Four Channels Temperature Monitoring Unit for Transformers and Other Electrical Machines
suitable for Pt100, Pt1000 or contactless IR sensors

DQ61-IR

User Manual
(Hardware Rel. 3.0 - Firmware Rel. 2.4.0)

Rev. 02.42_en
20/04/2020

1 General information

	Before performing any work on the device, ensure you have read and fully understood this manual. To ensure safe operation of the product it is necessary that the transport, storage, installation, use, maintenance and disposal practices are in compliance with the instructions in this manual. Each operation on the connections and installation must be performed by qualified and authorized personnel only. The QUANTA S.r.l. cannot be held responsible for any damage to people and/or things if have not been complied with all the instructions in this manual. The product shall be used only for the purpose specified in this manual. Any other use, besides being forbidden, could pose a risk to health and/or safety of persons and/or property and damage to the equipment. Use only QUANTA S.r.l. original spare parts. Use of non-original spare parts will invalidate your warranty, and might pose a risk to health and / or safety of persons and / or property. All rights are reserved. Any form of duplication or distribution of this manual is allowed only under the express written consent of QUANTA S.r.l.

2 How to use this manual

	This manual should be considered part of the unit, consequently it shall always be available for consultation by the management and maintenance staff. Keep it with care; in case of loss or damage you may request a copy asking your dealer or directly QUANTA S.r.l. quoting the model and serial number of the device,

3 Identification data

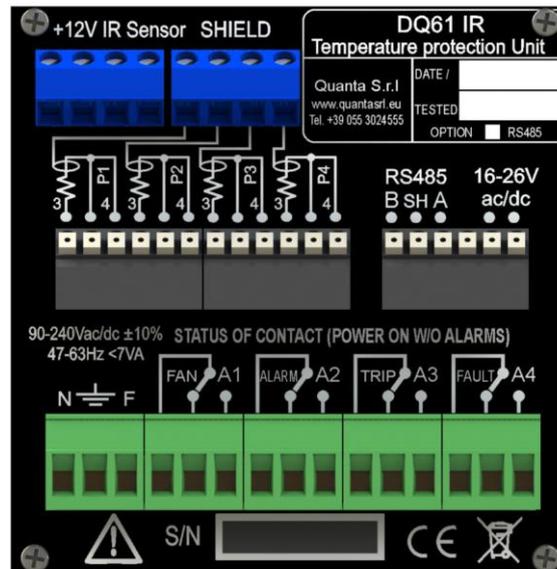The identification label is located on the back of the unit.

Figure 1

For technical assistance contact QUANTA S.r.l. using references in the footer of this manual.

4 The DQ61-IR

4.1 Terms and conditions of intended use

The DQ61-IR is an electronic control unit, designed to be used to monitor and control the temperature of electrical machines, e.g. medium/high voltage transformers or electrical motors.
Since it is not possible to know in advance what are the real application conditions in which the device will be utilized, and given the great variability of the fields of application, it is responsibility of the user to determine the suitability of DQ61-IR in performing the specific application properly.
QUANTA S.r.l. is available to provide the know-how to help customers in the evaluation of the specific suitability of the DQ61-IR.

	The DQ61-IR is a device classified under Measure Category III according to EN61010-1, permanently connected. *The device must be installed inside an electrical panel and shall be placed in proximity of a switch in order to allow for a swift disconnection from the power supply.* *The connection cables, including power cables must be secured and protected against the danger of direct contact to the operators.* *Working on the device shall only be done after power to the panel has been disconnected.*

	The device must be used only for the use and in the environmental conditions expressly provided in this manual: Any other use is considered improper and is not permitted. The use in ways and for purposes other than prescribed in this manual raises QUANTA S.r.l. from any liability for damage to persons, animals or property.

The device must be used for its intended use, only if in perfect conditions of maintenance. The use is permitted by qualified and trained personnel only, in strict accordance to current safety regulations and standards for the prevention of accidents.
In particular, the user should:

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- verify the compliance of the environment in which the equipment is installed and the related arrangements for the proper installation/use.
- thoroughly understand all the operations necessary for the proper use and the ordinary disposal, and all the general safety instructions and warnings provided in the manual.

4.2 Conditions of use not permitted

- The use of DQ61-IR in areas classified in category 20, 21 or 22 and / or 0, 1, 2 according to EU Directive 94/9, called Atex, is expressly prohibited.
- It is forbidden to use the DQ61-IR by personnel which is untrained and not aware of the risks related to the use of the device.

