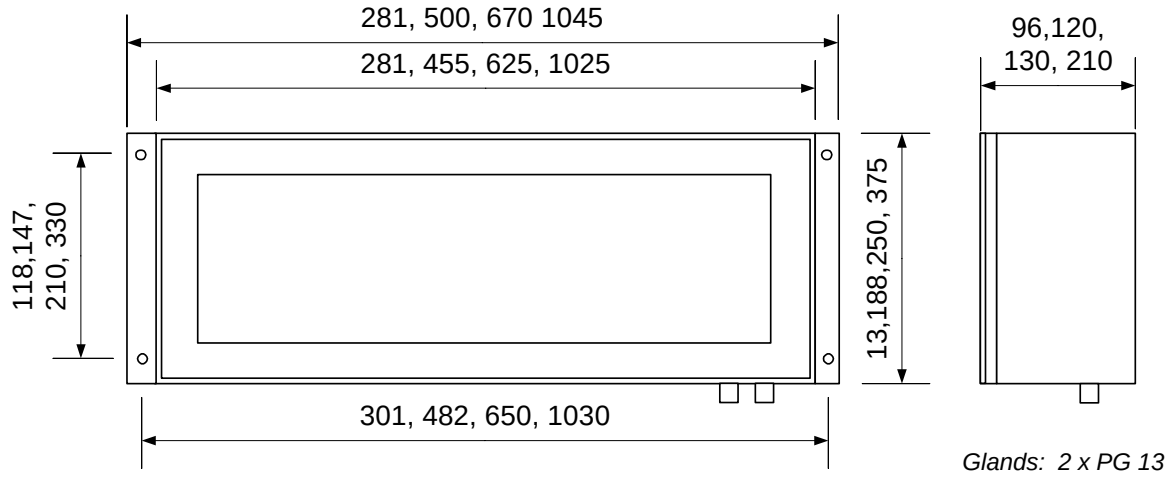
Configuration stage

Configuration can be started by pressing and holding ★- and ▲-keys simultaneously for 2 seconds.
Specified instructions on pages 6-7 Configuration.

Resetting configuration parameters

Some times it is necessary to return indicator parameters to factory defaults, e.g. if secret access code is missed. Resetting can be done by pressing and holding ★- and ➤-keys simultaneously for 2 seconds when connecting supply voltage. Prosedure will reset all settings to factory defaults.

Dimensions:

