

# 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.



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# 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 mm<sup>2</sup> 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 : <u>http://www.microsoft.com/net/</u>. and you will find .NET Framework.

Download ConfigLQT from <u>www.tillquist.com/eng/</u> 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.

Onfig_LC	2T						
File Ed	dit						
View data 🖉	Analog Outputs   Binary Outpu	ıts					
			1.2	1.0	Transducer input settings	Transducer informa	ation
	3-Priase System	LI	L2	L3	Primary suffix	Device model	LQT60-1136-A20
P	0,0 kW	0,0 kW	0,0 kW	0,0 kW	U 143 KV •	Input system	-11
Q	0,0 kvar	0,0 kvar	0,0 kvar	0,0 kvar	1 600 A V	Analog outputs	+/- 20 mA
	50.4 (4/4)	0.0 M/A	20.7 14/4	10.0 /4/4	Secondary	Nominal voltage	400∨
5	39,4 KVA	5,5 KVA	29,7 KVM	19,0 KVA		Nominal current	5 A
U	331,68 kV	331,70 kV	331,67 kV	331,68 kV	1.0	Nominal frequency	50/60 Hz
1112 11	23 1 31	0,00 kV	0,00 kV	0,00 kV	Data mode	Accuracy class	0,2
012,0	.20,001				System connection	Auxillary supply	24-250 VDC
I	0,000 A	0,000 A	0,000 A	0,000 A	-11 •		80-250 VAC
IS	0,000 A	0,000 A	0,000 A	0,000 A	Transducer name	Serial number	20124003
DE	0.000	0.000	-1.000	0.000		Software	SWLQTV0.83
PF	0,000	0,000	1,000	0,000	Apply settings	Firmware	FWF205UV1.03
QF	0,000	-1,000	0,000	-0,500	Read settings		
LF	0,000	-1,000	0,000	-1,000	USB connection status		
PA	123.612º	131.693°	170.101°	69.040°	Connected		
				,	Loading transducer settings 100%		
F	49,978 Hz						
Modbus Lo	oaded		• <b>T</b> ///	QUIST			

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

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

#### **3.3** Configuration inputs – Transducer input settings



### 3.3.1 Connection diagrams – System connection

Select appropriate diagram for the transducer.

-00	1-phase 1 system		1N ∿1E		N 10	USB	13_14 1	15_16 
	4 wire 3-phase symmetric load	Aux supply 17 🛧 18	RS-485 A SG B	- A1 + 21 <i>G</i> →22	- A2 + 23⊙→24	- A3 + 25 ↔26	- A4 + 27 <del>G→2</del> 8	- 45+ 29⇔30
-01	1-phase 1 system		1N ∿1E		N 10	USB	13_14 D1	1516 
	Single-phase AC	Aux.supply 17 📩 18	RS-485 A SG B	- A1 + 21 ↔22	- A2 + 23⊖→24	- A3 + 25 0→26	- A4 + 27 G→28	- A5 + 29 ⇔30
-02	1-phase 1 system		5  ∪₂ 2 ~/E			USB	13_14 D1	1516 
	3 wire 3-phase symmetric load phase-shift U12-I1	Aux.supply 17 🖘 18	RS-485 A SG B	- A1 + 21⊖→22	- A2+ 23⊖→24	- A3 + 25 ເ→26	- A4 + 27 G→28	- A5+ 29⇔30
-03	1-phase 1 system		5  ∪⊔₂ 2 ~1E	8  V@		USB	13_14 D1	15_16 D2
	3 wire 3-phase symmetric load phase-shift U23-I1	Aux.supply 17 🖘 18	RS-485 A SG B	- A1 + 21⊖→22	- A2+ 23⊖→24	- A3 + 25 ເ→26	- A4 + 27 G→28	- A5+ 29⇔30
-04	1-phase 1 system		2 ∿IE	8  Vu		USB	13_14 D1	15_16 D2
	3 wire 3-phase symmetric load phase-shift U31-I1	Aux.supply 17 रू 18	RS-485 A SG B	- A1 + 21 <i>⊙</i> →22	- A2+ 23⊖→24	- A3 + 25 ເ→26	- A4 + 27 G→28	- A5+ 29⇔30
-05	3-phase 1 system		5   <sup>U</sup> ⊡ 3 ∿1E	8  Vu		USB	13_14 D1	15_16 D2
	3-phase symmetrical load	Aux.supply 17 🖘 18	RS-485 A SG B	- A1 + 21 <i>⊙</i> →22	- а2+ 23 с <del>)</del> 24	- A3 + 25 ເ→26	- A4 + 27 G→28	- A5 + 29 G→30
-09	3-phase 2 system		5  U₁₂ 3 ∿2E	7 8 <b>↓</b>	9	USB	13_14 D1	1516 
	3-wire 3-phase asymmetircal load	Aux.supply 17 🛧 18	RS-485 A SG B	- A1 + 21 <i>G</i> →22	- A2 + 23⊖→24	- A3+ 25 ↔26	- A4 + 27 G→28	- A5+ 29⇔30
-11	3-phase 3 system		4 ↓ Uz 3N ~3E		9 10 J N	USB	13_14 D1	1516 
	4-wire 3-phase asymmetircal load	Aux.supply 17 <del>~</del> 18	RS-485 A SG B	- A1 + 21↔22	- A2 + 23⊖→24	- A3 + 25 ↔26	- ∆4 + 27 G→28	- A5 + 29 ⇔30