4.3 Technical specifications

Power supply	Universal < 7VA 90-240Vac/dc ±10% 47-63Hz ; 16-26Vdc/ac
Available inputs (Pt100, Pt1000 or IR Sensors inputs are alternatives to each other)	N°4 RTD Pt100 or Pt1000 – 3 wires N°4 Contactless IR sensors
Type selection of the used sensors	By software, with a service menù
Cable lengts compensation for Pt100/Pt1000 sensors	Up to 500m (0.5 mm^2)
External connections	Terminals wiring up to AWG 17 for Pt100, up to AWG14 for power and relays
Temperature range	-20 … +200°C
Accuracy (Pt100 sensors)	Better than 0,4°C ±1 digit
Accuracy (Pt1000 sensors)	Better than 1°C ±1 digit
Output alarm relays	N°2 SPDT 5A 250V for ALLARM and TRIP
Output Fan relay	N°1 SPDT 5A 250V
Output Fault relay	N°1 SPDT 5A 250V
Display	Graphic OLED 2,4" 128x64 pixel
Keyboard	Touch capacitive
Alarms signaling	With 4 dedicated LED and text message on display
Menu language	Italian, English, French, Espanol, more on request
Unit of measure	°C or °F
Dimensions	Front 96x96mm; depth 115mm
Mounting	Front panel
Panel cut-out	90x90mm
Building according CE directives	2014/35/UE (Lov Voltage) e 2014/30/UE (EMC)
Protection against electrical noise	EN61326-1
Dielectric strength	2500Vac for 1 minute
Isolation	Better than 100MOhm at 500Vcc ground -other terminals
Frontal protection	IP40, IP54 optional
Ambient operating temperature	-20 … +60°C
Ambient operating humitity	Max 90% no-condensing
MTBF	Better than 100.000 hours
Data storage	More than 10 years
Recorded data	Each channel Max temperature; Each alarm number of activactions
Remote control (optional)	Optoisolated RS485, MODBUS RTU protocol
Self-diagnosis, with error signal on the FAULT relay.	
Integrated counters (partial and total), for hours of work done.	
Ability to schedule the regular switch-on of the fans from the service menu.	
FCD function: ability to set an alarm if the temperature change is too fast (°C/s), from the service menu	
Ability to disable alarms activation for probes P1 P2 and P3 from the service menu.	
Ability to disable alarm activation for probe P4 from user menu.	

5 Operation and use

5.1 Control panel

Figure 2

Table 1: Panel Layout

1.	Display	In normal operation it displays the measured temperatures. During programming it guides the user to setup the parameters.
2.	Status Row	Located at the bottom of the display, it shows the operating condition of the DQ61-IR, alarm conditions particularly.
3.	LED group	The A1 LED indicates that the cooling fan is ON. The A2 LED indicates an alarm condition. The A3 LED signals the activation of the tripping relay. The A4 LED indicates a fault condition within the unit or on the probes
4.	MENU/ESC Pushbutton	Allows to enter or exit the programming menu.
5.	+ / INCREASE Pushbutton	Increase the value of a selected parameter / Displays the menu page or the previous line to the current one. Pressed from the main screen allows displaying of the Maximum Temperatures reached
6.	- / DECREASE Pushbutton	Decreases the value of a selected parameter / Displays the menu page or the following line to the current one. Pressed from the main screen allows displaying of Alarm Counters
7.	ENTER/MUTE Pushbutton	In normal operation: Allows to silence the buzzer. When setting parameters: Confirm the set value and pass to the next parameter.

Note: the display brightness is automatically decreased after about 30 seconds of keyboard inactivity.
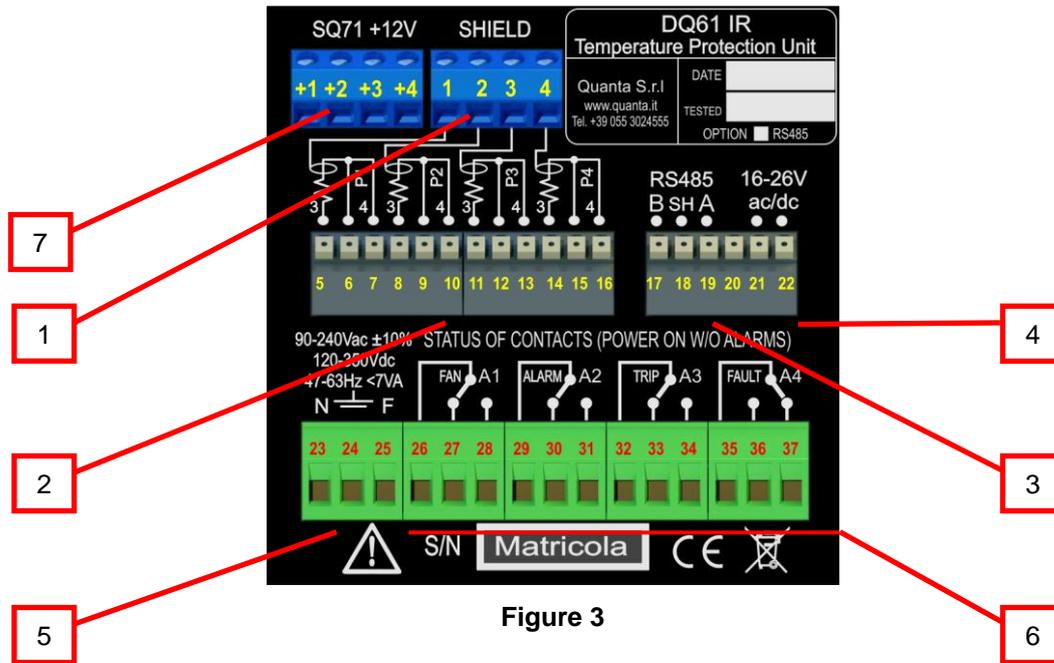
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5.2 Rear panel

Figure 3

Table 2: Terminal blocks for Pt100 only

	Terminal reference number	
1.	1 2 3 4	Common terminal shield for Pt100/Pt1000 probes
2.	5 … 16	Terminals for connection to Pt100/Pt1000 sensors
3.	17 18 19	Optional RS485 serial communication
4.	20 21 22	Power supply 16-26Vac/dc
5.	23 24 25	Power supply 90-240Vac/dc
6.	26 … 37	Relays terminal blocks (5A 250V)
7.	+1 +2 +3 +4	Not used

