# USER MANUAL
# LQT60 & LQT400



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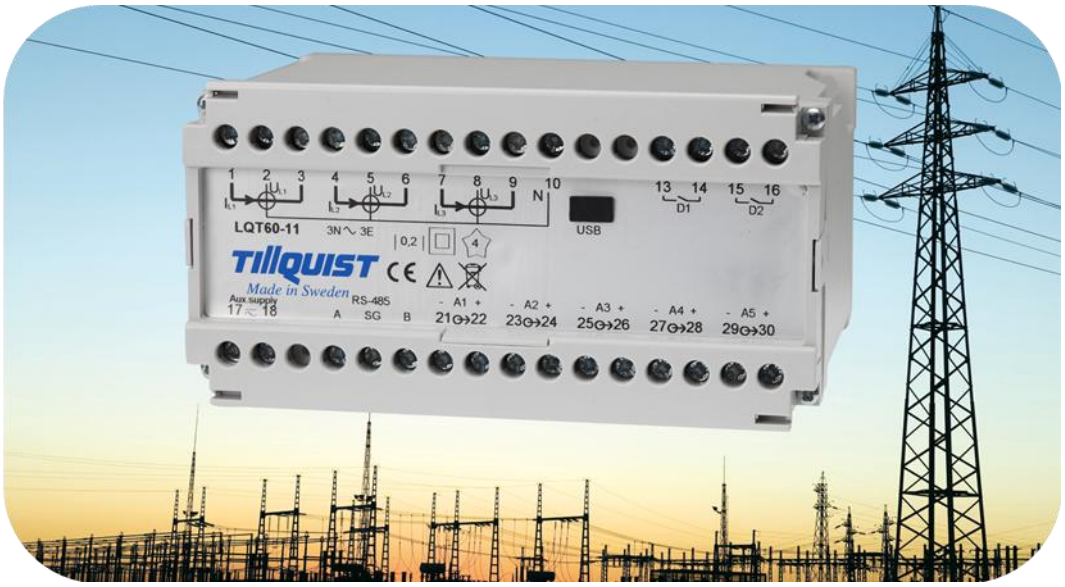
**Thank you for choosing LQT from Hugo Tillquist AB!**

***The LQT is a configurable multitransducer for all electrical quantities. All areas for AC current and voltage (True RMS) is covered by one single unit.***

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



# Contents

# 1 LQT product description

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

# 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 mm² in accordance with connection diagram.
Connection diagram, see page 5.

## 2.2 Installation software ConfigLQT

The installation package consists of configuration software and USB driver. ”.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/ 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 LQT

## 3.1 Connection LQT to computer

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

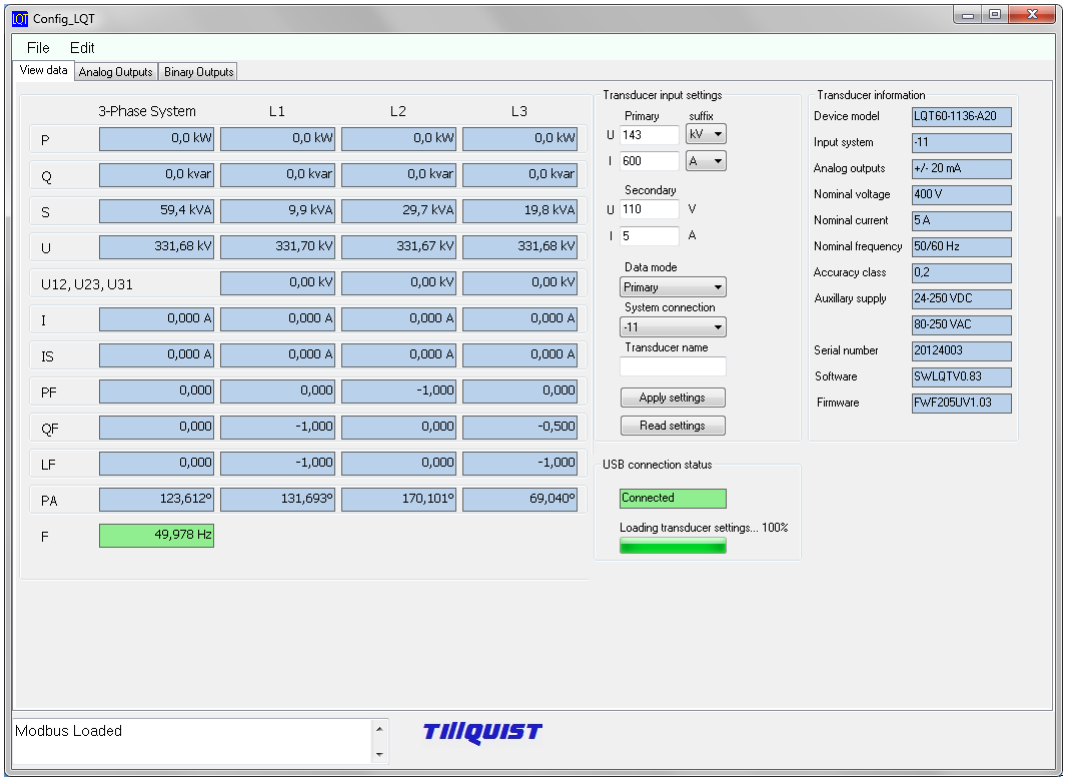
Click *File* and choose *Connect*.

