

## Data Centre Testing Solutions

The complete **HAC230-6RM** - 230V/400V range of rack mounted server simulator HeatLoad from Hillstone



With 14 years of  
datacentre Integrated  
System Testing the  
**HAC230-6RM** remains the  
industries goto HeatLoad  
solution



Designed by  
Hillstone



Over 10,000 pieces  
manufactured since 2007

## HeatLoad Server Simulators - IST - Uptime Certification

This HeatLoad Application note has been issued to support the successful delivery of a **Level 5 Integrated System Test** in a datahall or datacentre, using the Hillstone **HAC230-6RM** server simulator heatload load banks

The two scenarios for using the **HAC230-6RM** are (i) in a datahall populated with IT cabinets & (ii) in an empty white space.

This application note will also support the installing and operating for the load banks as required for UPTIME INSTITUTE Certification testing.

It is recommended that the operation of the load banks is performed alongside a robust commissioning programme for the specifics of the datacentre design.

We also recommend to support the IST, detailed surveys are carried out observing air flow, temperature: fixed data loggers and hand held measurement, UPS load values and air handling unit return air supply and set point temperature values. These readings should be correlated and time stamped against the planned events of the IST.

## HAC230-6RM Overview

The **HAC230-6RM** is a 4U 19" load bank server simulator designed to simulate IT server operation as part of the testing and commissioning of the data hall.

- Complete flexibility to meet all electrical connection requirements across the different stages of datacentre IST and electrical designs.
- Electrical design for 230V / 400V and 50 / 60Hz operation.
- The HAC230-6RM can operate in compliance to Ashrae TC9.9; recommended cold aisle temperature range ( 18°C -27°C / 64°F - 80°F).
- The HAC230-6RM is also used to determine the temperature rise time period to 40°C - 45°C / 104 - 113°F during simulated failure of the cooling system.
- Such testing allows IT managers to build Standard Operating Procedures ( SOP ) and staff training programs for the maximum operating temperature of commercial grade IT equipment.
- Designed with the highest availability of > '9999' and MTTF of performing over 200 datahall IST testing programs.
- Delivering over 10 years reliability and investment return on IST testing.

Flexibility

Complete Electrical Compatibility

Perfect air temperature mix in the datahall

## Using the 6RM Server Simulator in IT Cabinets

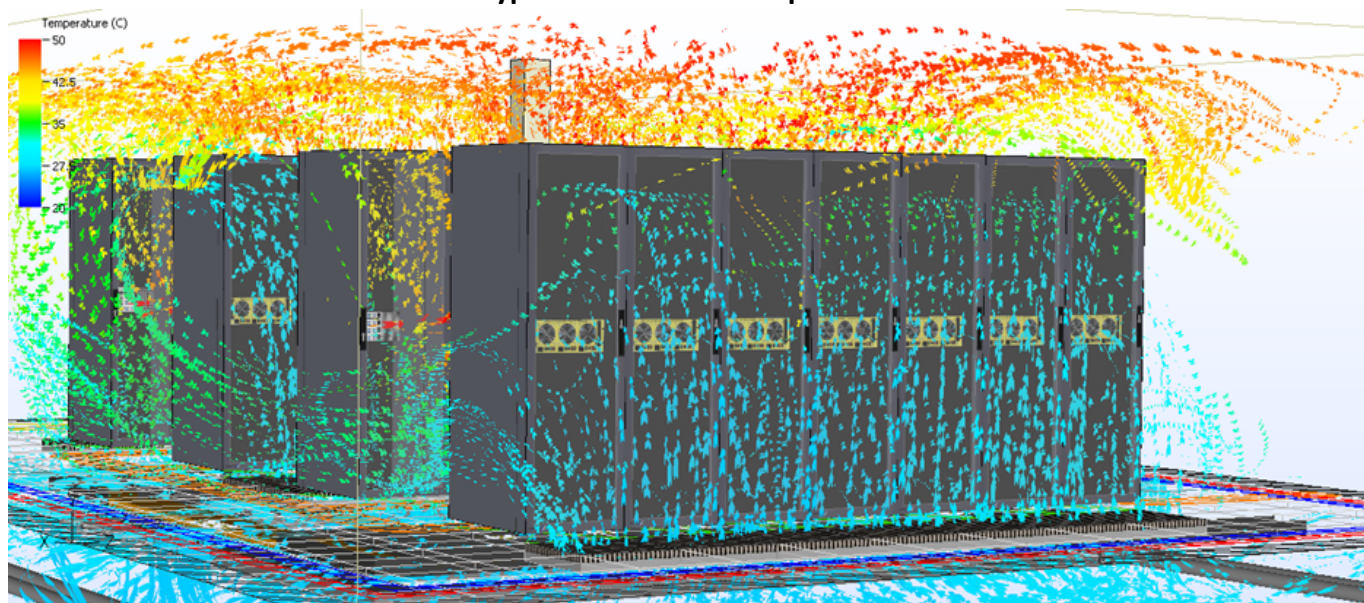
The **HAC230-6RM** provides complete electrical compatibility and can be connected to any available PDU power strips or IT cabinet tap off boxes used inside a data room.