Table 3: Terminal blocks for SQ71 sensors only

	Terminal reference number	
8.	1 2 3 4	Not used
9.	5 … 16	Terminals for connection to Sq71 sensors
10.	17 18 19	Optional RS485 serial communication
11.	20 21 22	Power supply 16-26Vac/dc
12.	23 24 25	Power supply 90-240Vac/dc
13.	26 … 37	Relays terminal tlocks (5A 250V)
14.	+1 +2 +3 +4	Power supply IR sensors

Note: both Pt100, Pt1000 and IR sensors can be used simultaneously (on different inputs)

5.3 Power supply

On the secondary of large transformers very strong transient disturbances may be present, which might exceed the filters and safeguards built into DQ61-IR and destroy it; for this reason it is advisable to power it by a transformer 24VAC or 24VDC power supply. If the power is taken directly from the secondary of the transformer to be protected, fit a suitable additional filter. For more information please contact QUANTA S.r.l.

5.4 Electrical connections

For the connection of the measuring sensors it is essential to observe the following rules:
- They must be placed separate from the power cables.
- They must be made with shielded twisted conductors.
- Must have a minimum cross section of 0.5 mm^2.
- Must have conductors silver or tin.

5.5 Pt100/Pt1000 probes electrical connections

Make Pt100 sensors connections as shown in the following diagram, using shielded cables:
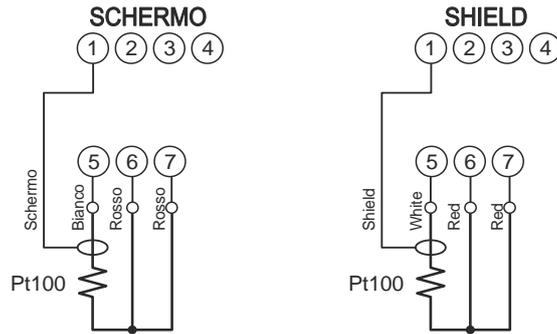

Figure 4

(Figure 4 shows the connection of the single P1 probe). If there are two-wire Pt100/Pt1000 available, connect terminals 6 and 7 together.

Do the same with the other probes, connecting to terminals 8 to 16 with the screens connected to terminals 2, 3 and 4. The probes P1, P2 and P3 are those which measure the temperature of the three windings in a three-phase transformer, while the probe P4 measures the temperature of the magnetic core. See the diagram below:
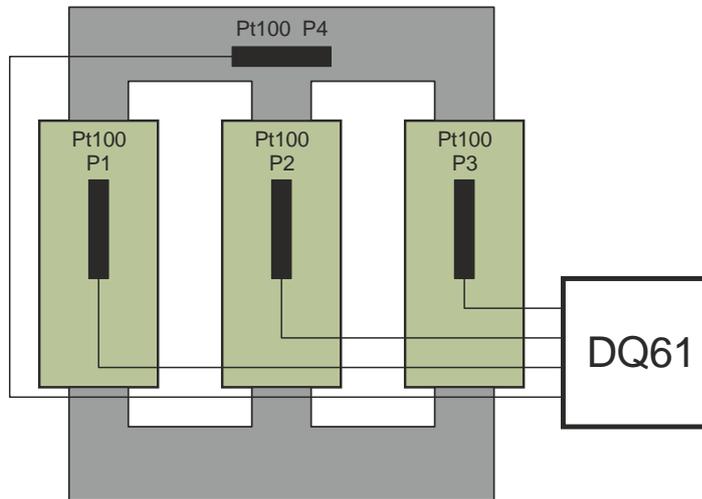
Figure 5

5.6 SQ71 probe electrical connections

Make SQ71 sensors connections as shown in the following diagram:
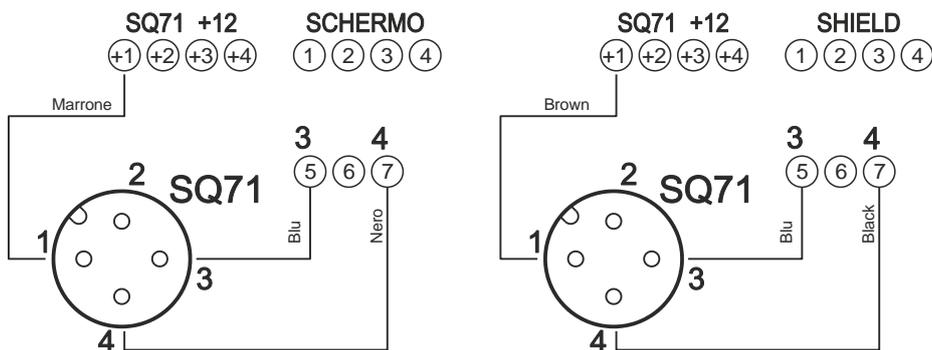
Figura 6

Do the same with the other probes, connecting to terminals 8 to 16 and from +2 to +4.
The IR, Pt100 and Pt1000 sensors (on different inputs) can be used simultaneously.

5.7 Other electrical connections

Connect the low safety voltage power supply to terminals 21 and 22 or connect the mains supply to terminals 23, 24 and 25.
WARNING: even if the power supply applied to terminals 21 and 22 is at low safety voltage levels, the ground terminal 24 must be connected, in order to maintain the effectiveness of noise filters and other internal devices.

