



## USER MANUAL LQT60



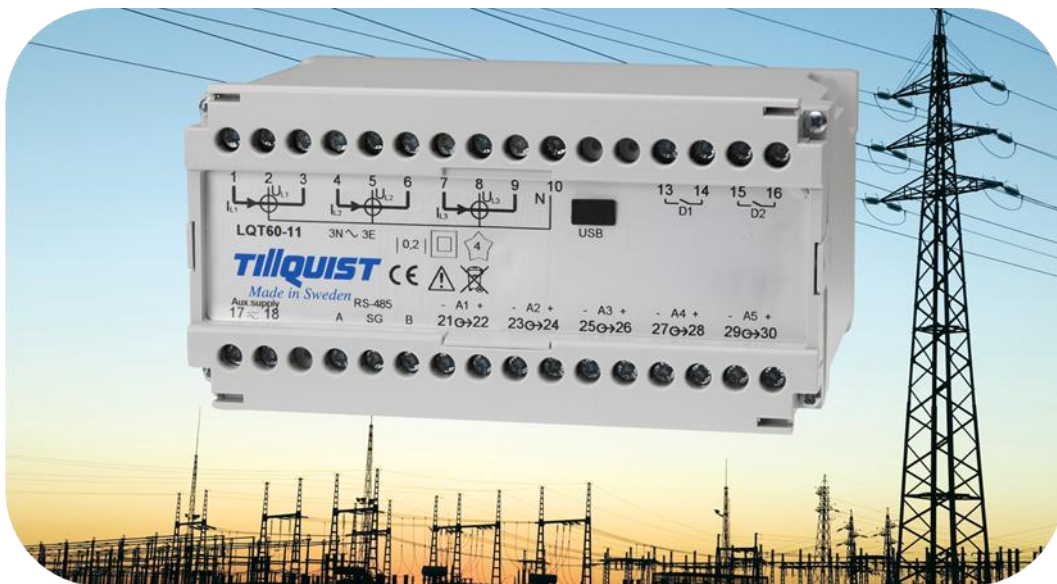
**HUGO TILLQUIST AB**  
Box 1120  
SE-164 22 KISTA  
Sweden  
Tel: +46 8 594 632 00  
Fax: +46 8 751 36 95  
E-mail: [info@tillquist.com](mailto:info@tillquist.com)  
Website: [www.tillquist.com](http://www.tillquist.com)

**Thank you for choosing LQT 60 from Hugo Tillquist AB!**

*LQT60 is a configurable multitransducer for all electrical quantities. All areas for AC current and voltage (True RMS) is covered by one single unit. 5 analog and 2 digital outputs together with a RS485 give almost unlimited possibilities.*

*The software “ConfigLQT” enables easy configuration via the USB-port.*

*It is as simple as that!*



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# 1 LQT60 product description

LQT 60 is a configurable multitransducer for electrical quantities in a line. It is possible to optionally choose electrical quantity to the 5 analog outputs. 2 transistors outputs can be used to energy pulses or alarm levels. The configuration is done with the software ConfigLQT via the USB-port on the LQT60.

## 1.1 Technical data LQT60

<b>Inputs</b>	<b>Voltage</b>	
	Input (Un)	100 – 400 V main voltage (nominal)
	Overload	1.5 x Un – continuously, 2 x Un – 10 s
	Measuring range	0 – 500 V TRMS
	Consumption (burden)	Un x 1 mA / phase
	Frequency	10...40...70...120 Hz
	<b>Current</b>	
	Input (In)	1 – 5 A
	Overload	2 x In continuously, 10 x In 15 s, 40 x In 1 s
	Measuring range	0 – 10 A TRMS
	Consumption (burden)	<0.05 VA / phase
	<b>Aux. supply</b>	
	Universal current	24 – 250 VDC 80 – 250 VAC
	Consumption	max 8 W
<b>Outputs</b>	<b>Analog</b>	
	Number	5 pcs
	Area	+/- 20 mA +/- 10 V (option)
	Load	max 750 ohm (15V)
	Response time	< 100 ms
	<b>Digital</b>	
	Number	2 transistor 110 V AC/DC, 100 mA
	<b>Communication</b>	
	Serial	RS485
<b>General data</b>	Accuracy class	0.2
	USB	1 pc for configuration
	Temperature range	-10 to +55 C° (operation) -40 to +70 C° (storage) Temperature coefficient < 0.1% / 10 C°
	Test voltage	4 kV AC / min
	Inputs	Overvoltage cat. III
	Outputs	Overvoltage cat. II
	Pollution degree	2
	Dimensions (w x h x d)	150 x 70 x 73 mm – DIN-rail
	Weight	ca 0.5 kg
	Standards	SS-EN 60688 Transducers SS-EN 601010 Safety EN 61000-6-2 / -6-4 / -6-5

## **2 Installation**

### **2.1 Installation measuring transducer**

The transducer is mounted in DIN-rail 35 mm for wall mounting or rack mounting in appropriate housing. The installation is to be made by competent electrician and in accordance with existing regulations. Before installation please check that the transducer has the correct type and that the data comply with the order. The transducer is connected with clamps max 2 x 2,5 mm<sup>2</sup> in accordance with connection diagram.

