Technical Specification LK601

MATUSCHEK

V2.0

sample rate	bandwidth	precision	ranges (rms)
10 Msps	DC – 1MHz	0,05% rms value	1,5V – 1000V / 0,5A – 1200A* *depends on sensor

Dimensions	84TE x 4 HE x 420 mm	**Number of modules**	7 per device
Weight	approx. 9 kg	**Number of power channels**	1 to 6 channels
Protection class	IP20	**Motor analysis**	1 motor card (2 motors)
Temperature	5°C .. 40°C (<80% RH)	**Extension cards**	1 to 3 cards
Power supply	230V / 50Hz		

Accuracy (excerpt)   ±(% measured value + % range value)

		DC	0,05 Hz - 45 Hz	45Hz - 65 Hz	65 Hz – 1 kHz	1 kHz – 10 kHz	10 kHz – 20 kHz	20 kHz – 50kHz	50 kHz - 100 kHz	100 kHz - 300 kHz
Current	1 mA – 5 mA	0,05 + 0,15	0,04 + 0,04	0,015 + 0,03	0,04 + 0,04	0,25 + 0,05	0,5 + 0,2	1,5 + 0,5	3,5 + 0,5	5 + 0,5
Current	10 mA – 500 mA	0,05 + 0,1	0,04 + 0,04	0,015 + 0,03	0,04 + 0,04	0,15 + 0,05	0,3 + 0,2	0,7 + 0,5	2 + 0,5	5 + 0,5
Voltage			0,04 + 0,04	0,015 + 0,03	0,04 + 0,04	0,1 + 0,05	0,3 + 0,2	0,4 + 0,2	0,65 + 0,2	5 + 0,5
Active Power	1 mA – 5 mA	0,1 + 0,15	0,08 + 0,04	0,02 + 0,03	0,08 + 0,04	0,35 + 0,05	0,8 + 0,2	1,9 + 0,5	4,2 + 0,5	10 + 0,5
Active Power	10 mA – 500 mA	0,1 + 0,1	0,08 + 0,04	0,02 + 0,03	0,08 + 0,04	0,25 + 0,05	0,6 + 0,2	1,1 + 0,5	2,7 + 0,5	10 + 0,5

Simultaneous voltage and current input conversion, Urms and Irms: 1 to 130% of the measurement range, Power (DC measurement): 0 to ±130%, (AC measurement): ±130% of the power range when the voltage and current range is 5 to 130%.

Temperature: 23±3°C, Humidity: 35 to 75%RH, Input waveform: Sine wave, Power factor (λ): 1, Common mode voltage: 0 V, Line filter: OFF, Frequency filter: 100 kHz or less when ON, after 1h warm-up, Range rms

Voltage measurement

Range RMS (V)	1,5	3	6	10	15	30	60	100	150	300	600	1000
Crest factor	3	3	3	3	3	3	3	3	3	3	3	2
Peak value	4,5	9	18	30	45	90	180	300	450	900	1800	2000
max Vrms (sinus)	3,2	6,4	12,7	21,2	31,8	63,6	127,3	212,1	318,2	636,4	1272,8	1414,2

Input terminal type	4mm plug-in terminal (safety terminal)
Input impedance	2 MΩ, 25 pF
Isolation	1000V CATII
Maximum voltage	1.5 kV RMS or 3 kV peak max. 1s
Continuous maximum voltage	1.1 kV RMS or 2 kV peak (if voltage frequency exceeds 150khz (1250-f) Vrms [f in kHz])
Cont. max. common mode voltage	1000 Vrms (50/60Hz)
Common mode rejection	50 Hz: 120db typical / 100kHz: 60dB typical
Line filter	Antialiasing 1MHz Bessel 5. order / digital 100Hz – 1MHz
Resolution	16 Bit
Sample rate	10 Msps

Current measurement

Sensor factor 1

Range rms (mA)	1	2	5	10	20	50	100	200	500
Crest factor	3	3	3	3	3	3	3	3	3
Peak value (mA)	3	6	15	30	60	150	300	600	1500
max mArms (sinus)	2,1	4,2	10,6	21,2	42,4	106,1	212,1	424,3	1060,7

Sensor factor 500

Range rms (A)	0,5	1	2,5	5	10	25	50	100	250
Crest factor	3	3	3	3	3	3	3	3	3
Peak value (A)	1,5	3	7,5	15	30	75	150	300	750
max Arms (sinus)	1,0	2,1	5,3	8,6	21	53	106	212	530

Sensor factor 1500

Range rms (A)	1,5	3	7,5	15	30	75	150	300	750
Crest factor	3	3	3	3	3	3	3	3	3
Peak value (A)	4,5	9	22,5	45	90	225	450	900	2250
max Arms (sinus)	3,1	6,3	15	31	63	159	318	636	1590

D-SUB9 (female)

Input terminal type	
Input impedance	1 Ω
Maximum current	1s: 1 A RMS or 1.5 A peak max. 1s / 20ms: 2 A RMS or 3 A peak
Continuous maximum current	0.7 A RMS or 1 A peak
Cont. max. common mode current	-
Line filter	Antialiasing 1MHz Bessel 5. order / digital 100Hz – 1MHz
Resolution	16 Bit
Sample rate	10 Msps

Pin assignment		
Pin 5	-15V	Sensor supply –vc
Pin 9	+15V	Sensor supply +vc
Pin 4	COM	Sensor supply 0V
Pin 8		Status in (10k pull-up)
Pin3	COM	Status com
Pin6	I_IN +	I_mess in+
Pin 1	I_IN -	I_mess in-
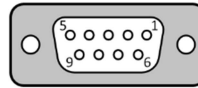
All reference grounds are potential-free against other channels