5.8 Relays functionality

The relays A1 A2 and A3 are normally at rest, while the relay A4 is normally activated, according to the diagrams of example in Figure 6 and Figure 7.

- The output A1 (signaled by LED FAN) switches when one of the sensors reaches the activation temperature of the fan.
- The relay A2 (signaled by the ALARM LED) switches when the probe reaches the alarm temperature. Enabling this relay can be delayed by setting a time in the user menu.
- The relay A3 (signaled by LED TRIP) switches when one of the probes reaches a temperature of release.
  The working mode of this relay can be controlled by the user menu:
  - ➢ Standard mode: It is active when you reach the alarm condition and remains active until the condition persists.
  - ➢ Latching mode: Keeps the alarm indefinitely, even to the end of the cause of the alarm.
  - ➢ Pulse mode: It is activated for a predetermined time and then returns to the rest condition.
- The relay A4 (indicated by LED FAULT) is always on and going off to signals a DQ61-IR fault condition or a fault condition in one or more probes.
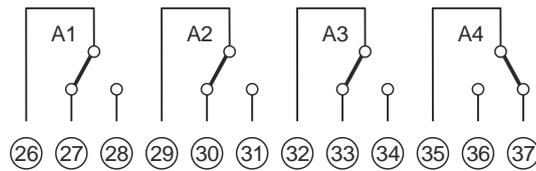
Figure 7

Relay in its rest position; DQ61-IR ON
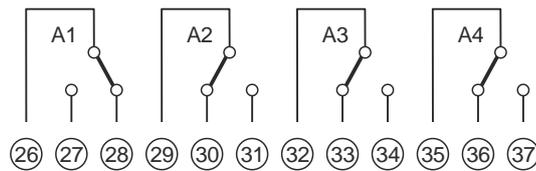
Figure 8

Fan activated; DQ61-IR Fault or probe fault

5.9 Buzzer features

By reaching the alarm set-point the buzzer is activated (ALARM), which also activates the relay A2, and beeps intermittently slow until the end of cause for alarm.
The buzzer sounds intermittently fast, when it reaches the release set-point (TRIP) which activates the relay A3.
The buzzer sounds a continuous tone to indicate the fault condition of a Pt100 probe.
The MUTE key mute the buzzer when alarm is active. In the state of silencing the buzzer wakes up in the presence of new alarm events.
The activation of the buzzer on alarm can be inhibited by the service menu..

Type of sound	Cause reported
Continuous	One or more probes are faulty
Intermittent slow	Active alarm relay (ALARM)
Intermittent fast	Active tripping relay (TRIP)

6 Programming

6.1 Normal view

In normal operation, set as the factory default, the display looks like this:
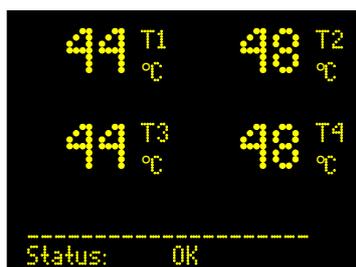
At the top, the display shows the four measured temperatures, while the bottom row summarizes the status of the DQ61-IR.

6.2 Access to menu

Press the MENU key to access the main menu of programming:

With the keys ↑ and ↓ you place the control on the desired line, with the key ↵ you access the submenu. When you are inside a menu, press the MENU button to exit and return to the main display.
The row `Output Test` can be reached by pressing the key ↓ after the row `Instrument Info`.
If no operations are done on the keyboard for about 30 seconds, DQ61-IR autonomously goes back to normal view.

6.2.1 Max temperature record menu
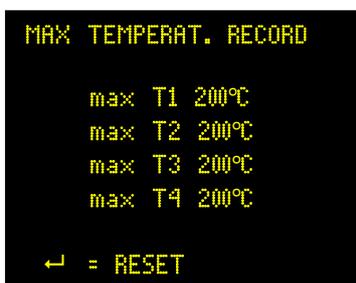
This menu shows the maximum temperatures recorded. Pressing the key ↵ twice, you can reset the recorded values.

6.2.2 Alarm setting menu

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This menu shows the temperature set point for fan, alarm and tripping. The settings are common to the probes P1, P2 and P3, while P4 probe has a setting dedicated. By pressing the keys ↑ and ↓ you place the cursor on the desired set point; the key ↵ leads to a submenu that lets you change its value. After changing the value, press the button ↵ again to save the change or press the key MENU to return without the change.

6.2.3 Alarm counters menu

```
      ALARM COUNTERS

      FAN       6
      ALARM     5
      TRIP      1
      FAULT     2

     ↵  = RESET
```

This menu shows how many alarms there were for different set-points. Pressing the key ↵ twice, you can reset the counters.

6.2.4 Display mode menu

```
        DISPLAY MODE

  > All Probes Temperat.
    Highest Temperature
    Cycling Temperature
    Manual Setting

     ↵  =   SELECT
```
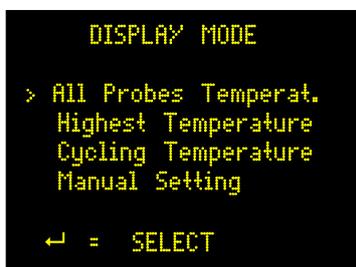
This menu allows you to set the screen to normal working mode, as it may be needed. Pressing the keys ↑ and ↓ you place the cursor on the screen that you want; pressing the key ↵ twice, you select and confirm the choice. The choices are as follows:

Current temperature of probes. All measured temperatures are displayed simultaneously on the display.	Highest temperature. The display shows only the highest temperature measured.
Cyclic temperatures. All the temperatures measured are shown in succession, one after the other with an interval of about four seconds.	Manual Scan. Acting with the keys ↑ and ↓ you select the displayed temperature.

