LQT40M

Modbus TCP, DIN rail, fully programmable, high accuracy, Tillquist's LQT40M multi-transducer, can measure all electrical quantities through serial communication Modbus TCP. This transducer can be used with a wide range of AC and DC auxiliary supply and can easily be programmed through its USB micro standard port and Tillquist's ConfigLQT free configuration software.

Technical Data		Details
Input	Voltage range (Un)	100 – 400 V (L-L) main voltage (nominal)
	Measuring range	1 – 520 V_{L-L} TRMS 50/60 Hz or 16⅔ Hz CAT III 1 – 300 V_{L-N} TRMS 50/60 Hz or 16⅔ Hz CAT III
	Frequency	50/60 Hz (10…40….70…120 Hz) 16⅔ Hz (10…15….18…120 Hz)
	Overload voltage	1.5 x Un – continuously 2 x Un – 10 s
	Consumption	≤U² / 1.32 MΩ
	Impedance	1.32 MΩ per phase
	Current (In)	1 – 5 A
	Measuring range	5 mA – 10 A TRMS
	Overload current	2 x In continuously, 10 x In 15 s, 40 x In 1 s
	Consumption	<0.05 VA / phase
	Auxiliary power supply	24 – 230 VDC / 90 – 230 V AC 50/60 Hz ±10 %
	Burden	max 7.1W / 15 VA
Output	Communication	Modbus TCP
	Programmable data sets	3 options (see data set mapping on page 3)
	Accuracy U, I, P, Q (40…70 Hz) or (15…18 Hz) F	0.2 (Ref. temp. 23 °C) 10 mHz or 5 mHz with test certificate
	Response time	<20 msec
Measured Quantities	F, U12, U23, U31, U, I, P, Q, LF and PA (see data set mapping on page 4)	
General Data		
	Galvanic isolation	Supply, in- and output are galvanically isolated
	Connection terminals/Torque	Input & auxiliary: 6 mm^2 / 0.8 Nm Output: 2.5 mm^2 / 0.5 Nm
	Humidity	95% non-condensing
	USB	USB Micro-B, port for configuration
	Temperature	-10…+55 °C (operation) -40…+70 °C (storage) Temperature coefficient < 0.1 % / 10 °C
	Measurement and overvoltage	Cat. III
	Pollution degree	2
	Dimension (W x H x D)	70 x 132 x 101 mm
	Weight	330 gr
	Protection	IP40 (housing), IK07
	Flammability class	UL94 V-0
	Standards	SS-EN 60688 Transducers SS-EN 61010-1 Safety IEC 61010-2-030 EN 61000-6-2 / -6-4 / -6-5

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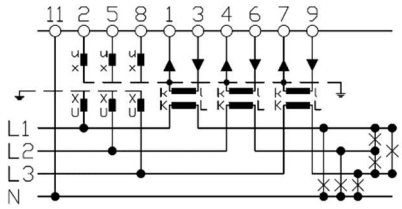
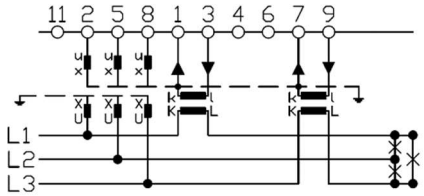
Configurable System Connection

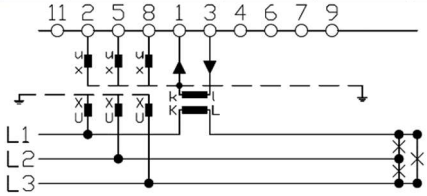
Code	Application	I1	I2	I3	N	U1	U2	U3	U12	U23	U31
00	4wire, 3 phase symmetric load	X	-	-	X	X	-	-	-	-	-
01	1-wire, 1 phase	X	-	-	X	X	-	-	-	-	-
02	3-wire, 3 phase symmetric load	X	-	-	-	-	-	-	X	-	-
03	3-wire, 3 phase symmetric load	X	-	-	-	-	-	-	-	X	-
04	3-wire, 3 phase symmetric load	X	-	-	-	-	-	-	-	-	X
05	3-wire, 3 phase symmetric load	X	-	-	-	X	X	X	X	X	X
09	3-wire, 3 phase asymmetric load	X	-	X	-	X	X	X	X	X	X
11	4-wire, 3 phase asymmetric load	X	X	X	X	X	X	X	X	X	X
11	4-wire, 3 phase asymmetric load Open Delta	X	X	X	-	X	X	X	X	X	X