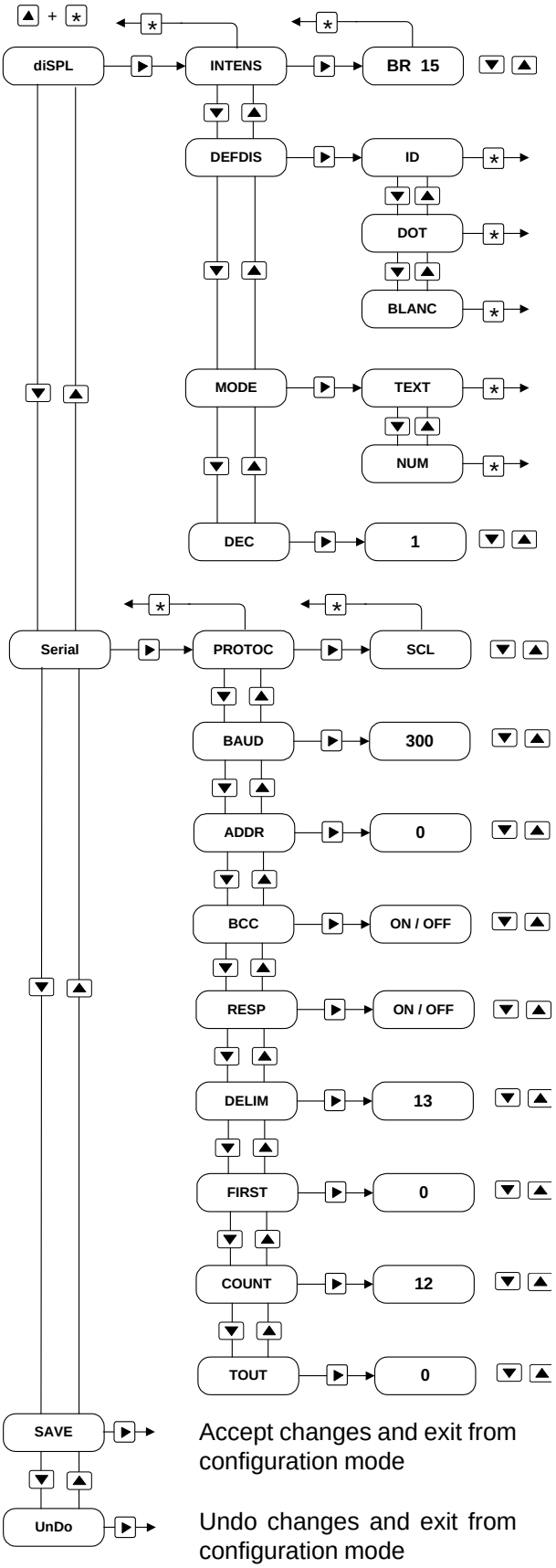


Glands: 2 x PG 13

Dimensions shown in the order:
575F, 1000F, 1100F, 1800F

Configuration

Beginning:
Configuration can be started by pressing and holding ★- and ▲-keys simultaneously for 2 seconds. Arrow keys ▲▼ moves up and down in main menu. Desired function is selected with ➤-key. Save mode can be selected directly by pushing ★-key in main menu.



Accept changes and exit from configuration mode

Undo changes and exit from configuration mode

Intens: Display brightness 0..15, brightest 15, default 7

DefDis: Display after connecting power:
ID = Display address
Dot = Dot in display
Blanc = Empty display

Mode: Text = Text mode
Num = Numerical mode

DEC: The max number of decimals 0..5 (Num mode only)

Protoc: Message protocol, addressable SCL or non-addressable ASCII

Baud: Baud rate selection: 300, 600, 1200, 2400, 4800, 9600, 19200

Addr: Serial address 0..127 (SCL only)

Bcc: Checksum selection
ON =used (SCL only)

Resp: Responce message select:
ON = used, Switch off if several units are controlled under same address (SCL only)

Delim: ASCII value of delimiter character between messages (<CR>=13) (ASCII only)

First: Number of characters to ignore at star of message, 0 = not used (ASCII only)

Count: Max number of characters processed on the message 1..12, (ASCII only)

Tout: 0..15 sec, The time after which the display is cleared when no messages are sent (0 = not used).

Serial protocol (SCL)

General

Port settings

Baud rate: 300, 1200, 2400, 4800, 9600 or 19200.
8 data bits, none parity, 1 stop bit.

Protocols

Two different serial protocols may be used to control X-2071. The protocol is selected in the configuraton menu. It can be either Nokeval SCL or Ascii. In Ascii protocol, there is no address involved, so every display in the bus will show the same display. These protocols are introduced in the next chapters.

SCL protocol

The SCL message consists of the actual command supplemented with some control bytes that are necessary to address the message to the correct device and to detect transmission errors.

Commands for 2071

To control the display, use DISP command (use upper case):
DISP 123456
After this command, the display will read 123456. See more on chapter Display modes.

To control the alarm indicators A1..M2 at the front panel, use LED command:
LED 00011X
This command will switch the three leftmost leds off (0), light up the two next leds (1), and blink the sixth led (X). The Conf led is not user controllable.

To read the four front panel keys, use KEYB command:
KEYB
About this command, see chapter Reading front panel keys.

Control bytes

The general format of SCL command packet is:
<ID>command<ETX><BCC>

The first byte sent (ID) has two purposes: it selects the device to which the command is intended, and indicates that a completely new command is to come. The byte is calculated by adding 128 (or 80h in hexadecimal representation) to the address of the device to be controlled, that is, the most significant bit is set. If you want to command a device in address 4, the <ID> byte will be 132 (or 84h). This is a single byte whose value is 132, do not send individual numbers 1, 3 and 2!