Connection diagram, see page 5.

### **2.2 Installation software ConfigLQT**

Installation kit consists of configuration software and driver for the USB switch on LQT60. ".NET Framework" version 4.0 must be installed on the computer otherwise ConfigLQT does not work. It is a software from Microsoft which often already is installed. If not it has to be installed. Go to : <http://www.microsoft.com/net/>. and you will find .NET Framework.

Download ConfigLQT from [www.tillquist.com/eng/](http://www.tillquist.com/eng/) and unzip the files.

1. Install driver for USB. "VCP\_V1.3.1\_Setup.exe" is for 32-bit Windows operative and "VCP\_V1.3.1\_Setup\_x64.exe" is for 64-bit.
2. Install ConfigLQT.

## 3 Configuration LQT60

### 3.1 Connection LQT60 to computer

Connect a USB-cable between the USB-port on LQT60 and the computer. Use cable with contacts type A and mini B.

Click *File* and choose *Connect*.

Choose COM-port and click *Open Port* and close the window *Close*.

On the tab **View data** in the field **USB Connection status** the word **Connected** is shown with a green background.

### 3.2 Indata – View data

In View data the various basic parameters of the transducer are configured and the present measuring values can be seen when the transducers is connected to an object. The measuring values are shown as Primary, Secondary or Raw values.

The screenshot displays the Config\_LQT software window. The 'View data' tab is active, showing a 3-phase system configuration table with columns for L1, L2, and L3. The table includes parameters such as P (Power), Q (Reactive Power), S (Complex Power), U (Voltage), I (Current), PF (Power Factor), QF (Reactive Power Factor), LF (Lag Factor), PA (Phase Angle), and F (Frequency). The frequency F is highlighted in green, indicating it is the primary value. To the right, the 'Transducer input settings' section shows primary and secondary voltage and current settings, along with data mode and system connection options. The 'Transducer information' section displays device model, input system, analog outputs, nominal voltage, nominal current, nominal frequency, accuracy class, auxiliary supply, serial number, software, and firmware. The 'USB connection status' section shows 'Connected' with a green background. The bottom status bar indicates 'Modbus Loaded' and the TILLQUIST logo.

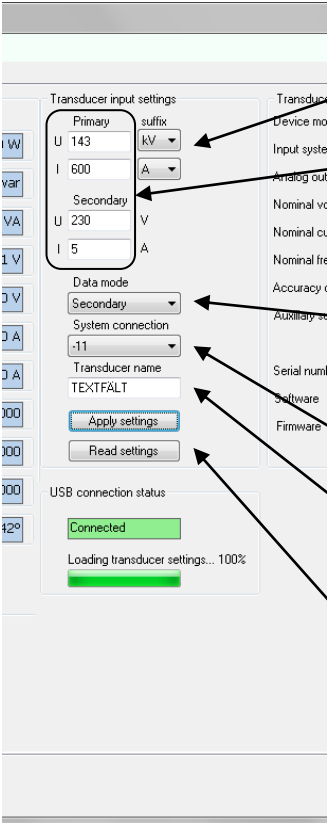
	L1	L2	L3
P	0,0 kW	0,0 kW	0,0 kW
Q	0,0 kvar	0,0 kvar	0,0 kvar
S	59,4 kVA	9,9 kVA	29,7 kVA
U	331,68 kV	331,70 kV	331,67 kV
U12, U23, U31	0,00 kV	0,00 kV	0,00 kV
I	0,000 A	0,000 A	0,000 A
IS	0,000 A	0,000 A	0,000 A
PF	0,000	0,000	-1,000
QF	0,000	-1,000	0,000
LF	0,000	-1,000	0,000
PA	123,612°	131,693°	170,101°
F	49,978 Hz		

The measuring inputs on LQT60 can be connected to nets with a nominal main voltage between 100 and 400 V AC and a current with a nominal value 1, 2 or 5 A. With the software ConfigLQT the unit can be used for all different connections in 1-phase and 3-phase nets.

### 3.2.1 Parameters monitorized

<b>P</b> Power $P=S*\cos(\varphi) [W]$	<b>IS</b> System current with sign??
<b>Q</b> Reactive power $Q=S*\sin(\varphi) [var]$	<b>PF</b> Power factor $PF=P/S$
<b>S</b> Appearant power $S=rot(3)*Uh*Ih [VA]$	<b>QF</b> Reactive power factor $QF=Q/S$
<b>U</b> Voltage	<b>LF</b> = sign(Q)*(1- PF )
<b>I</b> Current	<b>PA</b> Phase angle
	<b>F</b> Frequency

### 3.3 Configuration inputs – Transducer input settings



The screenshot shows the 'Transducer input settings' window. It includes fields for Primary and Secondary voltage and current, a Data mode selector, a System connection dropdown, a Transducer name text field, and buttons for 'Apply settings' and 'Read settings'. A USB connection status bar at the bottom shows 'Connected' and 'Loading transducer settings... 100%'.

