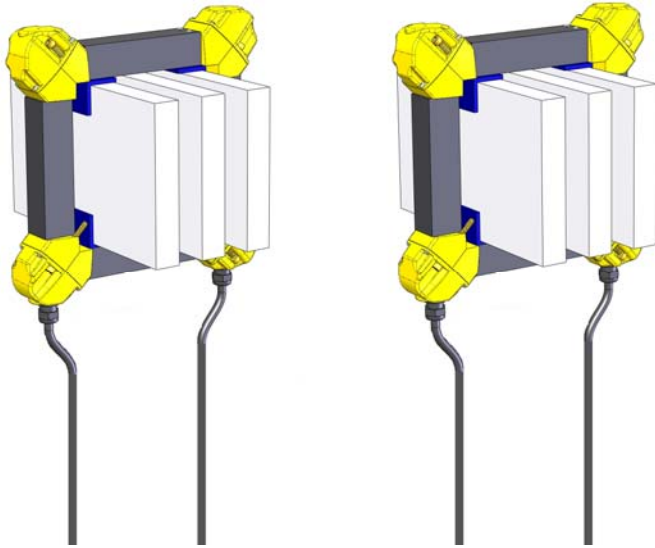




DynAmp

LKAT2 Sigma

Dual Head, Bi-Directional High Current Measurement with Rectifier Protection



Description

The new LKAT2 combines accurate high current measurement with reverse and/or overcurrent protection into a single rugged and cost effective system.

LKAT2 offers a new level of accuracy and stability to accurately and reliably measure uni- and bi-directional DC as well as AC bus currents. The LKAT2 represents the next generation of DynAmp's well proven OLOP™ technology.

The LKAT2 consists of a new, ruggedized IP65 two-piece measuring head with integrated mounting hardware. Heads connect to Metering Electronics via two cables per head.

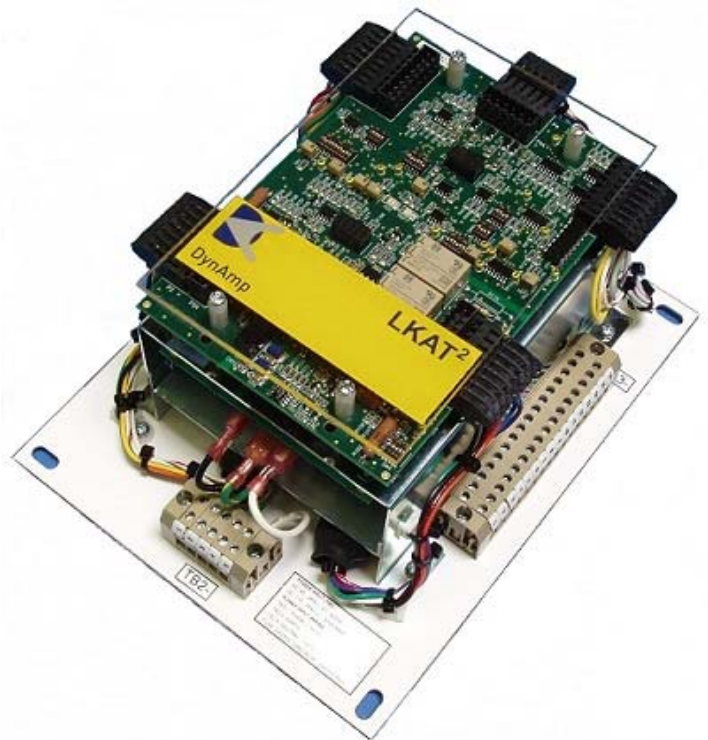
Application

The LKAT2 is particularly well suited to measure power rectifier outputs for control and protection purposes in electro-chemical processes such as aluminum, chlorine, copper, manganese, titanium, zinc, electroplating, etc.

The LKAT2 Sigma version is specifically designed for dual/parallel bus applications where a single, totalized measurement is needed. Typically, the two measurement heads are mounted inside larger power rectifier cubicles which utilize two "collector" bus bars (typically water cooled) which subsequently connect to a much larger total output bus bar (typically air cooled).