Connection -11



Connection -09



Connection -05

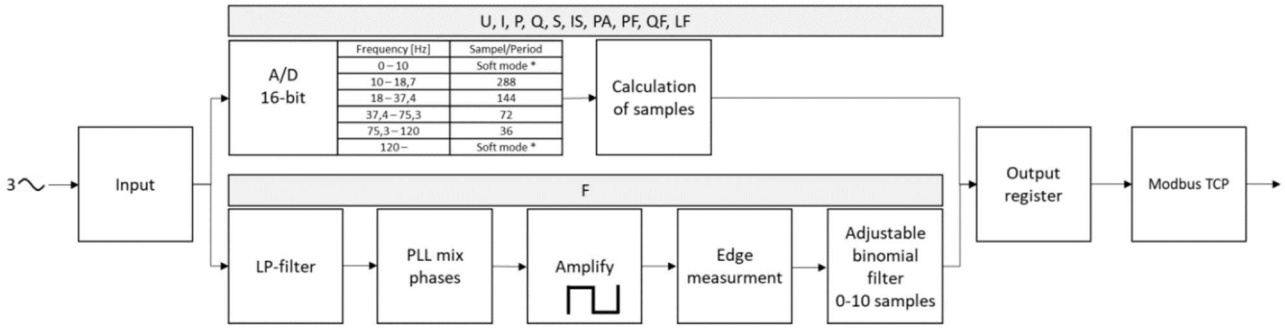
Measuring Process

PLL 10 to 120Hz The measuring system uses a phase-locked loop (PLL) between 10-120Hz where all quantities are System measured. The number of samples per period depends on the frequency.

Soft Mode outer range A fixed sample rate of 1800 samples/second (soft mode) is used when the frequency is lower than 10Hz or higher than 120Hz. Measured quantities in soft mode are voltage (U), current (I) and frequency (F).

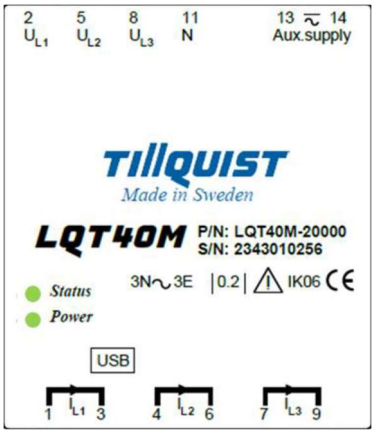
Frequency Filter The frequency is binomial low-pass filtered. The filter's length is determined by the period of the measured frequency that can be selected between 0 and 10. The shorter the lengths the faster the measurements, while longer ones are more stable.

Measuring Process Diagram

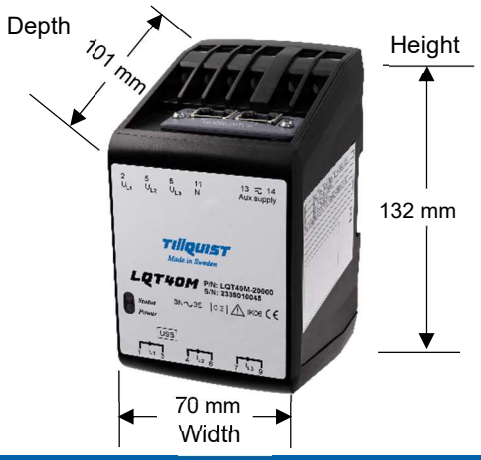


Connections

LQT40M



Dimensions



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Data Set A (Basic) and B (Basic with High resolution Frequency