The **HAC230-6RM** design can deliver 6 selectable 1.1kW load steps for 220V / 230V single phase electrical designs

The **HAC230-6RM** will also operate on 3 phase 380V / 400V electrical systems delivering 2 selectable load steps of 3.3kW or 6.6kW

The **HAC230-6RM** connections are via 3 independent C20 panel mounted sockets allowing connection to C14 or C20 RPP / PDU in the cabinet or to the cabinet fed 32A or 63A, 230V / 400V tap off boxes

### Typical IST Simulated Operation



### HAC230-6RM Return on Investment

The available industry options for using a server simulator to test a datacentre falls to either purchase or rental.

Both options are available from Hillstone and if we review a performance analysis on the HAC230-6RM there is a clear advantage of longevity and operational availability which overwhelmingly supports purchase over rental.

The HAC230-6RM conducted performance analysis is based across four criteria to creates an unrivald ROI

- Mean Time Between Failure
- Mean Time To Repair or Mean Down Time, calculated to include system recovery time
- Lifetime Availability
- Return on Investment

	Rental	Purchase
MTBF	1000 Hours	
Availability	>99999	
MTTR	<1 hr if over supplying is provided >1 day if replacement to site is required	1.2 hours with onsite support team
ROI	13 IST operating weeks	>1800% over lifetime operation

The **HAC230-6RM** delivers 1000 hours of MTBF Integrated System Testing performance and will deliver 200<sup>[1]</sup> standard IST tests or Uptime Institute certifications against lifetime operation.

The calculations for availability performance for a **HAC230-6RM** used for IST tests or Uptime Institute certifications will deliver >99999 which is very important for datacentre testing resilience.

The lifetime availability of the **HAC230-6RM** must also be considered against its 10 years service life history and with more than 10,000 units manufactured from the Hillstone factory in the UK, the performance is unrivalled against other alternatives in the market.

The MTTR or MDT for the **HAC230-6RM** has been calculated at 1.2 hours and can be delivered with a capex support team that invests in holding spare parts from the manufacturer.

Rental supply can mitigate MTTR or MDT if on site provision for spare units is factored into the quantity of asset investment. Even with a 5 nines availability, an on site reserve holding of 1-2% would ensure on site MDT of < 1hr or >1 day if off site replacement is required.

We have also evaluated the ROI of the **HAC230-6RM** based on the financial comparison of purchase to rental, which

becomes a simple analogy with the ROI being achieved over 13 weeks or 3 x one month tests and >1500% cost saving against - lifetime operation on capex vs opex ( rental ) investment.

#### Conclusion

While Hillstone operates both a rental and manufacture model for load banks in the UK it is because of our established dedicated and experienced team of global partners that we can add value and resilience to local onsite datacentre testing. Our network delivers either OPEX rental model or onsite CAPEX support to the end users asset investment.