Key Features

- Dual measurement heads to measure the total current of two bus bars using only one set of supporting electronics.
- True bi-directional performance. Ideal for difficult magnetic applications. No position or bus analysis needed.
- Standard alarm relay provides reverse or over-current protection.
- Extremely compact Metering Electronics for mounting inside existing cubicles and panels.
- Standard Accuracy Diagnostics monitors system performance.
- Optional "Protection Extensions" provides a second, fully isolated and independently scaled measurement output signal, plus two additional alarm relays. This allows one system to have 2 analog measurement outputs plus 3 current level alarm relay outputs plus 1 Accuracy Diagnostics alarm relay output.
- Optional 3.5 digit digital display of measured current can be viewed on the top of the metering electronics. Display can be DC or RMS AC.
- Optional low voltage DC mains allows system to be powered by safety mains supplies or even batteries.





Standard System Includes

- Two measuring heads. Each head has 2-halves with bus bar positioning hardware and bus bar mounted corner angles
- Measurement Head to Electronics connecting cables
 - One cable end fixed to each head half,
 - Other cable end separated to individual conductors for connection to metering electronics terminal blocks
- Metering Electronics : Panel / cabinet mountable
- One configurable Protection Relay with LED indication
- One Accuracy Diagnostics relay with LED indication
- Terminal block connections for user supplied wiring
 - Current measurement signal(s)
 - Protection relay contacts
 - Accuracy Diagnostic relay contacts
 - Mains power input
- Terminal block connections Head cables (4 cables total)
- Operator / installation manual
- Calibration result data tables and graphs
- 2 year warranty
- Packaging for air transport

System Options

• **Protection Extensions**

Optional LKAT2 "Protection Extensions", (PE), provides additional functionality for protecting high current rectifiers.

Second Freely Scalable Analog Output : This second analog output is independently scaled and fully isolated from the standard LKAT2 measurement output. In typical applications, it is scaled to provide accurate measurement above the rectifier standard operating range for advanced protection purposes. Using a 50kA application for example, the primary LKAT2 output may be scaled to 50kA to provide the highest degree of accuracy and resolution for normal rectifier control. The second output may be scaled to 75kA to provide the information to intelligently manage overcurrent situations. Using this signal, the rectifier control system could integrate overcurrent operation to allow 5 minutes at 110%, 1 minute at 120%, 10 sec at 140%.

Two Additional Protection Relays : These relays bring total number of configurable relays to three. Each can be configured to provide reverse or various degrees of overcurrent protection

Specify Item 43614

• **Display and RMS conversion**

Displays bus current on a 3.5 digit digital display behind the clear meter unit front panel. The option also includes an RMS converter to provide current display in AC measurement applications. NOTE: This option changes electronics maximum ambient temperature from 60°C to 50°C

Specify Item 43639

• **Custom Head Cable Length**

Systems are supplied with standard 10 meter (33 ft.) of interconnecting cable between each head half and metering electronics. Other cable lengths are available in 1m increments Specify total length required when ordering.

Specify Item 43623 (quantity of m > 10m)

Accessories

• **Summing multiple systems :**

A dedicated external module is available for totalizing/ summing up to 10 LKAT measurement signals. This is typically used to provide a true 'total' current signal when multiple rectifiers are used in parallel.

Item number specified with order

• **Functional Tester :**

Hand-held test set allows users to verify system operation and scaling as well as test relay trip points and output signals. See Datasheet D_LKAT_MUT for details.

Specify Item 45708

• **Extended Burn-In :**

Standard systems are operated for 4 hours before final tests and calibration. Extended burn-in periods can be ordered in 24-hour increments.

≤ 60kA: **Specify Item 99920**

> 60kA: **Specify Item 99922**

• **Extended Warranty :**

Standard 2-year Warranty can be extended in 2-year increments

Specify Item 99981

Support Services

On-Site Commissioning : Factory trained technicians and specialized equipment on-site to verify correct operation in application during start-up.

Contact DynAmp

Annual / Bi-Annual Calibration : Experienced field service technicians and specially calibrated equipment are available to verify proper operation and calibrate your system to internationally traceable standards.