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6.2.5 User menu

```
        USER MENU
↓
> Alarm Hysteresis
           5°C
   Alarm Dealay
           0 sec
   TRIP Latch
           NO
   TRIP Pulse Lenght
           0 sec
   Enable Alarm Probe 4
           YES
   Language
        ENGLISH
↵ = MODIFY
```

This menu shows the possible settings allowed to the user.
Pressing the keys ↑ and ↓ you can place the cursor on the entry to change; with the key ↵ you access a sub-menu that has the options available. You select the desired option using the buttons ↑ and ↓; use the ↵ key to select it and save.

- `Alarm Hysteresis     (P7)`.
  Sets the hysteresis on the alarm temperature between 1 and 20 °C (default 5 °C).
  For example, if a given alarm threshold is set to 120 °C and the hysteresis at 5 °C, DQ61-IR signals an alarm when the temperature exceeds 120 °C and will continue to report it until the temperature drops below 115 °C

- `Alarm Delay     (P8)`.
  Sets the time in seconds (between 0 and 120, default 0) for which the alarm condition must persist before an alarm is reported. For example, if this parameter is set to 60 sec., raise in temperature above the thresholds set for periods of less than 60 seconds will not give the alarm.

- `TRIP Latch     (P9)`.
  If set to YES (default NO), once in the conditions for which the alarm TRIP is activated, this alarm (alarm LED on the display and relay contact A3) continues to exist even if the temperature returns to normal until the key ↵ is not pressed by an operator.

- `TRIP Pulse Lenght   (P10)`.
  This parameter allows you to set the time for which the relay contact A3 (TRIP) is activated in case of alarm: if it is set to 0 (default), the relay is activated as long as the alarm condition persists, but if you set a value between 1 and 120 seconds, in case of alarm TRIP the relay will be activated only for that time even if the alarm condition persists. This function, if the value is not 0, takes precedence over latching function.

- `Enable Alarm Probe 4     (P17)`.
  This feature allows you to disable the alarm activation derived from probe 4. If the probe is connected its temperature is still shown on the display, but if it is absent, no alarms are reported. The alarm condition is signaled disabled on the display in the status line.
  This feature allows you to use the DQ61-IR to monitor only 3 temperatures without being warned for failure or absence of the fourth probe.

- `Language     (P24)`.
  Sets the menu language choosing among ITALIAN, ESPANOL, FRANCAIS, ENGLISH.

6.2.6 Service menu

This menu can only be accessed with a key password (by pressing MENU, MENU, MENU, ↓, MENU,MENU, MENU, ↓).
This menu is reserved for technical assistance. In this menu you can set some special features of the DQ61-IR:

```
      SERVICE MENU      ↓
  > FCD Rate Set
              0°C/s
    FAN auto ON Period
              0 h
    FAN auto ON Time
              5 min
    Enable Alarm Probe 1
              YES
    Enable Alarm Probe 2
              YES
    Enable Alarm Probe 3
              YES
    LCD oper. Brightness
              240
    LCD stand-by Brightn
              60
    ID MODBUS
              ----
    RS485 Baudrate
              ----
    Unit of Measure
              °C
    Enable Buzzer
              YES
  Sensor Type 1
          PT100
  Sensor Type 2
          PT100
  Sensor Type 3
          PT100
  Sensor Type 4
          PT100
  Temperature Min. IR
                  0°C
  Temperature Max. IR
          200 °C
    Default config.
              NO

    ↵ = MODIFY
```

- **Enable FCD feature and choice of rate of temperature rise that generate the alarm**
  `FCD Rate Set   (P11)`.
  Default 0 °C/s.
  It may set a value of rate of rise that generates alarm, between 0 and 30 °C/s. Setting the value to 0 exclude the function and the corresponding alarm is disabled.

- **Activation interval of the fan (independent of temperature)**
  `FAN Auto ON Period    (P12)`.
  Default 0 hours.
  You can set a value between 0 and 1000h. Setting the value 0, to disable this function: The fan will turn on anyway as a result of exceeding the alarm FAN temperature; setting a value other than 0, for example. 6h, the fan will turn on every 6 hours and will remain on for the time set to the next parameter (P13).

- **FAN ON Time (See parameter P12).**
  `FAN Auto ON Time    (P13)`.
  Default 5 minutes.
  Determines how long the fan stays on if the parameter P12 is different from 0.

- **Probe 1 Enable.**
  `Enable Alarm Probe 1    (P14)`.
  Default YES.
  Setting the value to NO exclude the alarm probe 1, while remaining visible indication of its temperature on the display.

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This condition is indicated on the status line with the message "Alarms probe T1 OFF".
The parameters from P14 to P17 allow you to use DQ61-IR with a number of probes between 1 and 4 without having to worry about the alarms generated by the probes that may be missing.

- **Probe 2 Enable.**
  `Enable Alarm Probe 2    (P15)`.
  Default YES.
  Setting the value to NO exclude probe 2 alarm, while the temperature on the display remains visible.
  This condition is indicated on the status line with the message "Alarms probe T2 OFF".