The security of using Hillstone, opens industry historical leadership and experience from the load bank industry to ensure the success of the datacentre testing, for the design and build process and future proofing of the transfer of the datacentre to IT operations.

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<sup>[1]</sup> An IST test should be completed in 5 days; UTI certification in 3-5 days



## Using the HAC230-6RM Server Simulator in an empty datahall

Position the **HAC230-6RM** load banks or the **HMT-20** Mini-towers on the floor with the air inlet facing the ducted cold air floor grill and the hot exhaust towards the “hot” aisle.

The loads should be distributed evenly across the data hall and positioned to represent the location of the future intended IT cabinets.

Either the **HAC230-6RM** or the **HMT-20** mini-tower can be connected to the 230V / 400V electrical design of the white space

Consider partitioning the hot aisle and cold aisle to replicate the populated datahall as per pic 1 below.

Identify, in advance of the installation day, the positions of the power sockets & select the location to fit the temporary cable floor tiles if they are located under the raised floor. Do not allow floor tiles to be raised because this will affect the room pressure and make it very difficult to balance the air mix.

## Temporary Partition Cold Aisle for Adiabatic Cooling System

Picture 1 is an example of a temporary partition hot aisle / cold aisle installation of HAC230-6RM server simulators in a datahall. The loads are distributed to replicate the power density of a low  $\Delta T$  adiabatic cooling system

Picture 2 illustrates the distribution of HAC230-6RM in a data hall without temporary partitions



Pic 1



Pic 2

## Electrical Compatibility

The **HAC230-6RM** 230V / 400V is designed to be used with the combination of 220 or 230V single phase and 380V / 400V 3 phase electrical systems designs seen in the modern datacentre.

The flexible design of the **HAC230-6RM** delivers 6 independent 1.1kW 230V loads for single phase rated for 50 or 60Hz supplies and 2 load steps 3.3kW or 6.6kW on 400V 3 phase systems.

This allows operation on UK, European or North American supplied electrical grid systems.

## Dual A-B UPS IT Load Testing

Dual feed A-B testing requirement solutions are provided by using a compatible **manual** or **automatic** transfer switch.

This gives additional flexibility to increase the ROI on existingly held **HAC230-6RM** load banks.

Load supply transfer testing allows integrity testing of the A & B UPS supplies, allowing the room load to perform 100% autonomy testing on both A & B without re-wiring the installed load banks.

This can also simplify performing the UpTime Institute '**concurrently maintainable**' requirement of proving the UPSsystems can support load acceptance during planned maintenance.

Load 50% on the A UPS and 50% on B UPS to ensure there is no loss of IT load during planned UPS maintenance when the load transferred to the B UPS when the A UPS is switched to by-pass

The lower cost Manual Transfer Switch **HAC230-6RM-MTS** gives the option to select mix the room loading across the UPS fed supplies, during UPS integrity testing.



The Automatic Transfer Switch **HAC230-6RM-ATS** gives the additional option of testing full load acceptance testing between the A to B supplies and the B to A supplies.



## Establish Environmental Conditions in the Data Hall

### Set the cooling system to run on A system

As part of the installation procedure it is recommended that the room is put under step load increments to deliver proportional operational response of the datahall cooling system.

This time period for each step load increment should be evaluated and extended as required until the cooling system is stabilized for the given load.

For each load step increment run the load for at least 30 minutes to ensure stability and response of the cooling system.

Perform a room survey recording airflow, temperature of hot and cold aisles, air handling units set points and return air temperatures ( fan speeds if data is available ), UPS load values for L1, L2, L3.