Contact DynAmp

Ordering Information

Complete the LKAT System Worksheet

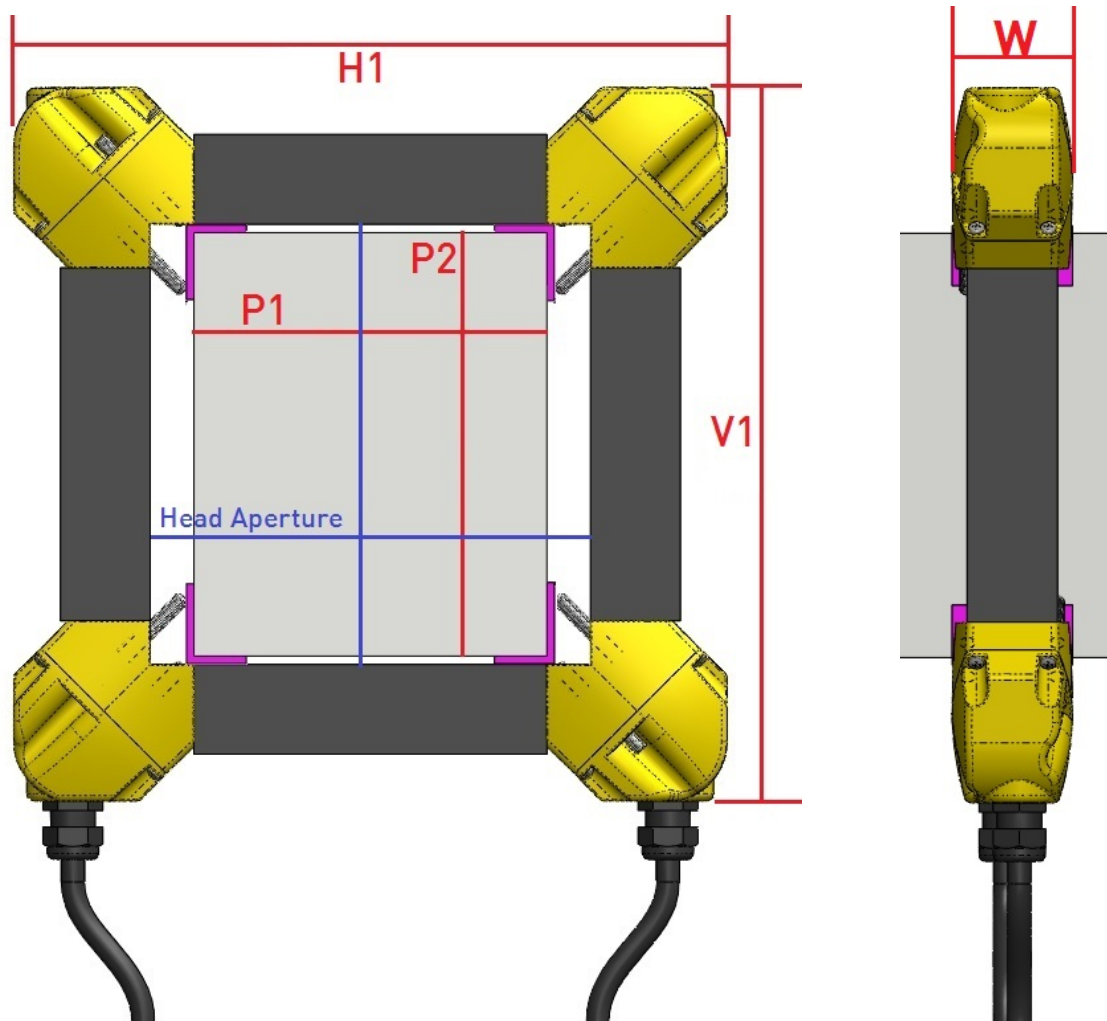
(download from www.DynAmp.com on LKAT product page)
and submit to DynAmp for quotation and system item numbers.