The command is one of the commands explained previously (e.g. DISP 28.5).

ETX character means End of Transmission. It terminates the command. It is a single byte with Ascii value 3 (03h).

BCC is a checksum. The sender calculates it from the command and ETX bytes using XOR operation. The id character is not involved in BCC calculation. If you do not want to send checksum, you must switch it off in the 2071 menu (set BCC OFF). It is recommended to use checksum, but sometimes it is not possible calculate it.

An example of a complete command packet (both characters and their Ascii values in hex shown):
<80h> D I S P 0 <ETX><BCC>
80 44x49x53x50x20x30x 03 = 1D
The x represents XOR operation in BCC calculation.

Response

2071 will respond to the command using SCL protocol. The response message is in the following form:
<ACK>response<ETX><BCC>
Instead, if there was errors in the transmission or in the command, the response will be:
<NAK>errorcode<ETX><BCC>

ACK is a single byte with Ascii value 6 (06h). It indicates that the device has accepted the command. About ETX byte, see previous chapter.

The response is dependent on the command sent. X-2071 has empty response except for KEYB command.

BCC is calculated similarly with the command BCC, taking all the bytes from ACK to ETX. This time 2071 will calculate the checksum, and your task is to check it if you want to.

Error response starter NAK is a single byte with Ascii value 21 (15h). It is followed by a single number representing the type of error. 3 means BCC error, while 4 indicates non-recognized command.

Non-addressable ASCII protocol

When using non-addressable ASCII protocol, the message sent to X-2071 consists of the text to display only, with no addresses, checksums etc.

However, there has to be a terminating character at the end of the message so that distinct messages can be separated from each other. Most often this delimiter is a newline character <CR> or <CR><LF>. The ascii value of that character is selected at the conf menu item “Delim”. Ascii value of <CR> is 13. When Delim is set to 13, also <CR><LF> (Ascii 13 and 10) is interpreted as single character.

Sometimes the message contains additional characters that are not to be displayed. If these occur before the actual message to display, the First setting can be set to match the number of these characters and they are abandoned. Likewise the number of characters to display may be limited with Count setting to 1..12.

An example of control message:
ANS_29.4PPP<CR>
Set Delim=13 (<CR>), First=4 (ANS_ is cut off) and Count=4 (PPP is removed).
The display will be: [29.4]

If there is a start character in addition to the terminating character, the start character can be removed by increasing the First setting by 1. The other way to handle this is to set the Delim to match the start character and use Count setting to indicate the end of the message (only if the length of the message is constant).

Display modes

X-2071 can be used to show short text messages, but most usually it is used to display measurement results, that is numerical values. There are two distinct display modes to choose from.

Generally, when the device that is contolling 2071 has formatted the message keeping in mind there is a six digit display, the Text mode gives free contol over the 2071 display. Also Text mode must be selected in order to display non-numerical text messages. On the other hand, when displaying numerical results, the Numerical mode is more flexible.

TEXT Mode

In the Text mode, X-2071 doesn’t process the message in any way. The first received message is placed at the leftmost position of the display and so on. However, dot (Ascii 46) and comma (44) are placed as the decimal point of the previous character, if applicable, thus not taking an display position of their own.

It takes never not more than 12 characters to fill up the display. This case will occur when each letter is succeeded with a dot: 1.2.3.4.5.6.

If more characters are sent that can fit on the display, the trailing characters are ignored.

If the display is wanted to be aligned to the right, there is no other way than to send a correct number of spaces (Ascii 32) before the actual characters. The display can be cleared with a message with only spaces (1 or more).

X-2071 does its best to represent all Ascii characters from 32 to 126 on its display. However, with seven segment technology there are several compromises. E.g. the number 5 and literal S appear equal.

NUMERICAL Mode

In the Num mode, X-2071 tries to interpret the message as a mathematical figure and then to reconstruct it onto the display right-aligned. This method will give more acceptable display when the message is not specifically targeted for a six-digit display.

Interpretation

In the message, the first numerical character (0..9 + - .) is searched for. This on the characters are interpreted as a part of a number until first non-numerical character is encountered. Additionally, there may be space characters between the sign (-) and the number itself.