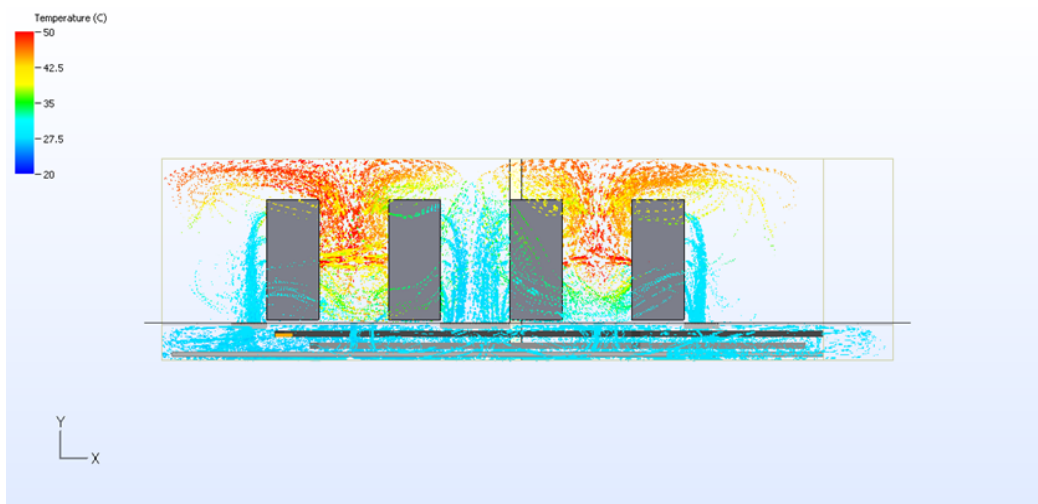
Once the verification of the cooling system has been proven the load % and time periods may be adjusted against testing time constraints.

### Load Running level increments

- Load up the room to 25% load
- Load up the room to 50% load
- Load up the room to 75% load
- Load up the room to 100% load

### IST Load level increments

- Load up the room in 10% load steps to 100%
- Apply step load increments at 30 mins intervals
- Decrease from 100% down to 0
- Test duration 10 hours 30 mins





#### Case #1: Using HeatLoad Server Simulators

- Data Halls Populated with IT cabinets
- Installation In Racks
- Power Connection to Rack PDU
- 4U 19" Mounting
- 6.6KW 230V / 400V
- 9.6A per C19 or C13 Connection



#### Connecting a HAC230-6RM to an IT cabinet with a Three Phase PDU

Fig. a illustrates how to connect the HAC230-6RM to a balanced three phase PDU.

Three Phase Ratings

	Power	Amps	Switch Steps		
Step 1	3300W	4.8A	1-1	2-1	3-1
Step 2	6600W	9.6A	1-1	2-1	3-1
			1-2	2-2	3-2

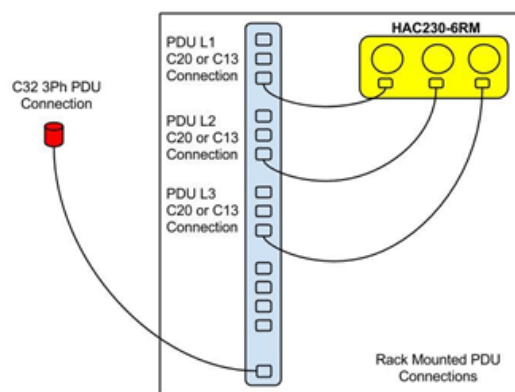


Fig. a

#### Connect a HAC230-6RM to IT cabinet with a Single Phase PDU

Fig. b illustrates how to connect HAC230-6RM to a single phase PDU.

Single Phase Load Switch Ratings

Panel Socket

Load 1	1-1	4.8A	1100W	C20
	1-2	4.8A	1100W	C20
Load 2	2-1	4.8A	1100W	C20
	2-2	4.8A	1100W	C20
Load 3	3-1	4.8A	1100W	C20
	3-2	4.8A	1100W	C20
6600W				