LKAT2 Sigma

Dual-head, Bi-Directional High Current Measurement with Rectifier Protection

Measuring Head Dimensions (2 heads supplied with Sigma configuration)



DIMENSION	
Bus Size P1 & P2	Nominal head dimensions start at 60mm (fits ≤ 60 mm bus) and increases in 30mm steps (Minimum bus dimension for standard mounting hardware is 30mm)
H1 & V1	Nominal 'outside' dimension size = P1 or P2 +130mm (190mm minimum)
W	60mm

Head Installation : One head is 2 head halves are joined around the bus bar and locked together via set screws
Complete head is held in position on bus bar using 8 positioning screws (2 at each corner)
Positioning screws are adjusted inward to contact 4 bus corner angles (included)

Head Notes : LKAT2 measurement heads are sized per order in 30mm increments.
LKAT2 head aperture is typically nominal head size (60mm min. + (X*30mm)) plus 10mm.

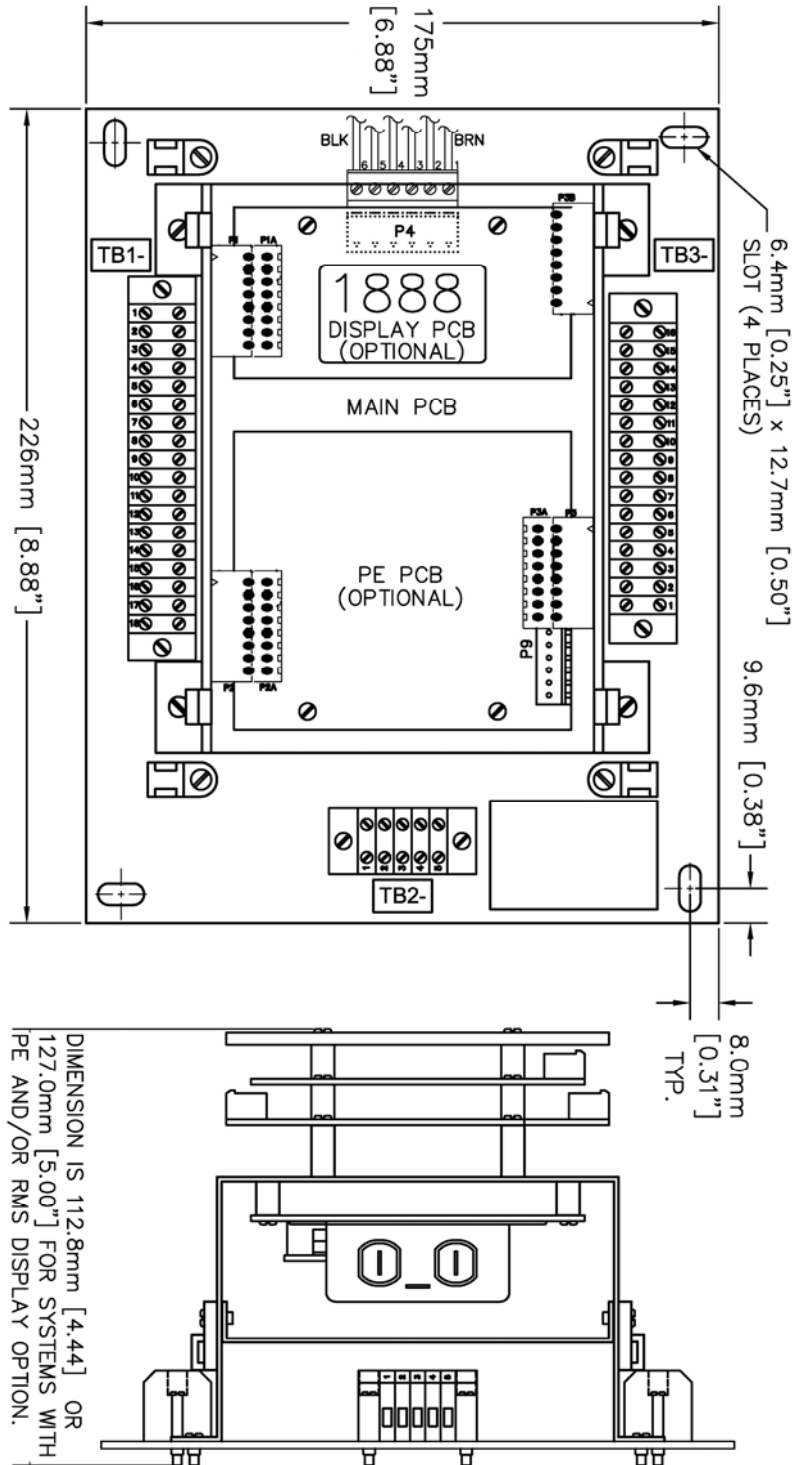
For accurate sizing, provide DynAmp with actual bus dimensions via product worksheet.