Parameter	Range	Unit	Description	Measured	Value	Bus Value	Type	Byte	A Basic	B Basic + High Resolution F
Bus Inc	-	-	Bus Increment	-	-	0-65535	Unsigned Word	1-2	X	X
Data Inc	-	-	Data Increment	-	-	0-65535	Unsigned Word	3-4	X	X
I_RMS	0-12	A	Phase Current	System	I = (I1+I2+I3)/3	0-65535	Unsigned Word	5-6	X	X
U_RMS	0-300	V	Voltage	System	U= (U1+U2+U3)/3	0-65535	Unsigned Word	7-8	X	X
P_RMS	±10800	W	Active Power	System	P= (P1+P2+P3)/3	±10800000	Signed Double Word	9-12	X	X
Q_RMS	±10800	Var	Reactive Power	System	Q= (Q1+Q2+Q3)/3	±10800000	Signed Double Word	13-16	X	X
F	0-300	Hz	System Frequency	System	F	0-65535	Unsigned Word	17-18	X	X
F_Hires	0-300	Hz	High Resolution F	System	F	0-300000	Unsigned Double Word	19-22	-	X

Data set C (Extended)

Paramete	Range	Unit	Description	Measured	Value	Bus Value	Type	Byte	C Extended
Bus Inc	-	-	Bus Increment	-	-	0-65535	Unsigned Word	1-2	X
Data Inc	-	-	Data Increment	-	-	0-65535	Unsigned Word	3-4	X
I_RMS	0-12	A	Phase Current	System	I = (I1+I2+I3)/3	0-12000	Unsigned Double Word	5-8	X
U_RMS	0-300	V	Voltage	System	U= (U1+U2+U3)/3	0-300000	Unsigned Double Word	9-12	X
P_RMS	±10800	W	Active Power	System	P= (P1+P2+P3)/3	±10800000	Signed Double Word	13-16	X
Q_RMS	±10800	Var	Reactive Power	System	Q= (Q1+Q2+Q3)/3	±10800000	Signed Double Word	17-20	X
F	0-300	Hz	High Resolution F	System	F	0-300000	Unsigned Double Word	21-24	X
I1	0-12	A	Phase Current	L1	I1	0-12000	Unsigned Double Word	25-28	X
I2	0-12	A	Phase Current	L2	I2	0-12000	Unsigned Double Word	29-32	X
I3	0-12	A	Phase Current	L3	I3	0-12000	Unsigned Double Word	33-36	X
U1	0-300	V	Phase Voltage	L1-N	U1	0-300000	Unsigned Double Word	37-40	X
U2	0-300	V	Phase Voltage	L2-N	U2	0-300000	Unsigned Double Word	41-44	X
U3	0-300	V	Phase Voltage	L3-N	U3	0-300000	Unsigned Double Word	45-48	X
U12	0-520	V	Phase-Phase Voltage	L1-L2	U12	0-520000	Unsigned Double Word	49-52	X
U23	0-520	V	Phase-Phase Voltage	L2-L3	U23	0-520000	Unsigned Double Word	53-56	X
U31	0-520	V	Phase-Phase Voltage	L3-L1	U31	0-520000	Unsigned Double Word	57-60	X
P1	±3600	W	Active Power	L1	P1	±3600000	Signed Double Word	61-64	X
P2	±3600	W	Active Power	L2	P2	±3600000	Signed Double Word	65-68	X
P3	±3600	W	Active Power	L3	P3	±3600000	Signed Double Word	69-72	X
Q1	±3600	Var	Reactive Power	L1	Q1	±3600000	Signed Double Word	73-76	X
Q2	±3600	Var	Reactive Power	L2	Q2	±3600000	Signed Double Word	77-80	X
Q3	±3600	Var	Reactive Power	L3	Q3	±3600000	Signed Double Word	81-84	X
LF	±1	-	LF Factor	System	LF=sign(Q) x (1-|PF|)	±1000	Signed Double Word	85-88	X
PA	±180	Deg	Phase Angle ϕ	System	PA= (1+2+3)/3	±180000	Signed Double Word	89-92	X

Data set mapping selection options

A: Basic
B: Basic + High Resolution F
C: Extended
D: Full

Bus Increment Number increases with every new message
Data Increment Number increases with every new measurement

The Modbus TCP parameters (Ethernet) can be set via ConfigLQT v3.
The data format used is IEEE 754 single-precision binary floating-point format: binary32.
Parameters are represented as two consecutive Modbus registers. Secondary values are outputted in SI unit.
To calculate the primary values, use the primary to secondary ratios in parameters CTR, PTR.
The CTR and PTR can be configured by editing primary to secondary current and voltage ratios in ConfigLQT.