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 configurated 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 measuring inputs on LQT 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

**P** Power
*P=S*cos(φ) [W]*

**Q** Reactive power
*Q=S*sin(φ) [var]*

**S** Appearant power
*S=rot(3)*Uh*Ih [VA]*

**U** Voltage

**I** Current

**IS** System current with sign??

**PF** Power factor
*PF=P/S*

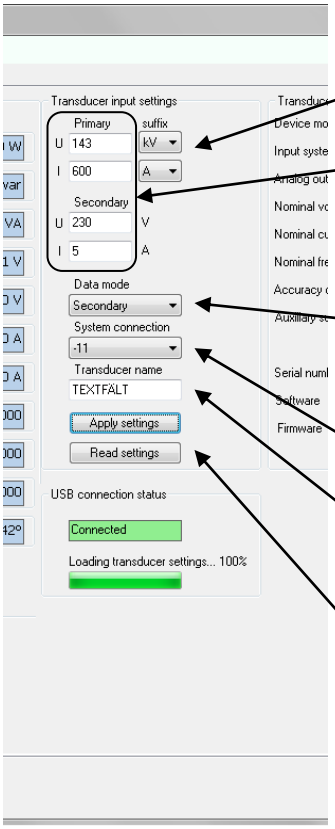
**QF** Reactive power factor
*QF=Q/S*

**LF** = sign(Q)*(1-|PF|)

**PA** Phase angle

**F** Frequency

## 3.3 Configuration inputs – Transducer input settings




**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.

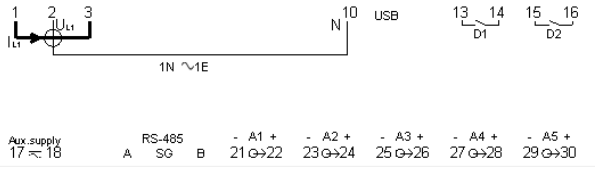
**Read settings**: Read present settings from LQT to ConfigLQT

### 3.3.1 Connection diagrams – System connection

Select appropriate diagram for the transducer.

-00 1-phase
1 system

4 wire
3-phase symmetric load

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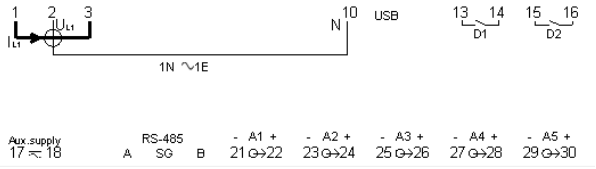
-01 1-phase
1 system

Single-phase AC

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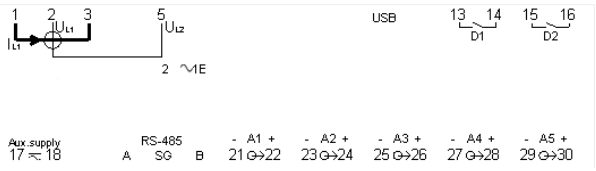
-02 1-phase
1 system

3 wire
3-phase symmetric load
phase-shift U12-I1

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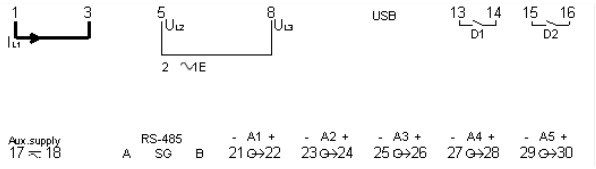
-03 1-phase
1 system

3 wire
3-phase symmetric load
phase-shift U23-I1

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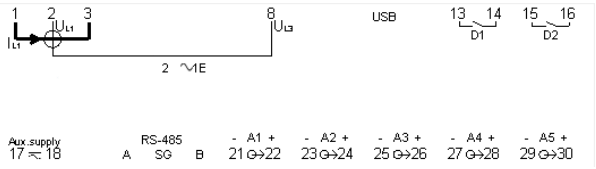
-04 1-phase
1 system

3 wire
3-phase symmetric load
phase-shift U31-I1

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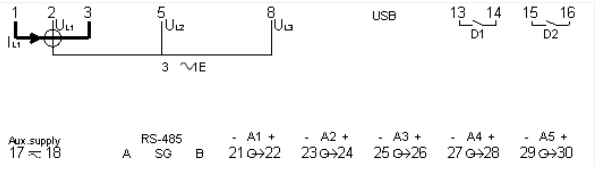
-05 3-phase
1 system