Displaying

The number is formatted on the display right-aligned and the sign immediately next to the number. The number of decimals will be the same as in the incoming message, but it may be limited with Dec setting in the menu. If the number is too big, the decimal count is decreased automatically. When decimal count is decreased, X-2071 will keep rounding the number properly.

If the number is too big to be displayed (e.g. 1 000

000), over/underflow characters are shown. If the number was ununderstandable (no numerical characters), dashes are shown.

Overflow	[^ ^ ^ ^ ^ ^]
Underflow	[_ _ _ _ _ _]
Not valid	[- - - - - -]

Examples

Message	Display
_3_ _ _	[3]
-_ _ 4 . 5	[- 4.5]
66.666	[6 6.7]
(Dec=1)	
999.9999	[1 0 0 0.0 0]

Reading front panel keys

The front panel keys of X-2071 can be read externally using serial bus commands. This way 2071 can be used for controlling other systems.

Reading the keys is possible with SCL protocol only. Key combinations ▲★ and ▲▼★ cannot be used beause they activate the configuration state.

2071 is a slave on the bus: it cannot send the key information on the bus by its own, it must be asken by a master.

Buffered method

Send command KEYB with no parameters for 2071. The response consists of a single hexadecimal character (0…9, A…F, Ascii 48…57, 65…70) and possibly a letter L (76).

The hex character represents the key status so that the lowest bit corresponds to the leftmost key (1).

Näppäin	Koodi
1 ▲	1
2 ▼	2
3 ★	4
4 ➤	8

If several keys are pressed simultaneously, the sum of these codes is returned. E.g. keys ★ and ➤: the code is 4+8 = C in hexadecimal. When no keys is pressed, the value is 0 (zero).

The code is succeeded with letter L (e.g. 1L), if the key has been held pressed more than 0.5 seconds.

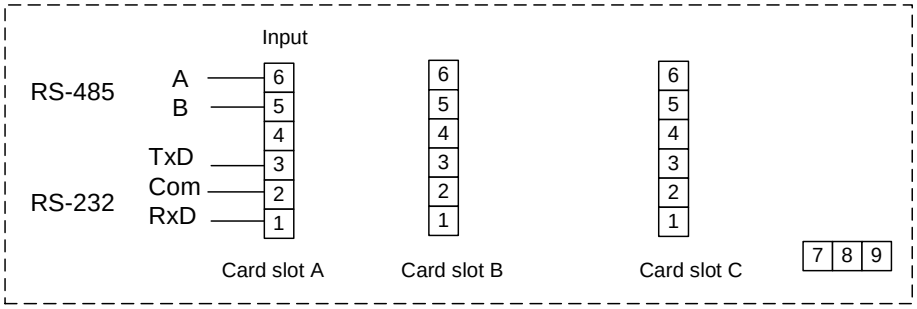
When using KEYB command, 2071 uses a buffer to store key presses (max 8 presses). If a key has peen pressed and released before KEYB command is used, 2071 will remember the press and return it with the next KEYB command. Similarly, if there has been several keypresses, each of them is buffered ad then returned one by one with every KEYB command.

If four buttons is not enough, one of the buttons can be reserved as a shift key that doubles the functions of the other keys. An excellent choice is ➤; remember that combination ▲★ is not available. Without "shift" pressed, the other buttons return 1, 2, and 4. With shift ➤ pressed, they return 9, A, and C.

Unbuffered method

If key buffering is not desired, instead it is more important to know the exact state of the keys in real time, use KEY command. The response is similar to KEYB command, with exception the L suffix is not used.