**Primary Suffix:** U: V, kV, MV  
I: A, kA

**Transformer ratios**

**Data mode** select value to be shown.

- Primary – values based on primary data.
- Secondary – values based on secondary data.
- Raw – 100 000 = 100% compared with transducer Nominal U/I.

**System connection:** For information please see page 5.

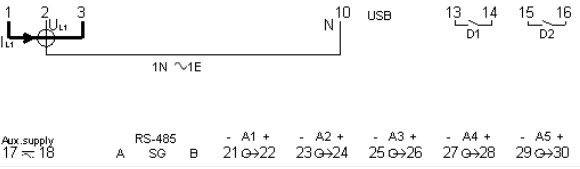
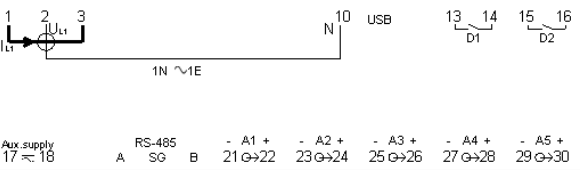
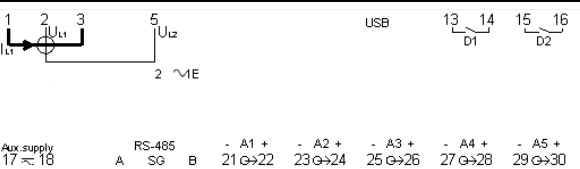
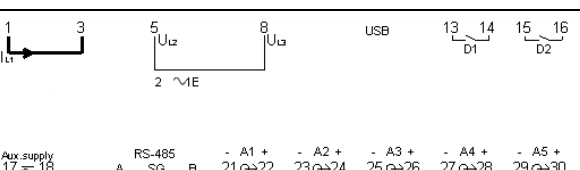
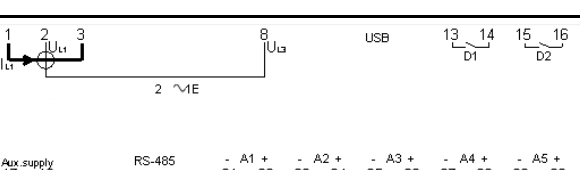
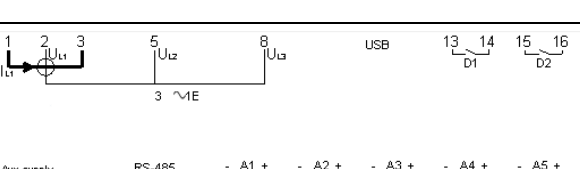
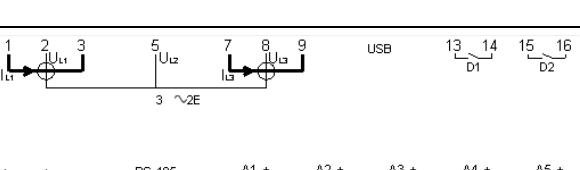
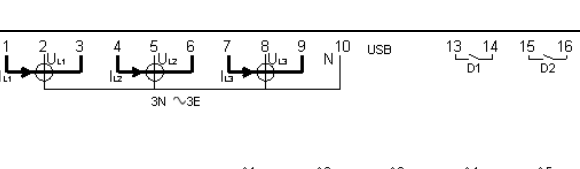
**Transducer name** – Text field – 20 characters

**Apply settings:** Save data to transducer.

**Read settings:** Read present settings from LQT60 to ConfigLQT

### 3.3.1 Connection diagrams – System connection

Select appropriate diagram for the transducer.

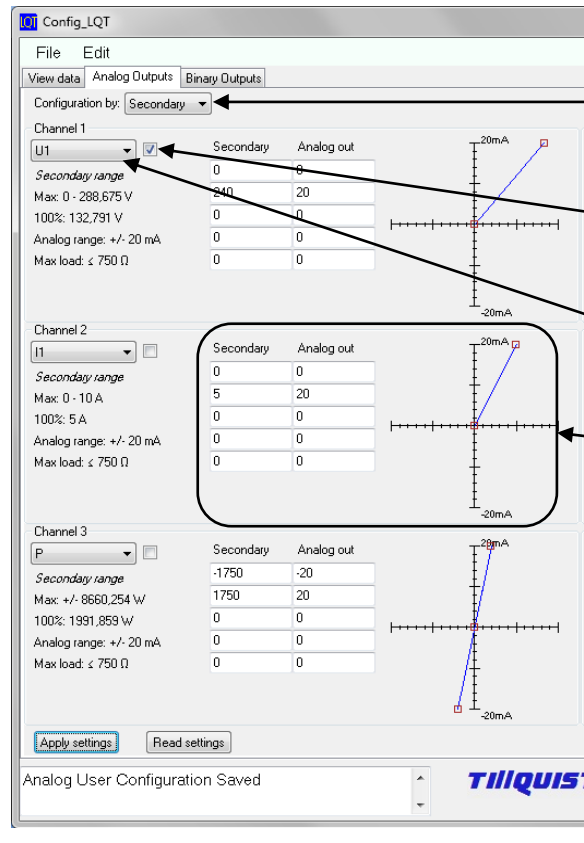
-00	1-phase 1 system  4 wire 3-phase symmetric load	
-01	1-phase 1 system  Single-phase AC	
-02	1-phase 1 system  3 wire 3-phase symmetric load phase-shift U12-I1	
-03	1-phase 1 system  3 wire 3-phase symmetric load phase-shift U23-I1	
-04	1-phase 1 system  3 wire 3-phase symmetric load phase-shift U31-I1	
-05	3-phase 1 system  3-phase symmetrical load	
-09	3-phase 2 system  3-wire 3-phase asymmetrical load	
-11	3-phase 3 system  4-wire 3-phase asymmetrical load	