3-phase symmetrical load

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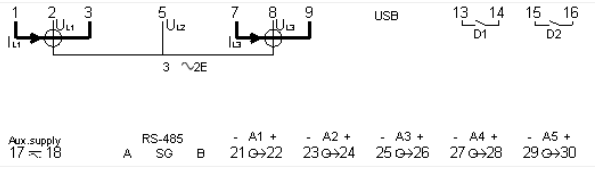
-09 3-phase
2 system

3-wire
3-phase asymmetircal load

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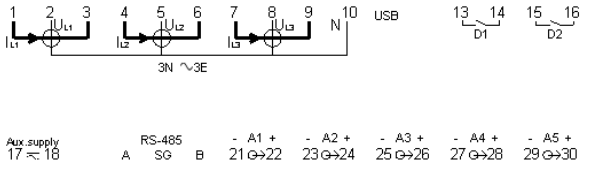
-11 3-phase
3 system

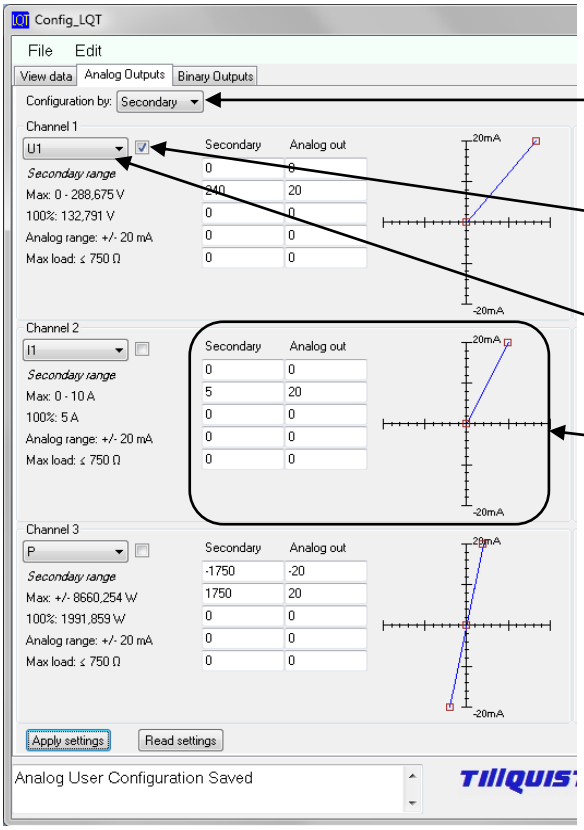
4-wire
3-phase asymmetircal load



| System-connection | Application | I1 | I2 | I3 | N | U1 | U2 | U3 | U12 | U23 | U31 | U = | I = | P = | Q = | S = |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -00 | 4 wire<br>3 phase symmetric load | X | - | - | X | X | - | - | - | - | - | U1 | I1 | P1*3 | Q1*3 | S1*3 |
| -01 | 1 wire<br>1 phase | X | - | - | X | X | - | - | - | - | - | U1 | I1 | P1 | Q1 | S1 |
| -02 | 3 wire<br>3 phase symmetric load | X | - | - | - | - | - | - | X | - | - | - | - | PI1U12 | QI1U12 | I1*U12*√3 |
| -03 | 3 wire<br>3 phase symmetric load | X | - | - | - | - | - | - | - | X | - | - | - | PI1U23 | QI1U23 | I1*U23*√3 |
| -04 | 3 wire<br>3 phase symmetric load | X | - | - | - | - | - | - | - | - | X | - | - | PI1U31 | QI1U32 | I1*U31*√3 |
| -05 | 3 wire<br>3 phase symmetric load | X | - | - | - | X | X | X | X | X | X | - | I1 | P1*3 | Q1*3 | S1*3 |
| -09 | 3 wire<br>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<br>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<br>3 phase asymmetric load<br>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 configurate 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 analog outputs can freely be configurated 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.