System-					Γ			Γ									
connection	Application	11	12	13	8 N	U	1 U2	2 U:	3 U 1 2	202	3 U 3	31	U =	l =	P =	Q =	S =
	4 wire	Г	Г	Г	Г	Г	Г	Γ				Т					
-00	3 phase symmetric load	X	-	-	Х	X	-	-	-	-	-		U1	l1	P1*3	Q1*3	S1*3
	1 wire	Γ			Γ												
-01	1 phase	X	-	-	Х	X	-	-	-	-	-		U1	l1	P1	Q1	S1
	3 wire	Γ			Γ												
-02	3 phase symmetric load	X	-	-	-	-	-	-	X	-	-		-	-	PI1U12	QI1U12	I1*U12*√3
	3 wire	Γ			Γ												
-03	3 phase symmetric load	X	-	-	-	-	-	-	-	X	-		-	-	PI1U23	QI1U23	I1*U23*√3
	3 wire																
-04	3 phase symmetric load	X	-	-	-	-	-	-	-	-	X		-	-	PI1U31	QI1U32	I1*U31*√3
	3 wire																
-05	3 phase symmetric load	X	-	-	-	X	X	X	X	X	X	(	-	<u> </u>	P1*3	Q1*3	S1*3
	3 wire																
-09	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
	4 wire																
-11	3 phase asymmetric load	X	X	X	X	X	X	X	X	X	X	(	(U1+U2+U3)/3	( 1+ 2+ 3)/3	P1+P2+P3	Q1+Q2+Q3	S1+S2+S3
	4 wire			1	1	1											
	3 phase asymmetric load																
-11	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**.

File Edit View data Analog Outputs Configuration by: Secondary Channel 1 U1	Binary Outputs	Analog out	T <sup>20mA</sup> 尸	Configuration by: Configuration of th or secondary value.	Primary or Secondary. e output based on primary.
Secondary range Max: 0 - 288,675 V 100%: 132,791 V Analog range: +/- 20 mA Max load: < 750 Ω		0 20 0 0 0		Activating a channe	el.
Channel 2 Secondag: vange Max: 0 · 10 A 100%: 5 A Analog range: +/- 20 mA Max load: ∠ 750 Ω	Secondary 0 5 0 0 0	Analog out 0 20 0 0 0	20mA	Drop-down list to s output signal. Characteristics for graph	r the output shown as a
Channel 3 <i>Seconday range</i> Max: +/: 8660,254 W 100%: 1991,859 W Analog range: +/: 20 mA Max load: ≤ 750 Ω	Secondary -1750 1750 0 0 0	Analog out -20 20 0 0 0 0		Example: I1: 0 – 5 A Ut: 4 – 20 mA Secondary 0 5	Analog out 4 20
Apply settings Read	settings tion Saved		↑ <i>TIllQUIS</i>	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
1	Input current	(I1+I2+I3)/3	System
11	Phase current L1		L1
12	Phase current L2		L2
13	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
Р	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(q3)=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(q3)=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	l1*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**.

Q Config_LQT						l	- C X
File Edit							
View data Analog Output	s Binary Outputs						
Voltage		Current					
Primary 143	м	Primary	600				
Secondary 230		Secondary	5				
Turnover 0,621	7	Turnover	120				
Output 1			Output 2				
Output Mode	Pulse Mode 🔹 👻		Output Mode	Pulse Mode 🔹			
Logic Level	Low -		Logic Level	High 👻			
Energy of P or Q	Energy P 👻		Energy of P or Q	Energy P 🔹			
Direction	Imported -		Direction	Exported -			
Pulse Frequency	1000	imp/kWh Secondary	Pulse Frequency	10000			
Pulse Length	50	ms	Pulse Length	50	imp/kWh Secondary		
CT x VT	74,604			74,604	ms		
Pulse Value	13,4041	imp/kWh Primary	Pulse Value	13,4041			
Pulse Value	0	kWh/imp	Pulse Value	0	imp/kWh Primary		
Power to transducer	1,992	kW	Power to transducer	1,992	kWh/imp		
Pulses/h	1992		Pulses/h	19920	k₩		
hardware limits of output	ıt 1		hardware limits of output	it 2			
Max Pulses/h	200		Max Pulses/h	200			
Min Pulse Length [ms]	50		Min Pulse Length [ms]	50			
Max Volt [V]	250		Max Volt [V]	250			
Max Current [A]	5		Max Current [A]	5			
Binary Output Type	RL		Binary Output Type	RL			
Apply settings Rea	ad settings						
Transducer settings	Saved	۸ ۲	TIIIQU	IST			