LKAT2 Sigma

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Metering Electronics Enclosure Dimensions





Specifications

MAIN ANALOG SIGNAL OUTPUT															
Main Output Full-Scale Measuring Range	±5kA to ±150kA (Contact factory for full-scale measuring ranges > 100kA)														
Signal Output Type (configurable) mA output max. burden : 10V mA output max. loop/load resistance : 500Ω V output min. load resistance : 100kΩ	<table border="1"> <thead> <tr> <th>Zero kA</th> <th>± Full-scale kA</th> </tr> </thead> <tbody> <tr> <td>0mA</td> <td>±20mA max.</td> </tr> <tr> <td>4mA</td> <td>+20 & -12mA</td> </tr> <tr> <td>0V</td> <td>±1V</td> </tr> <tr> <td>0.2V</td> <td>-0.6V to +1V</td> </tr> <tr> <td>0V</td> <td>±10V</td> </tr> <tr> <td>2V</td> <td>-6V to +10V</td> </tr> </tbody> </table>	Zero kA	± Full-scale kA	0mA	±20mA max.	4mA	+20 & -12mA	0V	±1V	0.2V	-0.6V to +1V	0V	±10V	2V	-6V to +10V
Zero kA	± Full-scale kA														
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0V	±10V														
2V	-6V to +10V														
Signal Output Calibration Accuracy *	±0.25% full-scale														
Linearity Error *	±0.1% of full-scale														
Repeatability Error Limits *	±0.1% of full-scale														
Response Time (t _d) *	≤ 50 μs														
di/dt Accurately Followed *	500 A/μs														
Frequency Response *	Switch selectable low-pass filter : No filter (default setting) / 330hz / 660hz (refer to Figure 3.1 for additional info.)														
Temperature Sensitivity	±50ppm/°C or better														
Mains Voltage Sensitivity	±0.001%/V														
* At DynAmp reference conditions : Ambient 25°C ± 2°C (77°F ± 4°F) / Mains 120/240V AC RMS, 60Hz ± 1Hz															
MAIN STATUS INDICATORS															
Accuracy Diagnostics	Indicates LKAT2 System proper operation or operational problem														
Accuracy Diagnostics Status LEDs	Green LED indicates proper operation Red LED indicates operational problem														
Accuracy Diagnostics Status Relay Function	Relay coil de-energizes when operational problem detected or mains power lost.														
Over / Reverse Current Trip Setpoint Qty. (1)	Factory/field configurable to trip on either over current (+5...+100% of full-scale) or reverse current (-5%...-100% of full-scale). Setpoint accuracy ±2%														
Over / Reverse Current Status LEDs	Green indicates operation OK – No Trip Red indicates measured current exceeds Trip Setpoint														
Over / Reverse Current Status Relay	Relay coil de-energizes when measured current exceeds Trip Setpoint or mains power lost.														
All Relay Function	Form C : Normally Open and Normally Closed Contacts (non-latching)														
All Relay Contact Ratings	120/250 VAC : 8A 30 VDC : 8A Relay response time 10mS typical														