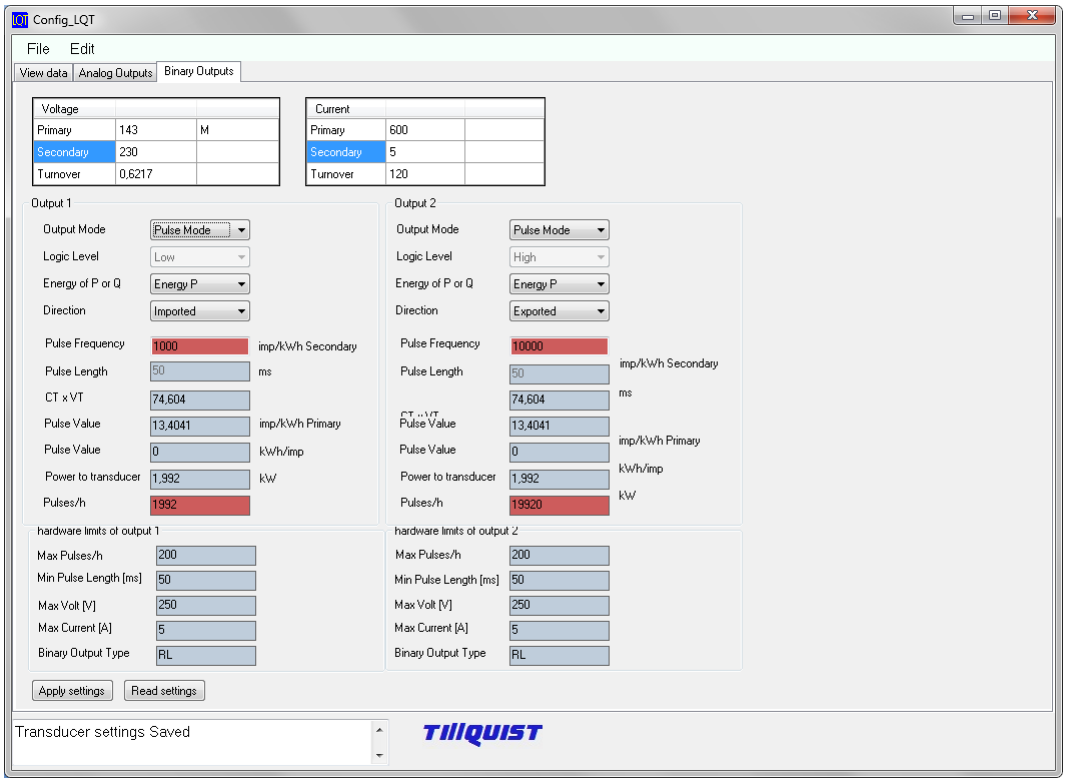
To simulate the outputs to test for instance a panel instrument, please use the drop-down list (Fixed Output). Write the output that you desire and click *Apply settings*.

### 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 voltageL1-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(φ1)=P1/S1 | L1 |
| PF2 | Active power factor | COS(φ2)=P2/S2 | L2 |
| PF3 | Active power factor | COS(φ3)=P3/S3 | L3 |
| QF | Reactive power factor | Q/S | System |
| QF1 | Reactive power factor | SIN(φ1)=Q1/S1 | L1 |
| QF2 | Reactive power factor | SIN(φ2)=Q2/S2 | L2 |
| QF3 | Reactive power factor | SIN(φ3)=Q3/S3 | L3 |
| LF | LF factor | sign(Q)*(1-\|PF\|) | System |
| LF1 | LF factor | sign(Q1)*(1-\|PF1\|) | L1 |
| LF2 | LF factor | sign(Q2)*(1-\|PF2\|) | L2 |
| LF3 | LF factor | sign(Q3)*(1-\|PF3\|) | L3 |
| PA | Phase angel | PA=(PA1+PA2+PA3)/3 | System |
| PA1 | Phase angel | φ1=ARCCOS(P1/S1)/PI*180*sign(P1) | L1 |
| PA2 | Phase angel | φ2=ARCCOS(P2/S2)/PI*180*sign(P2) | L2 |
| PA3 | Phase angel | φ3=ARCCOS(P3/S3)/PI*180*sign(P3) | L3 |
| IS | Input current with sign | (IS1+IS2+IS3)/3 | System |
| IS1 | Phase current with sign | I1*sign(P1) | L1 |
| IS2 | Phase current with sign | I2*sign(P2) | L2 |
| IS3 | Phase current with sign | I3*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 (LQT60 WIDE)

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




## 3.6 Save / Open saved configuration

The stored parameters in the LQT 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).