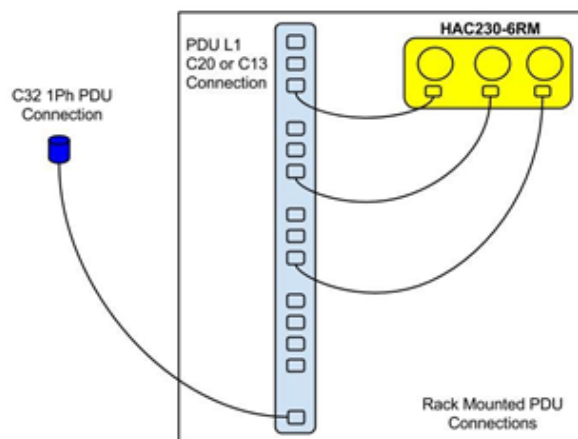


Fig b

#### Connect a HAC230-6RM to single phase or 3 phase 16A, 32A or 63A Tap Off Boxes

Fig.c illustrates connecting HAC230-6RM to single phase or 3 phase tap off box.

HAC230-6RM		Cable Type	Tap Off Box Sockets	
Panel Socket	Single Phase	BLUE Plugs	Current Rating	Single Phase Sockets
C20	9.6A	C19 to C16	16A	16A BLUE
C20	9.6A	C19 to C16		
C20	9.6A	C19 to C16		
<b>Total</b>	<b>29A</b>			

HAC230-6RM		Cable Type	Tap Off Box Sockets	
Panel Socket	Single Phase	BLUE Plugs 3x C19 cables to	Current Rating	Single Phase Sockets
C20	9.6A	C32	32A	32A BLUE
C20	9.6A	C63	63A	63A BLUE
C20	9.6A			
<b>Total</b>	<b>29A</b>			

HAC230-6RM		Cable Type	Tap Off Box Sockets	
Panel Socket	Single Phase	RED Plugs 3x C19 cables to	Current Rating	Single Phase Sockets
C20	9.6A	16A	16A	16A RED
C20	9.6A	32A	32A	32A RED
C20	9.6A	63A	63A	63A RED
<b>Total</b>	<b>29A</b>			

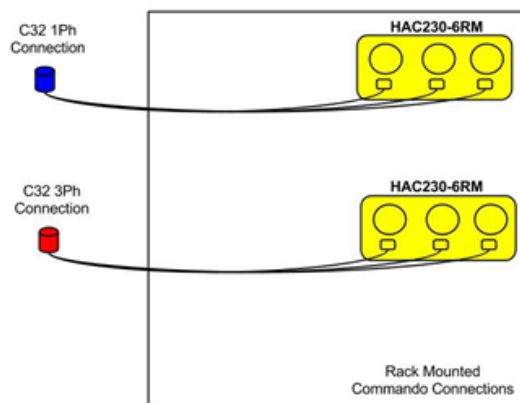


Fig c

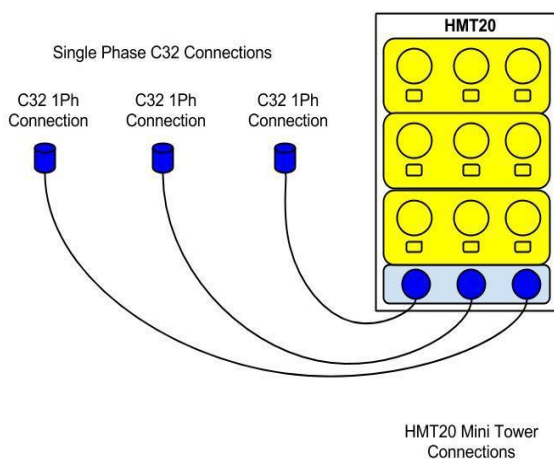


## Case #2: Using HeatLoad Mini-Tower Server Simulators

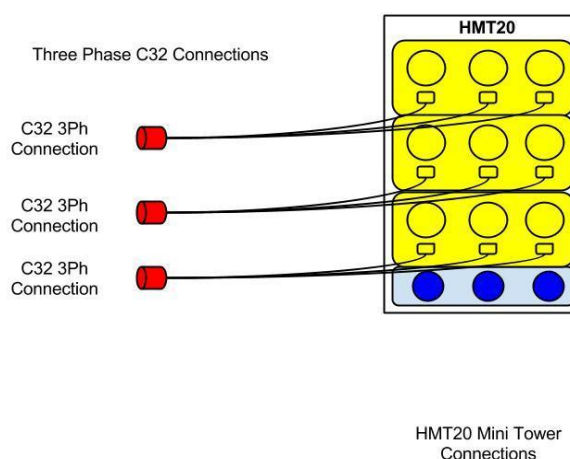
- For Use In Empty Data Halls
- Portable Heat Distribution
- 3 x 4U 19" Server Simulators
- 20KW 230V / 400V