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Sample Test Certificate

A high precision routine test certificate can be issued for the special products LQT40F-10201 and LQT40F-20201 guaranteeing a measurement accuracy better than 5 mHz within 45-65 Hz range. Other type of certificates can be requested, customized, and issued according to the client's needs on request.

FREQUENCY ROUTINE TEST CERTIFICATE MODBUS

Produkt / Product	Serial No.
LQT40M-20201	2351010061
Tillverkare / Manufactur	**Calibraton Date:**
Tillquist Group AB	20240229

Input:	0...300 V L-N / 0...5 A	
System connection:	-11, 3-phase, 4-wire system	
Output:	Modbus TCP	
Aux supply:	24-230 VDC / 90-230 VAC	FW_LQT40_V1.2

Frequency filter length 1 period (binomial)

	Input				Output							
	V (L-N)	A	el°	Hz	Expected		Read Modbus		error	acc.error		Result
1	63,509	0,000	30	49,000	49,000	Hz	49,000	Hz	0,000	0,005	0,00%	PASS
2	63,509	0,500	30	49,500	49,500	Hz	49,500	Hz	0,000	0,005	0,00%	PASS
3	63,509	1,250	25	49,503	49,503	Hz	49,503	Hz	0,000	0,005	0,00%	PASS
4	63,509	2,500	20	49,899	49,899	Hz	49,899	Hz	0,000	0,005	0,00%	PASS
5	63,509	3,750	15	49,900	49,900	Hz	49,900	Hz	0,000	0,005	0,00%	PASS
6	63,509	5,000	10	49,901	49,901	Hz	49,901	Hz	0,000	0,005	0,00%	PASS
7	63,509	0,000	0	49,999	49,999	Hz	49,999	Hz	0,000	0,005	0,00%	PASS
8	63,509	0,500	0	50,000	50,000	Hz	50,000	Hz	0,000	0,005	0,00%	PASS
9	63,509	1,250	0	50,001	50,001	Hz	50,001	Hz	0,000	0,005	0,00%	PASS
10	63,509	2,500	0	50,099	50,099	Hz	50,099	Hz	0,000	0,005	0,00%	PASS
11	63,509	3,750	0	50,100	50,100	Hz	50,100	Hz	0,000	0,005	0,00%	PASS
12	63,509	5,000	0	50,101	50,101	Hz	50,101	Hz	0,000	0,005	0,00%	PASS
13	63,509	2,500	-10	50,497	50,497	Hz	50,497	Hz	0,000	0,005	0,00%	PASS
14	63,509	3,750	-20	50,500	50,500	Hz	50,500	Hz	0,000	0,005	0,00%	PASS
15	63,509	5,000	-30	51,000	51,000	Hz	51,000	Hz	0,000	0,005	0,00%	PASS

Provutrustning / Test Equipment
Generator: Omicron CMC 256PLUS, S/N: DN153D / 112251591
TACS.Client 1.1.55.0

The transducer is tested and approved according to the technical specification.
Max allowed dev. 5 mHz within the frequency range 49-51 Hz. The transducer is without defects after test.

Ort /place, Testexecutors signature	Authorization / Company. Institute etc.
Kista 20240229 Per Clemenz	**TILLQUIST GROUP AB** **Box 1120** **SE-164 22 KISTA**