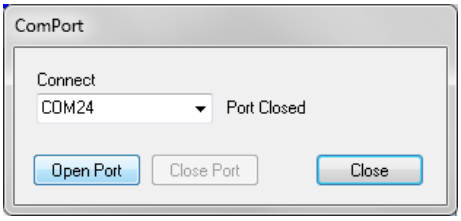
# 4 Upgrade of firmware in LQT

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

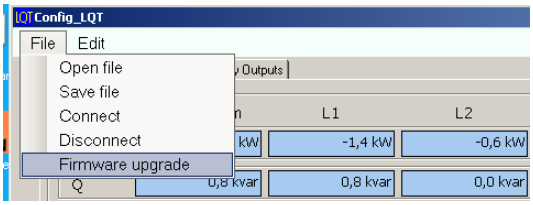
2. Select *File* and *Connect.*

3. Select COM-port in the drop-down list and click *Open*

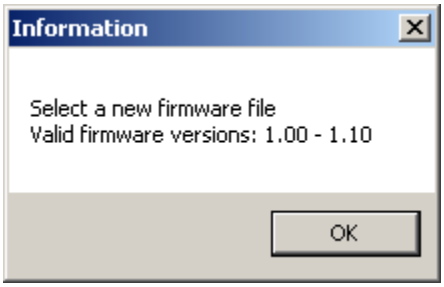



*4.* Close the window with *Close.*

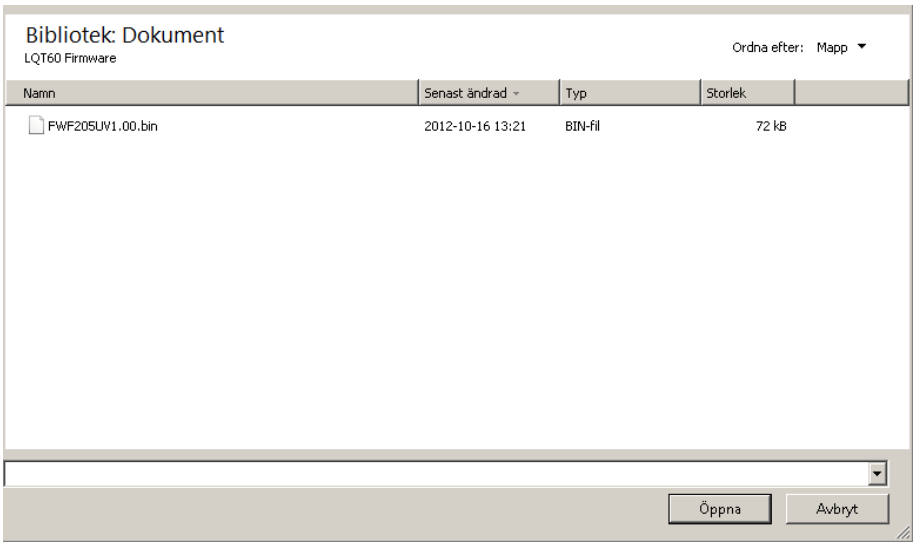
5. Select: *File* and *Firmware upgrade*.




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.