System-connection	Application	I1	I2	I3	N	U1	U2	U3	U12	U23	U31	U =	I =	P =	Q =	S =
-00	4 wire 3 phase symmetric load	X	-	-	X	X	-	-	-	-	-	U1	I1	P1*3	Q1*3	S1*3
-01	1 wire 1 phase	X	-	-	X	X	-	-	-	-	-	U1	I1	P1	Q1	S1
-02	3 wire 3 phase symmetric load	X	-	-	-	-	-	-	X	-	-	-	-	PI1U12	QI1U12	I1*U12*√3
-03	3 wire 3 phase symmetric load	X	-	-	-	-	-	-	-	X	-	-	-	PI1U23	QI1U23	I1*U23*√3
-04	3 wire 3 phase symmetric load	X	-	-	-	-	-	-	-	-	X	-	-	PI1U31	QI1U32	I1*U31*√3
-05	3 wire 3 phase symmetric load	X	-	-	-	X	X	X	X	X	X	-	I1	P1*3	Q1*3	S1*3
-09	3 wire 3 phase asymmetric load	X	-	X	-	X	X	X	X	X	X	-	(I1+I3)*3/2	(P1+P3)*3/2	(Q1+Q3)*3/2	(S1+S3)*3/2
-11	4 wire 3 phase asymmetric load	X	X	X	X	X	X	X	X	X	X	(U1+U2+U3)/3	(I1+I2+I3)/3	P1+P2+P3	Q1+Q2+Q3	S1+S2+S3
-11	4 wire 3 phase asymmetric load Open Delta	X	X	X	-	X	X	X	X	X	X	(U1+U2+U3)/3	(I1+I2+I3)/3	P1+P2+P3	Q1+Q2+Q3	S1+S2+S3

### 3.4 Analog Outputs

To configure the analog outputs select **Analog Outputs**.



**Configuration by:** Primary or Secondary.  
Configuration of the output based on primary or secondary value.

Activating a channel.

Drop-down list to select quantity or fixed output signal.

Characteristics for the output shown as a graph

Example:  
I1: 0 – 5 A  
Ut: 4 – 20 mA

Secondary	Analog out
0	4
5	20
0	0
0	0
0	0

The 5 analog outputs can freely be configured to the required measuring quantity within the allowed measuring ranges. Select the quantity that is to be connected to the analog output using the drop-down list.

In the field **Primary/Secondary** the start values is to be written in the first space and in the following space the end value and the breakpoints if any are to be indicated. Under **Analog out** the corresponding values of the output signal are indicated.

*Apply settings* transfer and save the new settings in the transducer.

To simulate the outputs to test for instance a panel instrument, please use the drop-down list (Fixed Output). Write the output that you desire and click *Apply settings*.