- **Probe 3 Enable.**
  `Enable Alarm Probe 3    (P16)`.
  Default YES.
  Setting the value to NO exclude probe 3 alarm, while the temperature on the display remains visible.
  This condition is indicated on the status line with the message "Alarms probe T3 OFF".

- **Adjusting the display brightness in the working mode.**
  `LCD oper. Brightness   (P18)`.
  Default 240.

- **Adjusting the display brightness in the stand-by mode.**
  `LCD stand-by   Brightn (P19)`.
  Default 60.
  The parameters P8 and P19 are connected to each other in the following way:
  P18 can be set between P19+1 and 255;
  P19 can be set between 0 and the value of P18-1.

- **ID. MODBUS.**
  `ID MODBUS     (P20)`.
  Default 1. (Allowed values: from 1 to 247).
  If the RS485 MODBUS option is not installed, the value indicated is `---` and will not be editable.

- **RS485 MODBUS Baud rate.**
  `RS485 Boudrate    (P21)`.
  Default 19.200. (Allowed values: between 1.200 and 38.400 baud).
  If the RS485 MODBUS option is not installed, the value indicated is `---` and will not be editable.

- **Choice of unit between °C and °F.**
  `Unit of measure    (P22)`.
  Default °C.

- **Buzzer Enable on Alarm**
  `Enable  Buzzer   (P23)`.
  Default YES.
  Warning: when the buzzer is disabled it does not sound on activation relay ALARM, TRIP relay and relay FAULT.

- **Sensor type used for input 1**
  `Sensor type 1    (P27)`.
  Default setting: Pt100. Alternative setting: Pt1000 and contactless infrared temperature sensor, selectable by ↓ and ↑ keys.

- **Sensor type used for input 2**
  `Sensor type 2    (P28)`.
  Default setting: Pt100. Alternative setting: Pt1000 and contactless infrared temperature sensor, selectable by ↓ and ↑ keys.

- **Sensor type used for input 3**
  `Sensor type 3    (P29)`.
  Default setting: Pt100. Alternative setting: Pt1000 and contactless infrared temperature sensor, selectable by ↓ and ↑ keys.

- **Sensor type used for input 4**
  `Sensor type 4    (P30)`.
  Default setting: Pt100. Alternative setting: Pt1000 and contactless infrared temperature sensor, selectable by ↓ and ↑ keys.

- **Minimum temperature measured by IR sensor SQ71**
  `Temperature Min. IR  (P31)`.
  Default setting 0°C; setting between -50°C and 0°C. This setting affects all SQ71 sensors used.

- **Maximum temperature measured by IR sensor SQ71**
  `Temperature Min. IR  (P31)`.
  Default setting 200°C; setting between 200°C and 350°C. This setting affects all SQ71 sensors used.

- **Default Setting**
  `Default Config.  (P26)`.
  Default NO.
  This selection resets the device to factory settings.

6.2.7 Instrument info

```
      INSTRUMENT INFO

SW Rev.            2.0.0
Working hours:
- Total              25
- Partial            10

   ↵ = PARTIAL RESET
```

This menu shows the software revision and hours of work. By pressing the key ↵ twice you can reset the partial working hours counter. The total counter can not be reset.

6.2.8 Output test

```
      OUTPUT TEST
> FAN Test          OFF
  ALARM Test        OFF
  TRIP Test         OFF
  FAULT Test        OFF
  BUZZER Test       OFF

   ↵ = TOGGLES ON/OFF
```

This menu allows you to check the operation of the output relays and LEDs associated with. You select the relay to test using keys ↑ and ↓, and then pressing the key ↵ switching from off to on and vice versa. Pressing the MENU button the test ends, the relays and the LEDs resume their work status
By entering this menu, any alarms are turned off to allow the test and are reactivated at the return of the normal operating condition.

7 Remote control

Through the RS485 port (when the corresponding option board is installed) DQ61-IR can be controlled by an External manager communicating with MODBUS protocol.

7.1.1 Communication: physical layer
Asynchronous serial communication, half-duplex, 19200bps (default), 8 data bit (LSB first), even parity, 1 stop-bit.

7.1.2 Communication: data layer
Protocol MODBUS Slave over serial line RTU mode.
Please refer to MODBUS over serial line specification and implementation guide V1.02 of 20/12/2006 by Modbus.ORG.
The address of the MODBUS Slave is the ID MODBUS set from the Service Menu.
The Protocol Data Unit (PDU) exchanged with the upper level are associated with the address above, and check for error checking (CRC), forming the Application Data Unit (ADU).

7.1.3 Communication: application layer

MODBUS Application level second *MODBUS Application Protocol Specification V1.1b of 28/12/2006* by Modbus-IDA.ORG for the management of PDUs exchanged with the lower levels.

The application layer defines the MODBUS PDU as formed by the following fields:

- **Function Code** – Function code indicates the type of action required by the Client to the Server.
- **Data** – Field data concerning the operation of control or monitoring required by the Client to the Server.

Are supported only the following function codes:

Function Code	Description
03 (0x03)	Read Holding Registers
16 (0x10)	Write Multiple Registers

As described in detail below, the table of Holding Registers contains not only all the variables that can be monitored and modified (read-write) by the External Manager, but also the variables monitored only (Read-Only) allocated all together in a separate address space, which in this case shall be extended to the maximum extent permitted by MODBUS (0x0000 to 0xFFFF). Is therefore rejected each write request involving the records Read-Only in that address space.