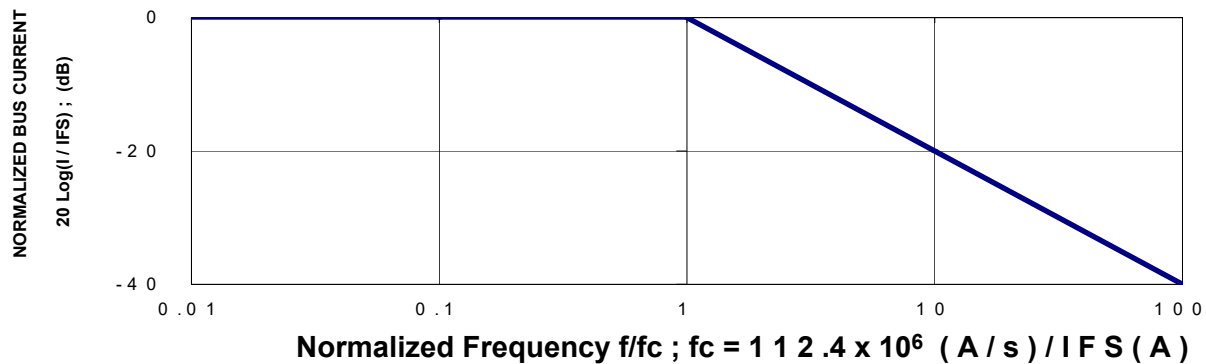
OPTIONAL PROTECTION EXTENSIONS (PE)	
PE Full Scale Measuring Range <i>(scaled independently and isolated from main output)</i>	±5kA to ±200kA (<i>Contact factory for full-scale measuring ranges > 100kA</i>)
PE analog output configuration and performance specifications	Same as Main output above with all configuration and scaling independent from main output
PE Over / Reverse Current Trip Setpoints -Qty. (2) - Field configurable	Function and specification same as Main Over / Reverse above with independent LEDs, configurations, scalings and outputs
OPTIONAL DISPLAY	
Digital Display of Bus Current in kA units	3 ½ Digit Green LCD ±2% Full-scale
Displayed Value (configurable)	DC or True RMS
NOTE: <i>Optional display reduces maximum ambient temperature of metering unit to 50°C</i>	
GENERAL	
Input Power <i>(any voltage within the specified range can be connected without any wiring changes)</i>	85 to 264Vac @ 47 to 440Hz / 110 to 264Vdc. (12 to 36Vdc optional)
Burden on Mains (max)	30 VA
Working Voltage: Signal Output to Metering Unit Low Voltage Circuit	450Vrms
Working Voltage: Bus to Metering Unit Low Voltage Circuit	1500Vdc
Working Voltage: Mains Supply to Metering Unit Low Voltage Circuit	264Vrms
Working Voltage: Mains Supply to chassis	264Vrms
Working Voltage: Output to chassis	450Vrms
Isolation : Head surface to signal outputs	6000Vrms for 1 minute
Isolation : Mains supply to signal outputs	1000Vrms for 1 minute
Isolation : Mains or signal output to chassis	2000Vrms for 1minute
Installation Category	III
Pollution Degree	2
ENVIRONMENTAL	
Operating Ambient Temperature Range of Metering Unit Location	-10°C to 60°C (14°F to 140°F)
Operating Ambient Temperature Range of Measuring Head	-20°C to 80°C (-4°F to 176°F)
Environmental rating: Measuring Head and cable connection at Head	IP65
Environmental rating: Metering Unit and cable connection at Metering Unit	IP10



PHYSICAL	
Measuring Head Weight (each)	Typically 1 to 6 kg (3 to 13lbs.)
Metering Unit Weight	Typically 2kg (4.5lbs.)
Standard Length Head Connection Cables (1 cable per head half). Optional custom lengths may be available up to 50m (164 ft.)	10m (33 ft.) Cable fixed to Measuring Head with individual conductors for Meter Unit on opposite end
Signal Output Cable	NONE User supplied : connection to terminal block
Power Input Cable	NONE User supplied : connection to terminal block

Figure 3.1
LKAT2 Frequency Response without internal low-pass filters switched into circuit

Normalized LKAT2 Bandwidth



F.S. Bus Current (kA)	5 to 50	60	70	80	90	100
Corner Frequency (kHz)	2.248	1.873	1.606	1.405	1.249	1.124