### 3.4.1 Measured quantities

Prefix	Quantity	Calculation	System / Phase
I	Input current	$(I1+I2+I3)/3$	System
I1	Phase current L1		L1
I2	Phase current L2		L2
I3	Phase current L3		L3
U	Input voltage	$(U1+U2+U3)/3$	System
U1	L1 Phase voltage		L1
U2	L2 Phase voltage		L2
U3	L3 Phase voltage		L3
P	Active power	$P1+P2+P3$	System
P1	Active power L1		L1
P2	Active power L2		L2
P3	Active power L3		L3
Q	Reactive power	$Q1+Q2+Q3$	System
Q1	Reactive power L1		L1
Q2	Reactive power L2		L2
Q3	Reactive power L3		L3
S	Apparent power	$S1+S2+S3$	System
S1	Apparent power L1		L1
S2	Apparent power L2		L2
S3	Apparent power L3		L3
U12	Main voltage L1-L2		L1 - L2
U23	Main voltage L2-L3		L2 - L3
U31	Main voltage L3-L1		L3 - L1
PF	Active power factor	$P/S$	System
PF1	Active power factor	$\cos(\phi1)=P1/S1$	L1
PF2	Active power factor	$\cos(\phi2)=P2/S2$	L2
PF3	Active power factor	$\cos(\phi3)=P3/S3$	L3
QF	Reactive power factor	$Q/S$	System
QF1	Reactive power factor	$\sin(\phi1)=Q1/S1$	L1
QF2	Reactive power factor	$\sin(\phi2)=Q2/S2$	L2
QF3	Reactive power factor	$\sin(\phi3)=Q3/S3$	L3
LF	LF factor	$\text{sign}(Q)*(1- PF )$	System
LF1	LF factor	$\text{sign}(Q1)*(1- PF1 )$	L1
LF2	LF factor	$\text{sign}(Q2)*(1- PF2 )$	L2
LF3	LF factor	$\text{sign}(Q3)*(1- PF3 )$	L3
PA	Phase angel	$PA=(PA1+PA2+PA3)/3$	System
PA1	Phase angel	$\phi1=\arccos(P1/S1)/\pi*180*\text{sign}(P1)$	L1
PA2	Phase angel	$\phi2=\arccos(P2/S2)/\pi*180*\text{sign}(P2)$	L2
PA3	Phase angel	$\phi3=\arccos(P3/S3)/\pi*180*\text{sign}(P3)$	L3
IS	Input current with sign	$(I1+I2+I3)/3$	System
IS1	Phase current with sign	$I1*\text{sign}(P1)$	L1
IS2	Phase current with sign	$I2*\text{sign}(P2)$	L2
IS3	Phase current with sign	$I3*\text{sign}(P3)$	L3
P_I1_U12	Active power, System connection-02		System
P_I1_U23	Active power, System connection -03		System
P_I1_U31	Active power, System connection -04		System
Q_I1_U12	Reactive power, System connection -02		System
Q_I1_U23	Active power, System connection -03		System
Q_I1_U31	Active power, System connection -04		System
F	Frequency		System
Fixed Output	Fixed output		

### 3.5 Binary Outputs

To configuration the binary outputs, select the **Binary outputs**.

The screenshot shows the 'Config\_LQT' window with the 'Binary Outputs' tab selected. It displays configuration parameters for two binary outputs, Output 1 and Output 2. The parameters include:

- Voltage:** Primary (143), Secondary (230), Turnover (0.6217).
- Current:** Primary (600), Secondary (5), Turnover (120).
- Output 1 Settings:**
  - Output Mode: Pulse Mode
  - Logic Level: Low
  - Energy of P or Q: Energy P
  - Direction: Imported
  - Pulse Frequency: 1000 imp/kWh Secondary
  - Pulse Length: 50 ms
  - CT x VT: 74.604
  - Pulse Value: 13.4041 imp/kWh Primary
  - Pulse Value: 0 kWh/imp
  - Power to transducer: 1.992 kW
  - Pulses/h: 1992
- Output 2 Settings:**
  - Output Mode: Pulse Mode
  - Logic Level: High
  - Energy of P or Q: Energy P
  - Direction: Exported
  - Pulse Frequency: 10000 imp/kWh Secondary
  - Pulse Length: 50 ms
  - CT x VT: 74.604
  - Pulse Value: 13.4041 imp/kWh Primary
  - Pulse Value: 0 kWh/imp
  - Power to transducer: 1.992 kW
  - Pulses/h: 19920
- Hardware limits of output 1:**
  - Max Pulses/h: 200
  - Min Pulse Length [ms]: 50
  - Max Volt [V]: 250
  - Max Current [A]: 5
  - Binary Output Type: RL
- Hardware limits of output 2:**
  - Max Pulses/h: 200
  - Min Pulse Length [ms]: 50
  - Max Volt [V]: 250
  - Max Current [A]: 5
  - Binary Output Type: RL

Buttons at the bottom include 'Apply settings' and 'Read settings'. The status bar shows 'Transducer settings Saved' and the 'THORQUIST' logo.

### 3.6 Save / Open saved configuration

The stored parameters in the LQT60 can be saved to a file.

#### 3.6.1 Save to file

1. Select *File* and *Save file*.
2. Write filename and select folder.

#### 3.6.2 Load from file

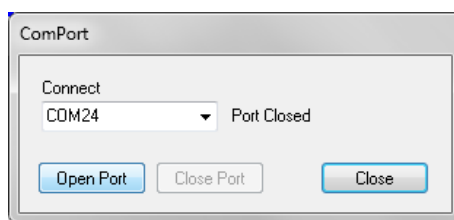
1. Select *File* and *Open file*.
2. Select saved configuration file (XML-dokument).

## 4 Upgrade of firmware in LQT60

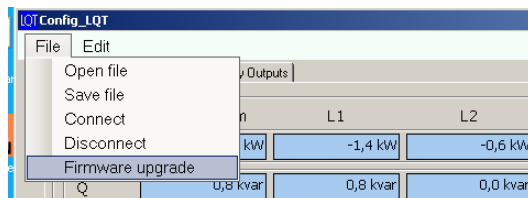
LQT60 firmware is upgraded with ConfigLQT. Connect the computer to the USB port of the computer. Find out which COM-port that LQT60 is connected to.

You find information about this in "Windows Device Manager" section "Ports". See page 14, chapter 5 for further information.