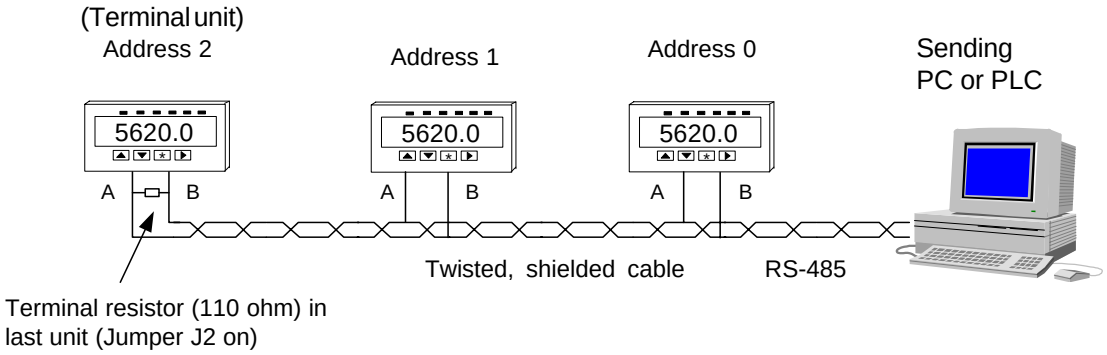
Terminal Connections



Only one of the serial connectors can be used at a time.

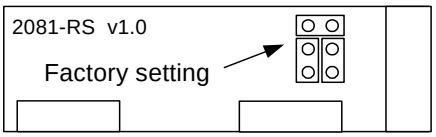
Card slots B and C are for optional cards

Power supply
85..240 VAC (grey 7 and 8)
or 24VDC (Green 7 and 9 no polarity)



Serial signal RS-485 loop last unit must be terminated with 110 ohm resistor. Termination can be done on terminal connections or by connecting short cut jumper into following position.

2071 RS card version 1.0 jumper selection



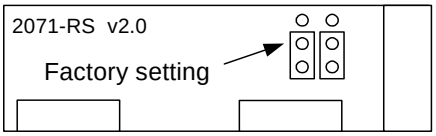
Fail-safe OFF
Terminator OFF

Use for other cases and for RS-232

Fail-safe ON
Terminator ON

Use for the last device in the bus

2071 RS card version 2.0 jumper selection



Fail-safe OFF
Terminator OFF

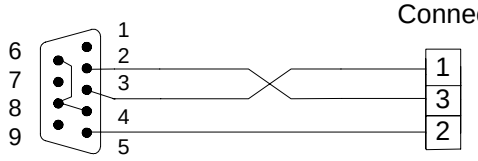
Use for other cases and for RS-232

Fail-safe ON
Terminator ON

Use for the last device in the bus

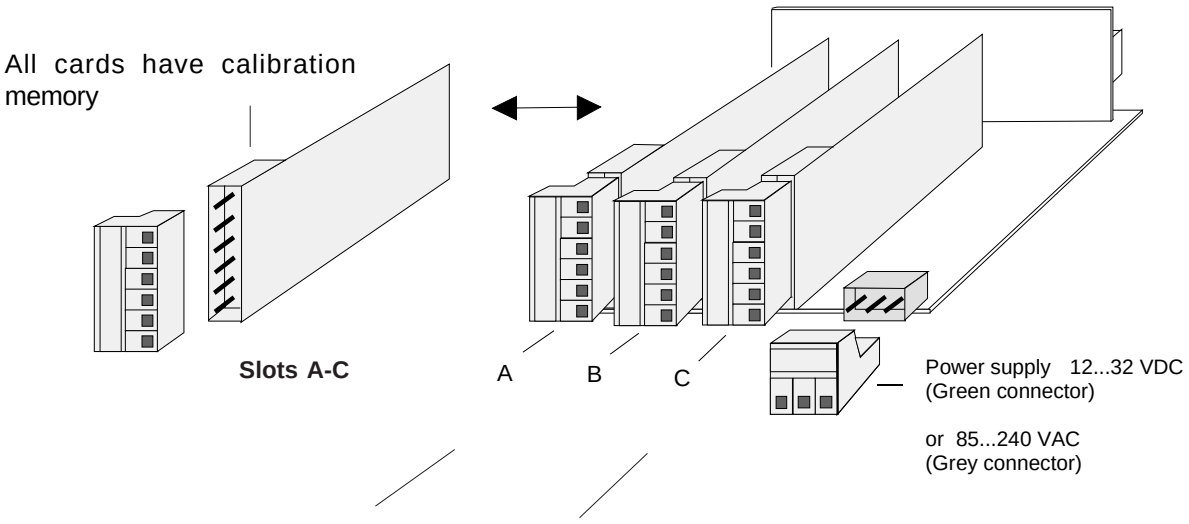
2071 - PC
RS-232
serial connection

PC
9-pin
conn.