Typical MODBUS requests for diagnostic **are not handled** over serial lines (08 (0x08) Diagnostics, 11 (0x0B) Get Comm Event Counter and 12 (0x0C) Get Comm Event Log).

7.1.4 Controllable variables table

The data of all controllable variables are mapped into a table of 16-bit registers, depending on the model MODBUS data representation.

7.1.5 Data types

The data is divided into the following types:

- BOOL – binary value 0 or 1
- CHAR – alphanumeric character (0 ÷ 255)
- BYTE – 8-bit positive integer (0 ÷ 255)
- WORD – 16-bit positive integer (0 ÷ 65535)
- BITMAP – 16-bit words corresponding to 16 flags in order from 0 to 15 (for each bit logic is: 0 = off, 1 = on)
- INT – 16-bit signed integer (-32768 ÷ 32767)
- DWORD – 32-bit positive integer (0 ÷ 4294967295)
- LONG – 32-bit signed integer (-2147483648 ÷ 2147483647)
- FLOAT – IEEE 754 single-precision floating point number ($\pm$1.175494351E–38 ÷ $\pm$ 3.402823466E+38)

For the type CHAR and BYTE, the 16-bit register that contains it has the high byte set as zero, unless it is an array.

For type DWORD, LONG and FLOAT the two 16-bit registers that represent the value in the table are sorted according to the scheme Big-Endian (Motorola): The first register contains the high word, the second register contains the low word.

For arrays of CHAR and BYTE, each 16-bit register employed from the array contains two elements: The k-th element in the low byte and the (k +1)-th element in the high byte, with k = 0.1, 2, ... index of characters in the array. The element of null value (0x00) is taken as a string terminator in arrays of CHAR.

The notation "[n]" indicates the size of an array of n elements of a certain type.

7.2 Monitorable and editable registers table

7.2.1 Monitorable and editable parameters and variables

Address	Type	Description
0x0000	BITMAP	Bitmap configuration flag: Bit0. Default configuration Bit1. TRIP latch Enabled Bit2. Probe T1 Enabled Bit3. Probe T2 Enabled Bit4. Probe T3 Enabled Bit5. Probe T4 Enabled Bit6. Unit of Measure = °F Bit7. Buzzer on Alarm Enabled Bit8. Bit9. Bit10. Bit11. Bit12. Bit13. Bit14. Bit15.
0x0001	INT	FAN Probes 1/2/3 (°C o °F) Set-Point
0x0002	INT	FAN Probe 4 (°C o °F) Set-Point
0x0003	INT	ALARM Probes 1/2/3 (°C o °F) Set-Point
0x0004	INT	ALARM Probe 4 (°C o °F) Set-Point
0x0005	INT	TRIP Probes 1/2/3 (°C o °F) Set-Point
0x0006	INT	TRIP Probe 4 (°C o °F) Set-Point
0x0007	BYTE	Hysteresis (°C o °F)
0x0008	BYTE	FCD (°C/s or °F/s) Set-Point

0x0009	BYTE	Alarm Delay (s)
0x000A	BYTE	TRIP Pulse Duration (s)
0x000B	WORD	Auto Ventilation Period (h)
0x000C	BYTE	Auto Ventilation Time (min)
0x000D	DWORD	Partial Working Hours (Reset only)
0x000E		
0x000F	INT	Max Temperature T1 (°C o °F) (Reset only)
0x0010	INT	Max Temperature T2 (°C o °F) (Reset only)
0x0011	INT	Max Temperature T3 (°C o °F) (Reset only)
0x0012	INT	Max Temperature T4 (°C o °F) (Reset only)
0x0013	WORD	Number of Activation of Relays FAN (Reset only)
0x0014	WORD	Number of Activation of Relays ALARM (Reset only)
0x0015	WORD	Number of Activation of Relays TRIP (Reset only)
0x0016	WORD	Number of Activation of Relays FAULT (Reset only)