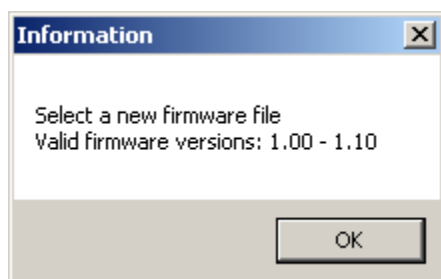
1. Start Config LQT.
2. Select *File* and *Connect*.
3. Select COM-port in the drop-down list and click *Open*



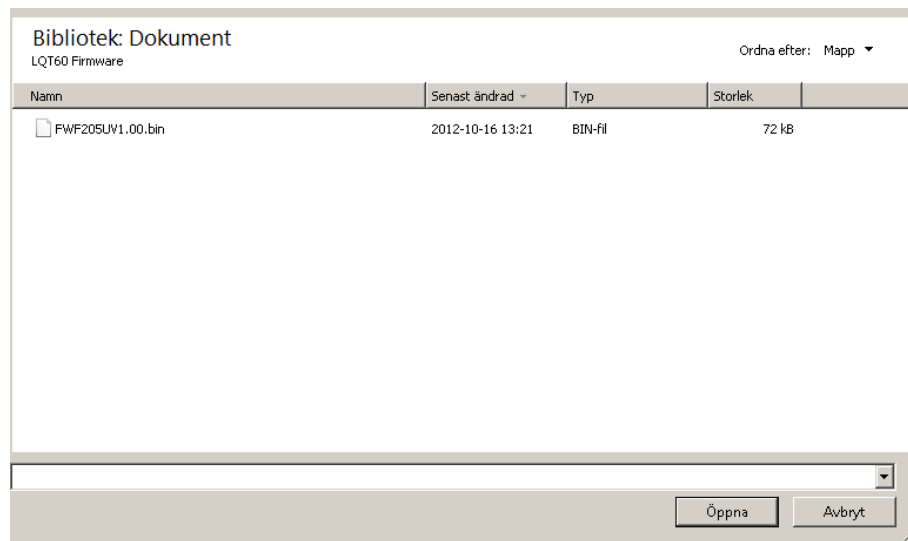
4. Close the window with *Close*.
5. Select: *File* and *Firmware upgrade*.



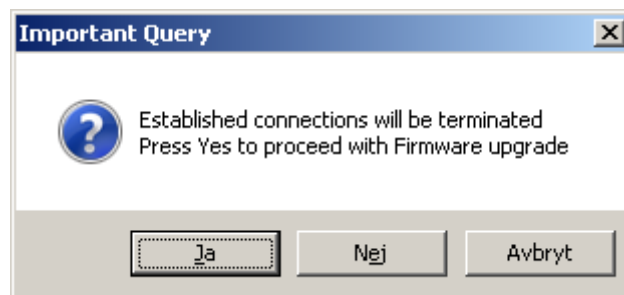
6. Information about the available firmware versions that can be installed with this version of Config LQT is shown. In case a new version of firmware is installed the latest version of ConfigLQT must be chosen.



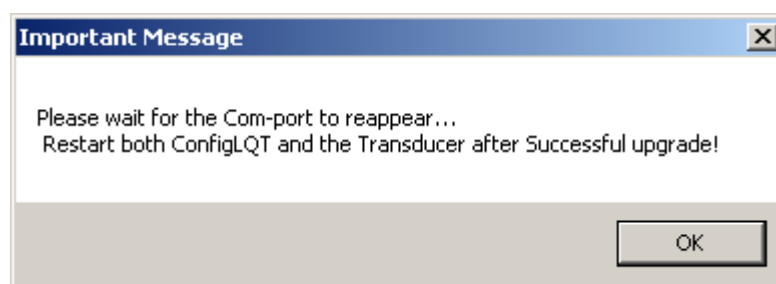
7. Select firmware file.



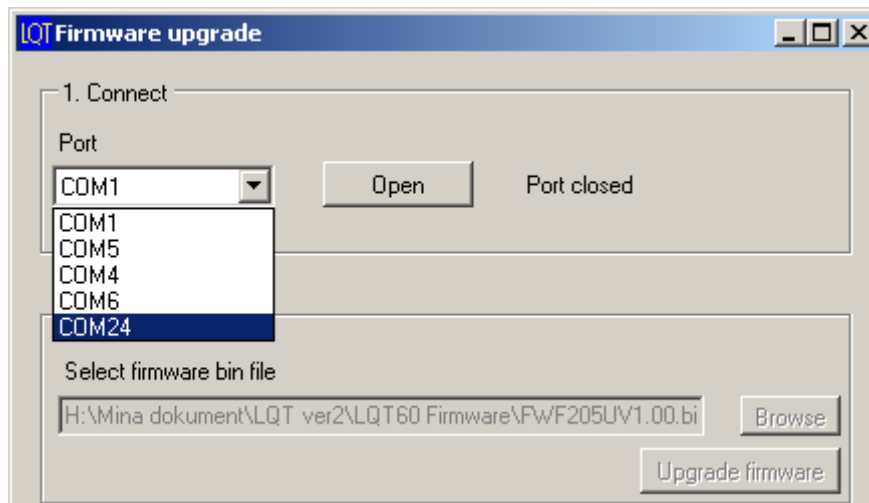
8. Click *Yes (Ja)*. The connection with LQT60 will be terminated.