LK601

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Signal latency UI	< 5ns
A/D converter	Simultaneous voltage and current input conversion
Temperature coefficient	0,01%/°C
Update rate	0.05s, 0.1s, 0.2s, 0.5s, 1s, 2s, 5s, 10s / custom / dfcs (dynamic full cycle synchronization)
Smallest measuring cycle	10 ms (custom / dfcs)
Synchronization	Trigger groups / independent single channel trigger with adjustable filter
Synchronization sources	U1 - U6, I1 - U6, Speed (impulse input) if equipped with motor card
Current sensor	Integrated power supply (±15V,5A)
Interface	Ethernet, CAN, SCPI
Internal memory	1GByte
Motor card	2x speed / position (a, b, z, rotary encoder (quadrature))
	2x torque (analog 200ksps / frequency)
Process data export	CAN, SCPI, csv
Configuration/settings	**POWER**Studio, CAN, SCPI, LabVIEW
Application	Test benches, electrical drives, inverter, solar, batteries, R&D, consumer...

LAN

Connector	1 x RJ-45 connector
Transmission mode	100Base-TX, 1000Base-T
Protocol	TCP/IP
Default IP	192.168.2.170
Function	SCPI

CAN

Number of ports	1 port
Input terminal	D-SUB9 (male)
Rated voltage range	-3 V to 10 V
Common mode voltage	30 V
Baud rate	10k, 20k, 50k, 100k, 125k, 250k, 500k, 1Mbps
Format	Standard (0x000 to 0x7FF), extended (0x00000000 to 0x1FFFFFFFF)
Terminal resistance	-
Receive / transmit settings	ID, byte order, type, start bit, length
Byte order	Intel, Motorola
Data type (transmit)	Process data / user defined data
Output interval (process data)	0.05s, 0.1s, 0.2s, 0.5s, 1s, 2s, 5s, 10s / custom
CAN-ID filter (receive)	64

Pin assignment		
Pin 1, 4, 6, 8, 9	n.c.	
Pin 2	out	CAN_Low
Pin 3		GND
Pin 5	shield	Connected to GND
Pin 7	out	CAN_High
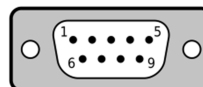
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CAN process data export

Time	Time
Module frequency (trigger)	Freq
Active power	P
Apparent power	S
Phase	Phi
Power factor	PF
Current frequency	Ifreq
Current rms value	Ieff
Current average	Iavg
Voltage frequency	Ufreq
Voltage rms value	Ueff
Voltage average	Uavg
Motor speed	MSpeed
Motor torque	MTorque
Mechanical motor power	MPmech

Motor card

Type	LK-MC1	
Number of channels	2	
Interfaces per channel	1 x speed (pulse), position	
	1 x torque (frequency / analog)	
Input terminal speed	D-SUB15 (female)	
Input terminal torque	D-SUB9 (male)	

Speed interface		speed, rotation, angle
Pin assignment		
Pin 1,3,5,10,12,14,15	COM	Ground reference
Track A		Track A for quadrature or pulse signals
Pin 9	positive	A
Pin 2	negative	AN
Track B		Track B for quadrature or pulse signals
Pin 11	positive	B
Pin 4	negative	BN
Track Z		Track Z for reference signal
Pin 13	positive	Z
Pin 6	negative	ZN
Pin 7	5 V,400mA	Auxiliary voltage (encoder) short circuit proof

All reference grounds are potential-free against other channels
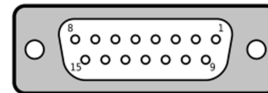
Input voltage	5 V for TTL (RS422)
	24 V-30 V for HTL (push–pull)
Input resistance (DC)	1 MΩ / 120 Ω termination resistor @ RS422
Max. input voltage	40 V

Electrical specifications

RS-422 TTL input	10 MHz max.
Differential threshold voltage	-200 mV … +200 mV
Differential input hysteresis	230 mV
Common mode range	±20 V
RS-422 HTL input	400 kHz max.
Differential threshold voltage	-900 mV … +900 mV
Differential input hysteresis	1 V
Common mode range	±20 V
Single ended TTL input	1 MHz max.
Input high voltage	2.0 V … 40 V
Input low voltage	-40 V … 0.8 V
Input hysteresis	0.53 V
Single ended HTL input	200 kHz max.
HTL threshold voltage (low)	Lo: -40 V… 6 V, Hi: 8 … 40 V
HTL threshold voltage (high)	Lo: -40 V … 11 V, Hi: 13 V … 40 V
Input hysteresis	270 mV

Track A and track B can also be used as independent speed interfaces
Track Z/ZN (reference signal) can be used optionally

HTL incremental encoder	HTL NPN (open collector) external pull-up resistors (4k7Ω, ¼ W) are provided
	HTL PNP (open emitter) external pull-down resistors (4k7Ω, ¼ W) are provided
	HTL (push-pull) no external resistor

Torque interface

Sensor	Analog (unipolar / bipolar)
	Frequency input

Analog interface

Sample rate	200 ksps @ 16 bit per channel
Input voltage	
Analog unipolar	0-5 V or 0-10 V
Analog bipolar	±2.5 V, ±5 V or ± 10 V
Input impedance	1 MΩ
Bandwidth	15 kHz @ -3 dB

Frequency interface

Digital	5V TTL (RS422)
Bandwidth	360 kHz
Bus termination resistor	120 Ω fix
Differential threshold voltage	-200 mV +200 mV
Differential input hysteresis	230 mV
Common mode range	± 20 V

Pin assignment		
Pin 1,3,5,6,8	COM	Ground reference
RS422 interface		Frequency signals
Pin 7	positive	
Pin 2	negative	
Analog interface		Analog signals
Pin 9	positive	
Pin 4	negative	

All reference grounds are potential-free against other channel