7.3 Read-only registers table

7.3.1 Read-only variables

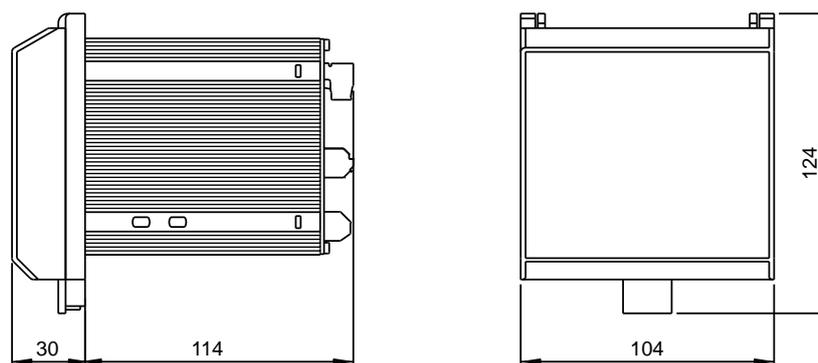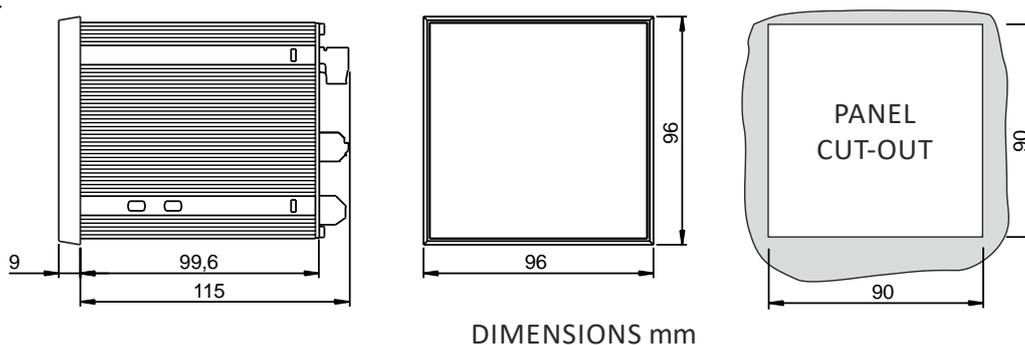| Address	Type	Description
0x8000	WORD	Firmware Release: Bit15÷11 – Version number Bit10÷6 – Revision number Bit5÷0 – Build number
0x8001	INT	Temperature T1 (°C o °F)
0x8002	INT	Temperature T2 (°C o °F)
0x8003	INT	Temperature T3 (°C o °F)
0x8004	INT	Temperature T4 (°C o °F)
0x8005	BITMAP	Bitmap #1 Alarms Status: Bit0.　　Default Configuration Bit1.　　Active FAN (T1) Bit2.　　Active FAN (T2) Bit3.　　Active FAN (T3) Bit4.　　Active FAN (T4) Bit5.　　ALARM (T1) Bit6.　　ALARM (T2) Bit7.　　ALARM (T3) Bit8.　　ALARM (T4) Bit9.　　TRIP (T1) Bit10.　TRIP (T2) Bit11.　TRIP (T3) Bit12.　TRIP (T4) Bit13.　Probe FAULT (T1) Bit14.　Probe FAULT (T2) Bit15.　Probe FAULT (T3)
0x8006	BITMAP	Bitmap #2 Alarms Status: Bit0.　　Probe FAULT (T4) Bit1.　　FCD: Temperature Rapid Rise (T1) Bit2.　　FCD: Temperature Rapid Rise (T2) Bit3.　　FCD: Temperature Rapid Rise (T3) Bit4.　　FCD: Temperature Rapid Rise (T4) Bit5.　　Probe T1 OFF Bit6.　　Probe T2 OFF Bit7.　　Probe T3 OFF Bit8.　　Probe T4 OFF Bit9. Bit10. Bit11. Bit12. Bit13. Bit14. Bit15
0x8007	DWORD	Total Working Hours
0x8008		

8 Overall dimensions

DIMENSIONS mm

IP 54 DIMENSIONS mm

Figure 9

9 Troubleshooting

In the event of unexpected behavior, before concluding that the unit is faulty, check the following list:

Symptom	Cause and / or remedies
The DQ61-IR doesn't turn on	Make sure there is voltage at the power supply terminals. Make sure the power connector is properly inserted in its place. Ensure that the wires are securely clamped in the terminals.
The display indicates "---" instead of the temperature of a probe	The indicated probe is open or shorted. Replace the probe.

10 Contactless IR temperature sensor

The DQ-61 can also be interfaced with sensors that use the infrared measurement technique to determine the temperature of an object without direct contact with the object itself.
It is applied in all cases in which the traditional detection with Pt100/Pt1000 temperature probes placed on the object to be measured is dangerous or difficult, as for example for measurement on the primary windings of MV transformers.

Various IR sensors are available and compatible with the DQ61-IR, including the SQ71 and the **optris®**
CS LT in various configurations that differ in the temperature range and / or the emissivity of the object under measurement. In addition to the 4-20mA output, a signal is available to interface directly to the DQ61-IR temperature controller.
Further documentation is available on the website http://www.quanta.it

EC Declaration of Conformity

QUANTA s.r.l.
via A. Ferrarin, 19-23 – 50145 Firenze (Italy)

declare

that the **Temperature Monitoring unit DQ61-IR**

is built in accordance with:

• Low Voltage Directive 2014/35 / UE, in particular the rules:

EN61010-1: 2010   EN62233: 2008

• EMC Directive 2014/30 / UE, in particular the rules:

EN 61326-1 :2006+EC/2008   EN 61000-4-6:2009
EN 61000-3-2:2007   EN 61000-4-11:2006
EN 61000-3-3:2008   EN 61000-6-1:2007
EN 61000-4-2:2009   EN 61000-6-2:2007
EN 61000-4-3/06+A1/08+A2/10   EN 61000-6-3:2007
EN 61000-4-4:2006   EN 55011:2009
EN 61000-4-5:2007

Firenze, 4 Aprile 2016

Giovanni Righini
(Amministratore Quanta S.r.l.)

12 User manual revision history

1.14	28 December 2012	English language first release
1.15	03 December 2014	Power Supply changed to 90..250Vac/dc
1.16	20 November 2015	EC Declaration of Conformity inserted
1.17	20 November 2015	Repagination
1.18	23 November 2015	Nominal power supply range specified
1.19	16 December 2015	Updated front / rear images. Change of IP protection
2.01	07 May 2016	Release also suitable for the temperature sensor IR SQ71
2.02	23 November 2016	Minor orthographic translation changes Updated to FW Ver. 2.1.0 (Improved noise immunity and workaround to silicon errata)
2.04	23 January 2018	Rear images updated
2.05	07 March 2018	First page updated (Template)
2.40	26 June 2018	Updated to FW Rel. 2.4.0
2.42	24 April 2020	Update Power Supply range