### 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

ComPort		
Connect		
COM24	<ul> <li>Port Closed</li> </ul>	
Open Port	Close Port	Close

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

LQT	Config_LQT			
	File Edit			
	Open file	, Outputs		
	Save file			
	Connect	n	L1	L2
	Disconnect	kW	-1,4 kW	-0,6 kW
	Firmware upgrade			
	Q	J,8 kvar	0,8 kvar	0,0 kvar

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.

Information	×
Select a new firmware file Valid firmware versions: 1.00 - 1.10	
ОК	

7. Select firmware file.

Bibliotek: Dokument			Ordna efte	r: Mapp ▼
Namn	Senast ändrad 👻	Тур	Storlek	
FWF205UV1.00.bin	2012-10-16 13:21	BIN-fil	72 kB	
				•
			Öppna	Avbryt

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



9. Click OK.



10. Select COM-port and click Open.

l <mark>QT</mark> Firmware upgrade		<u> </u>
1. Connect Port COM1 COM1 COM5 COM4	Open Port closed	
COM4 COM6 COM24 Select firmware bin file H:\Mina dokument\LQ	T ver2\LQT60 Firmware\FWF205UV1.00.bi	rowse

11. Click Upgrade firmware.

🕼 Firmware upgrade
-1. Connect
Port COM24 Close Port open
2. Upgrade Select firmware bin file
H:\Mina dokument\LQT ver2\LQT60 Firmware\FWF205UV1.00.bi Browse
Upgrade firmware
Status: Port opened

12. The upgrade is done.

🔃 Firmware upgrade
1. Connect Port COM24  Close Port open
2. Upgrade Select firmware bin file H:\Mina dokument\LQT ver2\LQT60 Firmware\FWF205UV1.00.bi Browse
Upgrade firmware
Status: Uploading

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



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

OT Firmware upgrade	
1. Connect Port COM24 Close Port open	
2. Upgrade Select firmware bin file	
JH:\Mina dokument\Lu I ver2\Lu I 60 Firmware\FWF2050V1.00.bi Upgrade firm	ware

### 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	$1.5 \times \text{Un} - \text{continuously}, 2 \times \text{Un} - 10 \text{ s}$
	Consumption	U x 1 mA / phase
	Frequency Current	10 <u>4070</u> 120 Hz
	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
	O	S COENTA (mb and
	Consumption Aux, Supply	<0.05 VA / phase
		24 – 250 VDC
		80 – 250 VAC
	Burden	max 8 VA
Output	Analog	
Οιίμαι		2
	Range	z $\pm/20 \text{ m}$
	Range	+/-10 V (option)
	External resistance load	max 750 ohm (15V)
	Response time	<100 msec
General data	Accuracy	0.2
Ceneral data	Galvanic isolation	Supply, in- and output are galvanically
	Carvanio iociation	isolated
	USB	1 port for configuration
	Temperature	-10…+55 °C (operation), -40…+70 °C
		(storage)
		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
		SS-EN 601010 Safety
		EN 61000-6-2 / -6-4 / -6-5

# 6.2 Technical data LQT60

Inputs	Voltage Input (Un) Overload Measuring range Consumption (burden) Frequency Current Input (In) Overload Measuring range Consumption (burden) Aux. supply	100 - 400 V main voltage (nominal) $1.5 \times Un - continuously, 2 \times Un - 10 \text{ s}$ 0 - 500 V TRMS Un x 1 mA / phase 104070120 Hz 1 - 5 A $2 \times In continuously, 10 \times In 15 \text{ s}, 40 \times In 1 \text{ s}$ 0 - 10 A TRMS < 0.05 VA / phase 24 - 250 VDC
	Consumption	80 – 250 VAC max 8 W
Outputs	Analog Number Area Load Response time Digital Number	5 pcs +/- 20 mA +/- 10 V (option) max 750 ohm (15V) < 100 ms 2 transitor 110 V AC/DC, 100 mA
General data	Accuracy class USB Temperature range Test voltage Inputs Outputs Pollution degree Dimensions (w x h x d) Weight Standards	0.2 1 pc for configuration -10 to +55 C° (operation) -40 to +70 C° (storage) Temperature coefficient < $0.1\%$ / 10 C° 4 kV AC / min Overvoltage cat. III Overvoltag cat. III 2 150 x 70 x 73 mm – DIN-rail ca 0.5 kg SS-EN 60688 Transducers SS-EN 601010 Safety EN 61000-6-2 / -6-4 / -6-5