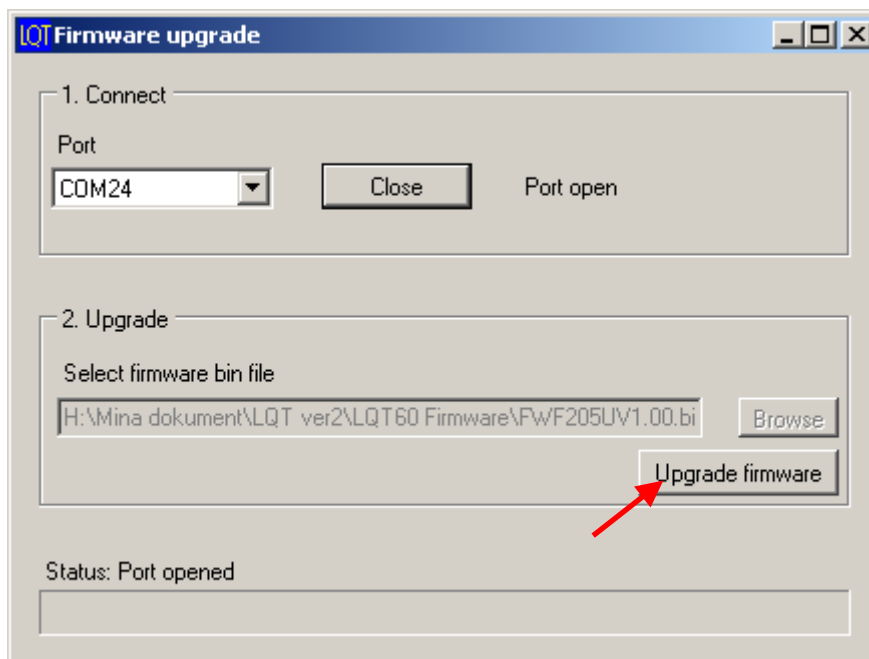
9. Click *OK*.



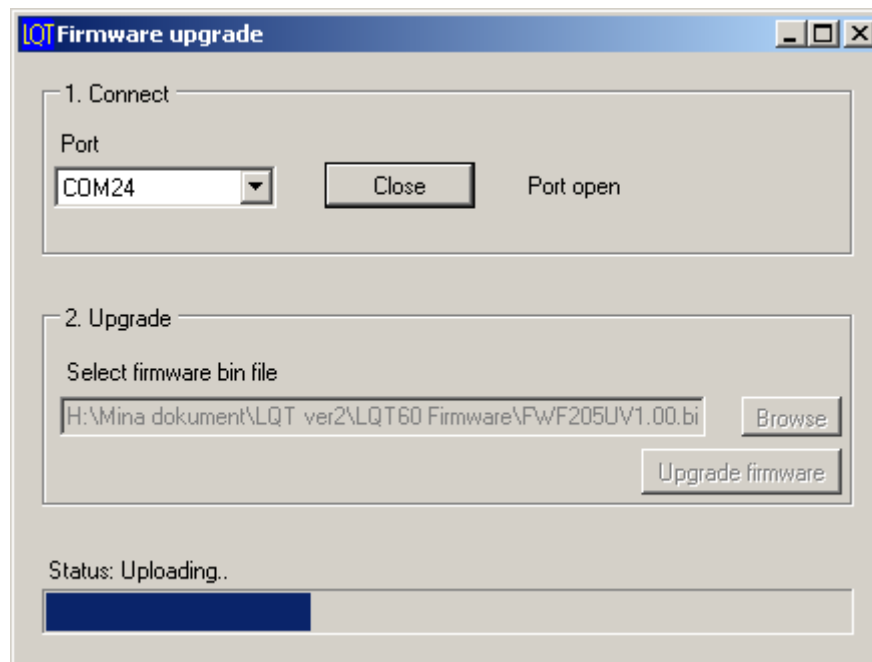
10. Select COM-port and click *Open*.



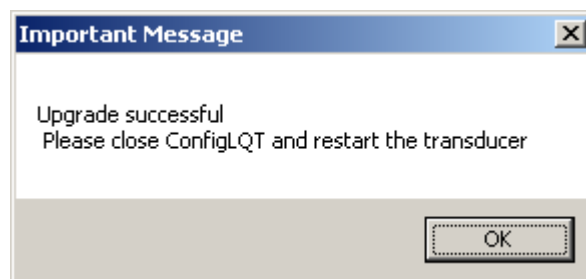
11. Click *Upgrade firmware*.