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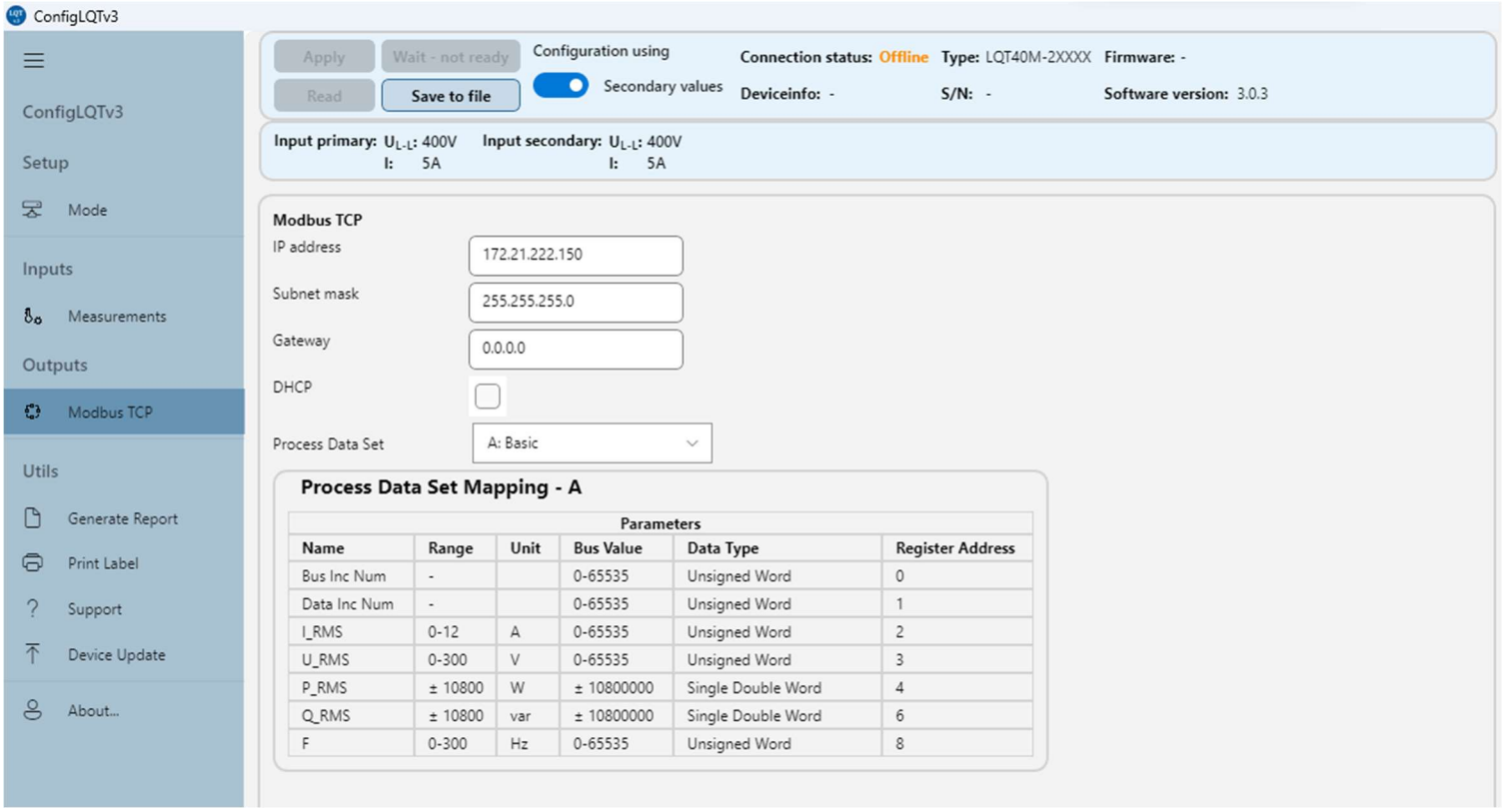
Configuration Software - ConfigLQT

ConfigLQT, free configuration software, downloadable from our webpage, www.tillquist.com, configures all Tillquist's programmable transducers. The software connects to live transducers, changes the configuration, and visualizes live readings.



Ordering Codes

LQT40M Ordering Codes

	LQT40M-	X	X	XXX
Communication				
Modbus TCP		2		
Frequency				
50/60 Hz			0	
16⅔ Hz			1	
Special Requirements				
Standard configuration				000
Customer configuration (to provide ERF)				001
High precision with frequency test certificate				201

Standard Ordering Codes

LQT40M-20000: LQT40M Modbus TCP 50/60 Hz
LQT40M-20001: LQT40M Modbus TCP 50/60 Hz with ERF ad test certificate
LQT40M-21000: LQT40M Modbus TCP 16⅔ Hz
LQT40M-20201: LQT40M Modbus TCP 50/60 Hz High precision with frequency test certificate

Other protocols and certificates are available on request.

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