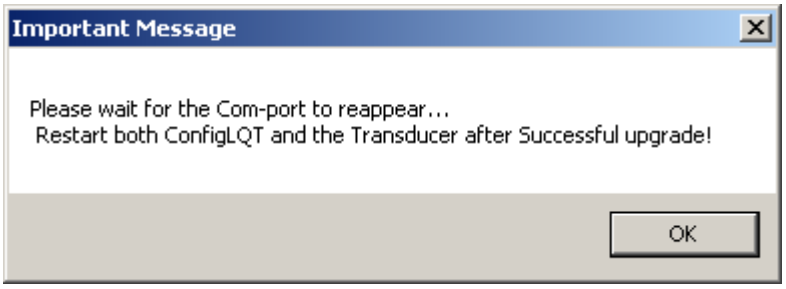


7. Select firmware file.

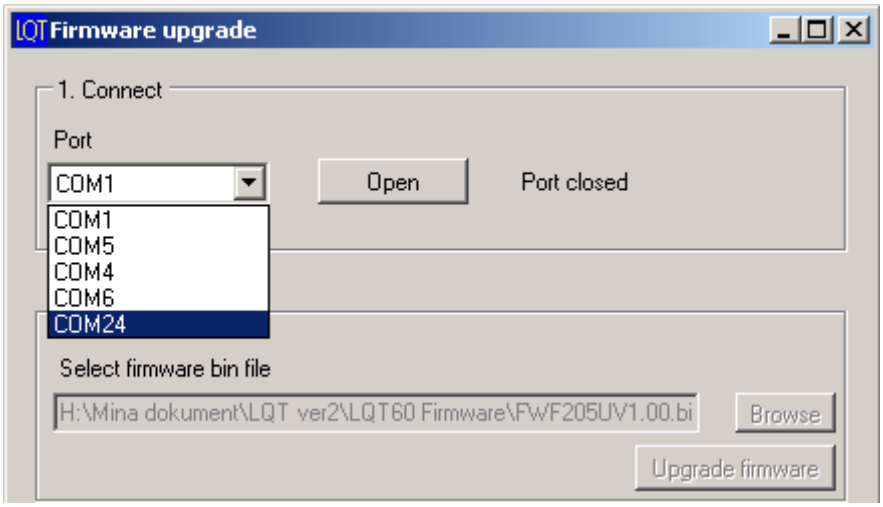



8. Click *Yes*. The connection with LQT will be terminated.

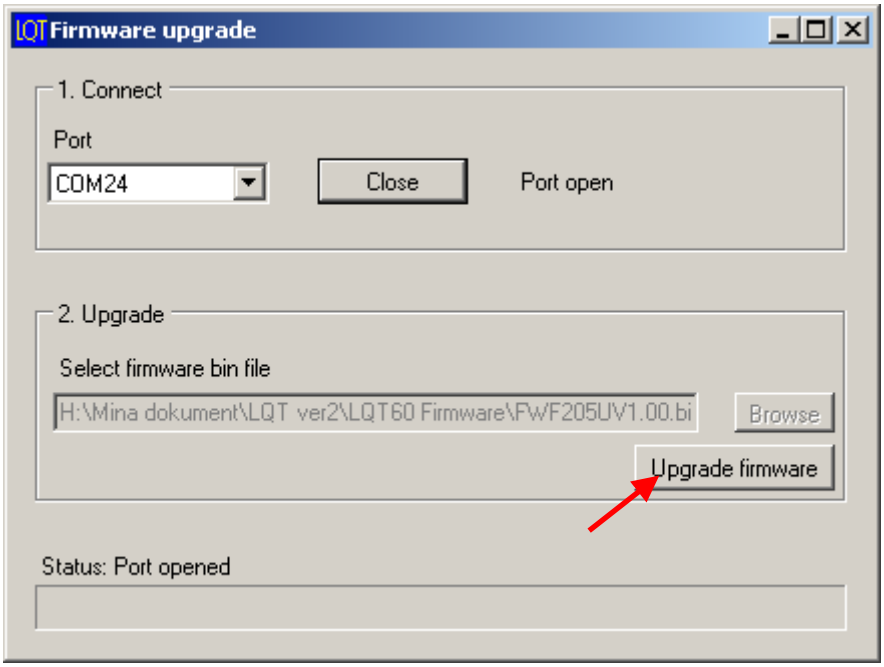

9. Click *OK*.



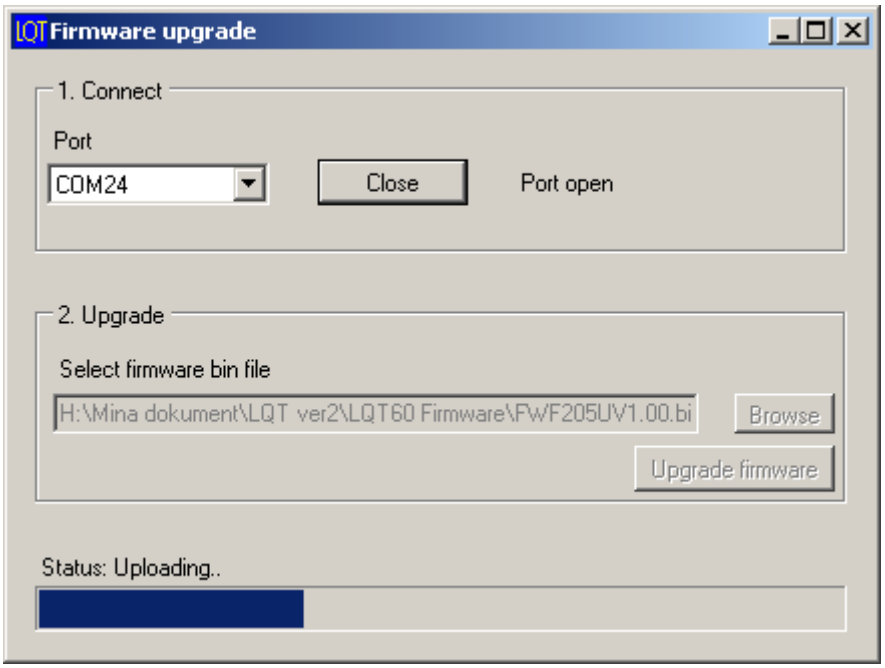
10. Select COM-port and click *Open*.



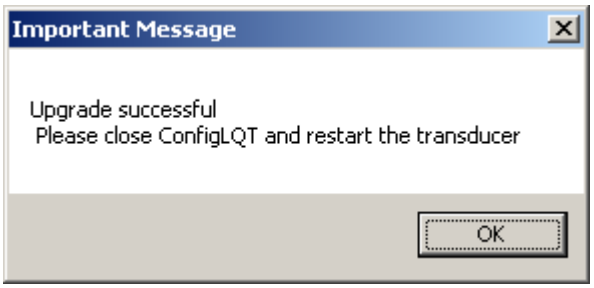

11. Click *Upgrade firmware*.



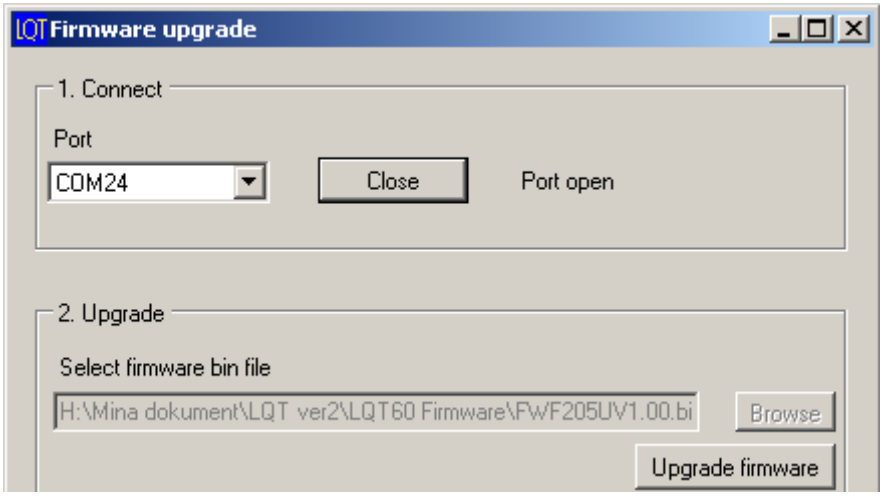
12. The upgrade is done.