Construction of field display series

The field display series is modular and easy to assemble according to customers wishes. The basic construction consists of mother board with tree 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 an other type of meter. You can change meter with pulse input to meter with current input, thermocouple, strain gage etc.

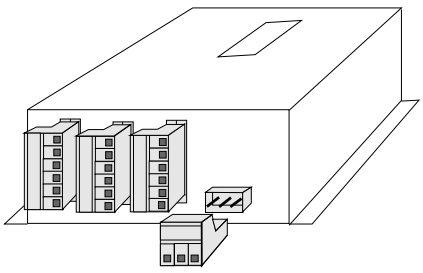
Additional slots:

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..240 VAC (relay contacts).

Power supply:

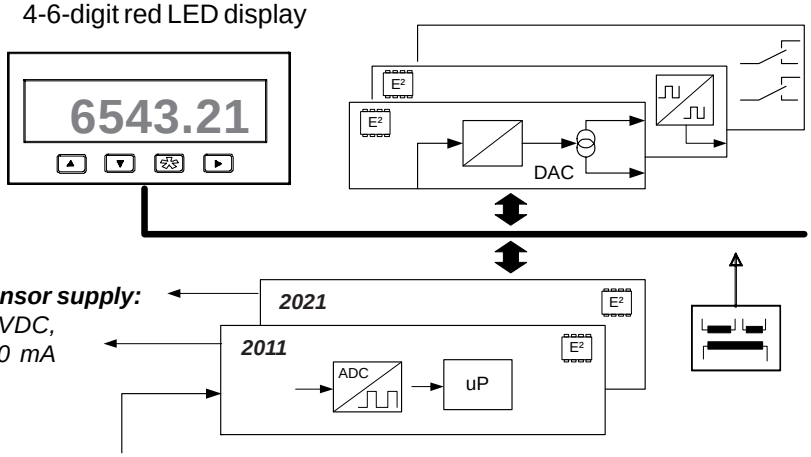
There are two different mother boards power supply 85..240 VAC and 12..32 VDC. VDC-mother board accepts 24 VAC. Connectors are colour coded.

Control electronic case:



Modular field display series 575F...1800F

4-6-digit red LED display



Sensor supply:
24VDC,
150 mA

Process inputs (model 2011):
0..20 mA**,** 4..20 mA
0..5/10 V
Potentiometer 100Ω..5kΩ

Input card contains:
- microprocessor
- bus control
- keys control
- display control

Option cards

Alarm cards:
2 relay card, 4 alarm types,
change over contacts
3 relay card, closing contacts
4 I/O-ports

Model 2011:
2 relays change over contacts
(also with remote reset)

Output cards (not for 2011):
0/4..20 mA, 0..10 V
RS232 or RS485

Power supply:
85..240VAC or
12..32 VDC / 24 VAC

Model 2021 contains also process inputs but it can also measure RTD-sensors and thermocouples. 2021 has very accurate and fast A/D-converter (16 bit 1/64 000).

2000 series input and option cards:

2011-IN	Process input
2021-MU	Multi input
2031-IR	Infrared sensor input
2041-SG	Strain gage measurement
2051-PU	Scaleable frequency indicator
2061-CO	Counter input (max 5 kHz)
2066-SEC	Timer function, s/min/h ext.
2071-RS	Serial input RS232 / RS485
2081-BCD	BCD-, Gray- binary code input (1-5 digits)

2000-BASE	Base card with power supply
2000-REL2	Alarm card, NO/NC
2000-REL3	Alarm card, Closing contacts
2000-OUT	Output card, U and I
2000-RS	Serial output RS232 or RS485
2000-I/O	4 pcs input /output ports (60 V / 100 mA)

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