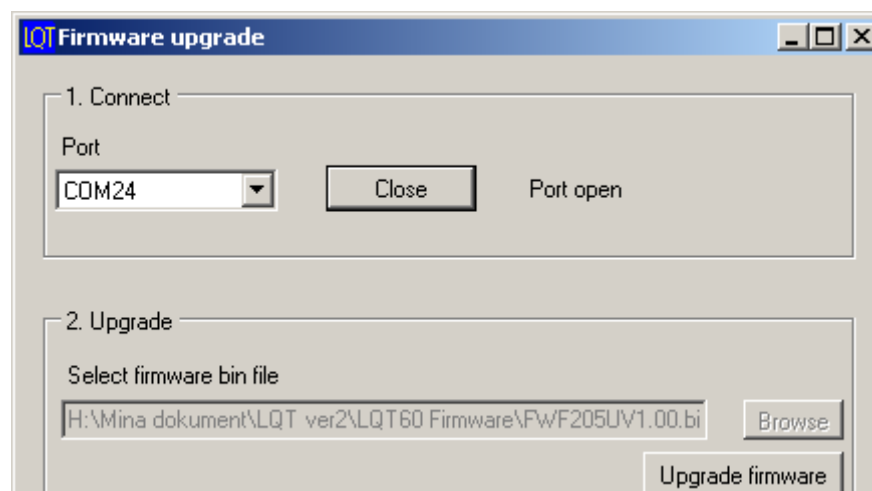
12. The upgrade is done.



13. Message that the upgrade was successful is shown. Click *OK*.



14. Click *Close* and restart LQT60 by interrupting the aux. supply.

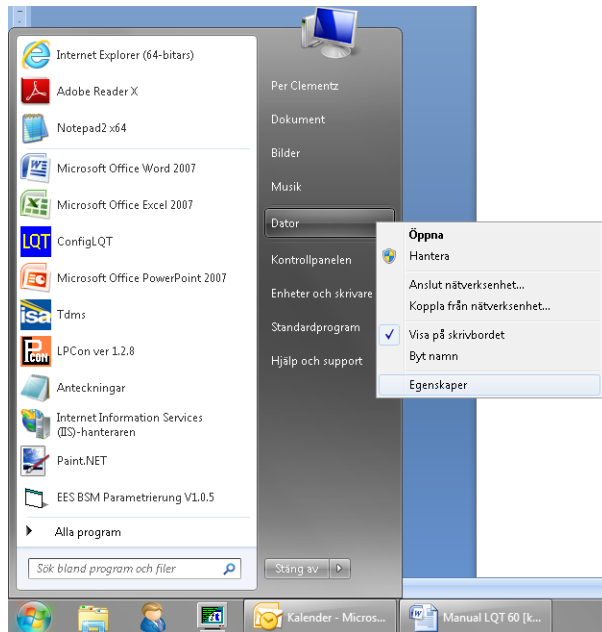




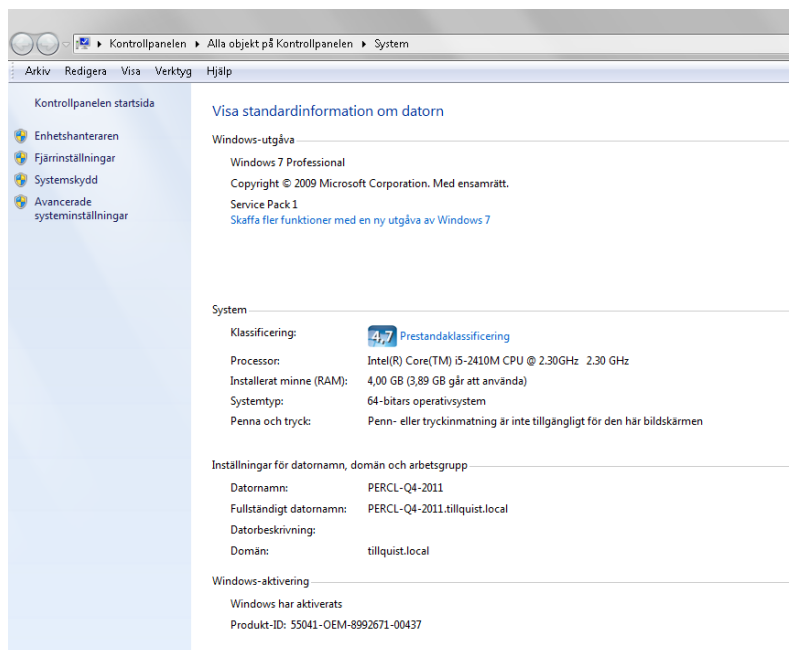
## 5 Which COM-port is LQT60 using

In **Windows Device Manager** you find information about the COM-port that LQT60 is using. Below is a general description. It may differ between different Window versions, the principle is however the same.

1. Select *Start (Windowsflag)*, right click *My Computer* and select *Properties*.



2. Here you will find the information about the Windows version that is used and if it is 32-bit or 64-bit. Select *Device manager*.



3. Expand *Ports (COM och LPT)*. Look for a unit with the name **"STMicroelectronics Virtual COM Port"**. Within brackets you find the information about the COM-port of the unit.