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



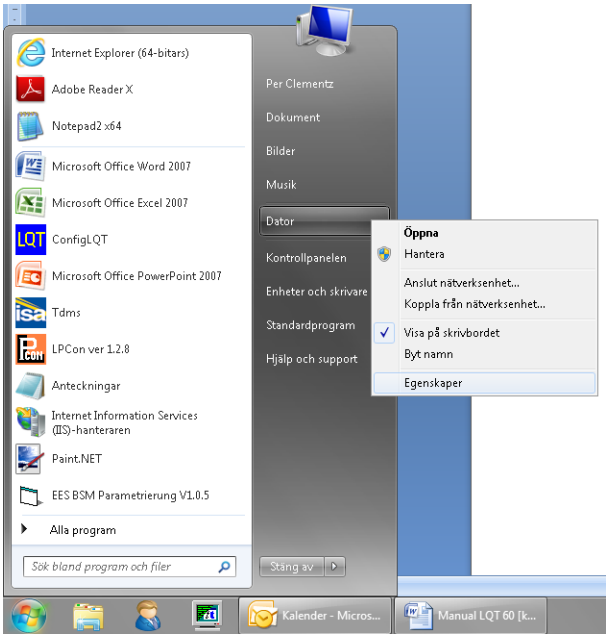

14. Click *Close* and restart LQT by interrupting the aux. supply.



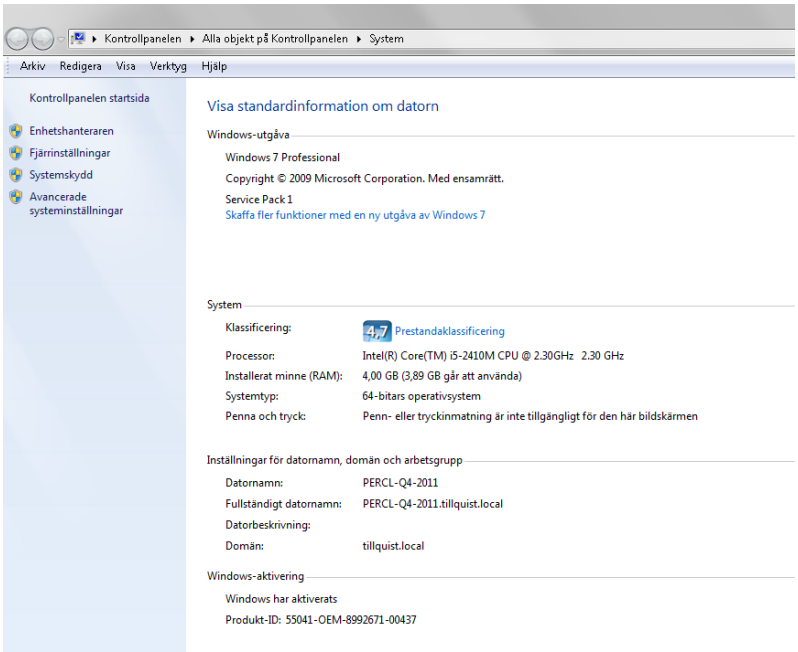
# 5 Which COM-port is LQT using

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

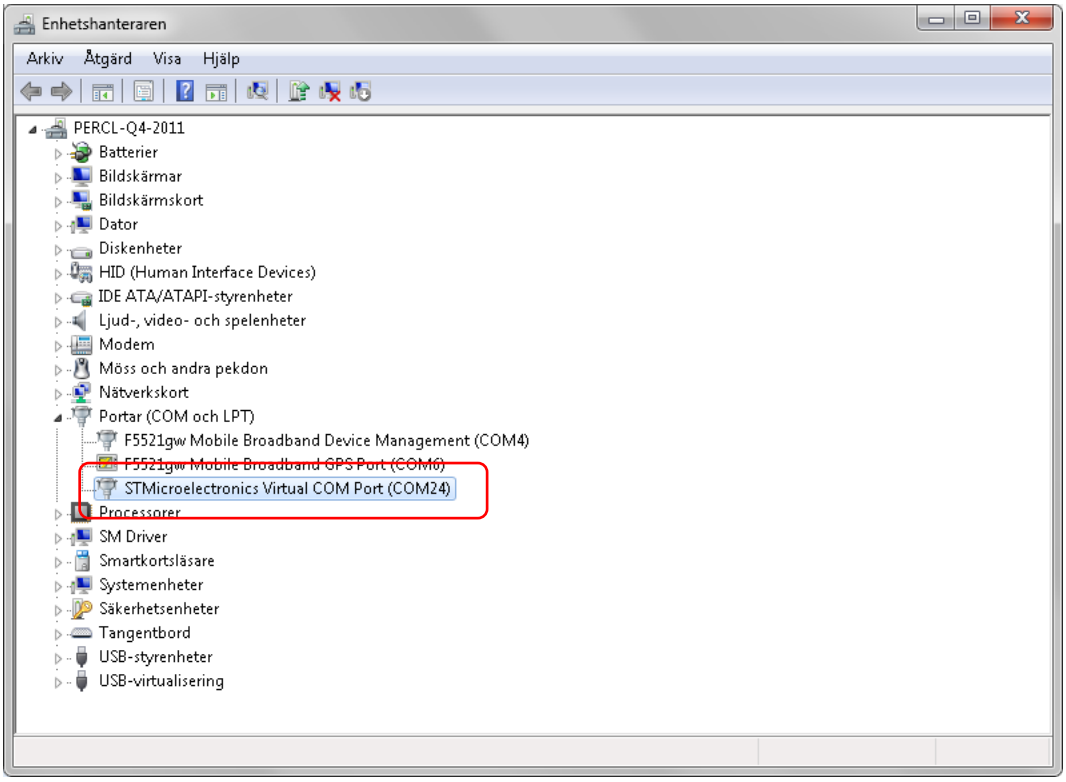
1. Select *Start (Windowsflag)*, right click *My Computer* and select *Properties*.




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 Virtal COM Port**”. Within brackets you find the information about the COM-port of the unit.



# 6 Appendix

## 6.1 Technical data LQT400

| | | |
|---|---|---|
| **Input** | **Voltage** | |
| | Voltage range (Un) | 100 – 400 V main voltage (nominal) |
| | Measuring range | 0 – 500 V TRMS |
| | Overload voltage | 1.5 x Un – continuously, 2 x Un – 10 s |
| | Consumption | U x 1 mA / phase |
| | Frequency | 10…40….70…120 Hz |
| | **Current** | |
| | Current (In) | 1 – 5 A |
| | Measuring range | 1 – 10 A TRMS |
| | Overload current | 2 x In continuously, 10 x In 15 s, 40 x In 1 s |
| | Consumption | <0.05 VA / phase |
| | **Aux. Supply** | |
| | | 24 – 250 VDC<br>80 – 250 VAC |
| | Burden | max 8 VA |
| **Output** | **Analog** | |
| | Analog output | 2 |
| | Range | +/- 20 mA<br>+/- 10 V (option) |
| | External resistance load | max 750 ohm (15V) |
| | Response time | <100 msec |
| **General data** | Accuracy | 0.2 |