### Single Phase



### Three Phase



Connect directly via the mini-tower panel mounted sockets

## HAC230-6RM Specification

Type Ref	HAC230-6RM
Max Voltage	230 volts single phase, 400 volts 3 phase, 50/60 hz
Full Load Rating	Nominal: 6666W - 29A - 230V single phase Nominal: 6666W - 9.6A - 400V 3 phase
Power Factor	1.0pf resistive load
Controls	6 x 1.1kW loads at 230V 2 x 3.3kW loads at 400V
Adjustment	Load steps selected via panel mounted illuminated switches
Connection	Three C20 panel mounted sockets for each independent load channel
Cooling	3 low noise < 60dBA @ 1m, horizontal force air cooling fans, powered from the test source. Cool air intake at front, hot air exhaust at rear.
Airflow	Each fan 144 m3/hr at minimum pressure zero Pa. (Static). Total airflow 432 m3/hr
Element Type	High temperature ni-chrome tape wound mounted on mica composite card
Dimensions	4U ( 176mm high x 250mm deep plus handles ) 19" rack assembly
Weight	8 kgs
Construction	Zintec steel, with powder coated yellow gloss finish front panel Enclosed tray assembly with rear grill
Operating Temperature	0 - 45°C / 0 - 113°F
Storage Temperature	0 - 80°C / 0 - 176°F
Movement	Front handles for slide in assembly to 19" racks
Mean Time Between Failure	> 200 IST testing weeks; > 10 years reliability and investment return on IST testing
Optional Extras	Cables: 1phase or 3 phase to: 16A, 32A or 63A free plugs



#### Adjustable Airflow / Heat Dissipation per HAC230-6RM

kW Load	Delta T Range from 144 to 432 CMH	
	Minimum	Maximum
1.1kW to 2.2kW	6°C / 43°F	12°C / 54°F
3.3kW to 4.4kW	10°C / 50°F	15°C / 59°F
5.5kW to 6.6kW	14°C / 57°F	20°C / 68°F

#### Environmental Air Temperatures

Cold Aisle Temperature Range

Ashrae 18°C - 27°C / 64°F - 80°F

IT Equipment Maximum Operating Temperature

> 40°C - 45°C / 104°F - 113°F

Adjustable Cold Aisle ΔT Range

ΔT 6°C - 20°C / 43°F - 68°F

	Case Size	Depth	Width	Height	Approx. Weight
HAC230-6RM	2	250mm	482mm ( 19" )	176mm ( 4U )	8Kgs
HMT-20	4	320mm	520mm	900mm	44Kgs
HAC230-6RM-MTS	1	400mm	482mm ( 19" )	90mm ( 2U )	3Kgs
HAC230-6RM-ATS	1	400mm	482mm ( 19" )	90mm ( 2U )	5Kgs

#### Standards And Quality Assurance

The **HeatLoad Load Bank Range** is manufactured in the UK to the following EU and ISO standards

Low Voltage Directive 2006/95/EC

EMC Directive 2004/108/EC

BSEN61000-6-3 2007 amendments for 2011

BSEN61000-6-1 2007

BSEN61000-6-4 2007 amendments for 2011

Hillstone Products Quality Assurance procedures ISO 9001:2015



**ISO  
9001 : 2015  
REGISTERED**

Cert No. 14124754

#### Notes

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2. We reserve the right to make detailed changes to specification, components, dimensions or weights at the time of design or manufacture without prior notice.
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