| | Galvanic isolation | Supply, in- and output are galvanically isolated |
| | USB | 1 port for configuration |
| | Temperature | -10…+55 °C (operation), -40…+70 °C (storage)<br>Temperature coefficient less than 0.1% / 10 °C |
| | Test voltage | 4 kV AC / min |
| | Inputs | overvoltage cat. III |
| | Outputs | overvoltage cat. II |
| | Pollution degree | 2 |
| | Dimension (B x H x D) | 70 x 132 x 137 mm – DIN-rail |
| | Weight | ca 0.5 kg |
| | Standards | SS-EN 60688 Transducers<br>SS-EN 601010 Safety<br>EN 61000-6-2 / -6-4 / -6-5 |

## 6.2 Technical data LQT60

| | | |
|---|---|---|
| **Inputs** | **Voltage** | |
| | 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 |
| | **Current** | |
| | 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 |
| | **Aux. supply** | |
| | | 24 – 250 VDC<br>80 – 250 VAC |
| | Consumption | max 8 W |
| **Outputs** | **Analog** | |
| | Number | 5 pcs |
| | Area | +/- 20 mA<br>+/- 10 V (option) |
| | Load | max 750 ohm (15V) |
| | Response time | < 100 ms |
| | **Digital** | |
| | Number | 2 transitor 110 V AC/DC, 100 mA |
| **General data** | Accuracy class | 0.2 |
| | USB | 1 pc for configuration |
| | Temperature range | -10 to +55 C° (operation)<br>-40 to +70 C° (storage)<br>Temperature coefficient < 0.1% / 10 C° |
| | Test voltage | 4 kV AC / min |
| | Inputs | Overvoltage cat. III |
| | Outputs | Overvoltag 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<br>SS-EN 601010 Safety<br>EN 61000-6-2 / -6-4 / -6-5 |