

Data Centre Testing Solutions

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



HAC230-6RM



**12 years of datacentre Integrated System Testing
the HAC230-6RM is the goto HeatLoad solution**

Issue 9 with buy or rent ROI Analysis from the leading experts in datacentre HeatLoad Server Simulators

Designed by
Hillstone

 **MADE IN
BRITAIN**

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 a 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 along side 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 show 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.

Total Flexibility

Complete Electrical Compatibility

Perfect air temperature mix in the datahall

Using the 6RM Server Simulator in IT Cabinets

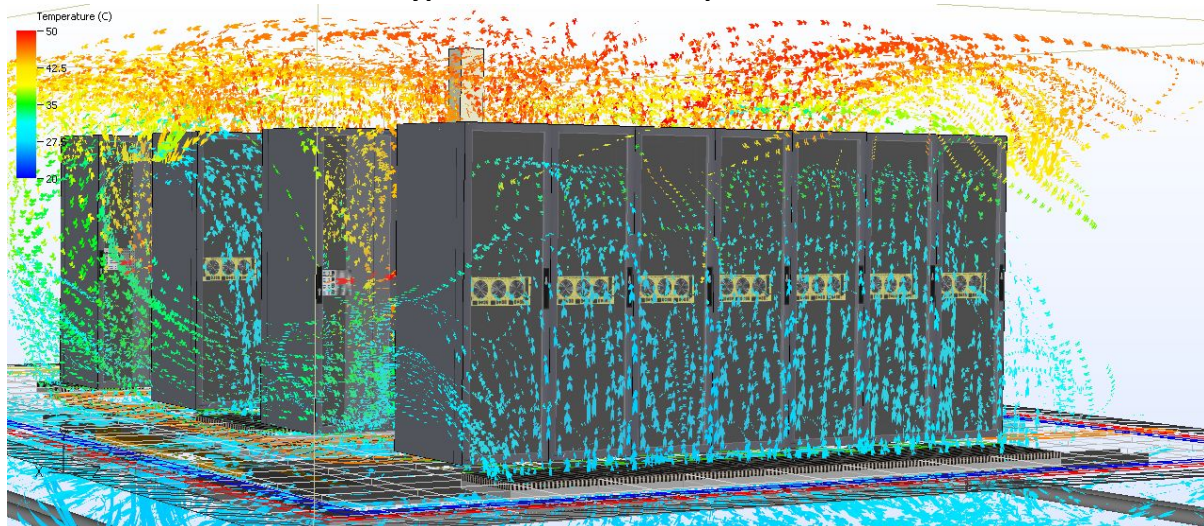
The **HAC230-6RM** provides complete electrical compatibility and can be connected to any available PDU power strips or IT cabinet tap off boxes used inside a data room.

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 life time operation |

The **HAC230-6RM** delivers 1000 hours of MTBF Integrated System Testing performance and will deliver 200¹ 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.

¹ 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 balance.

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 ΔT 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 UPS systems 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.

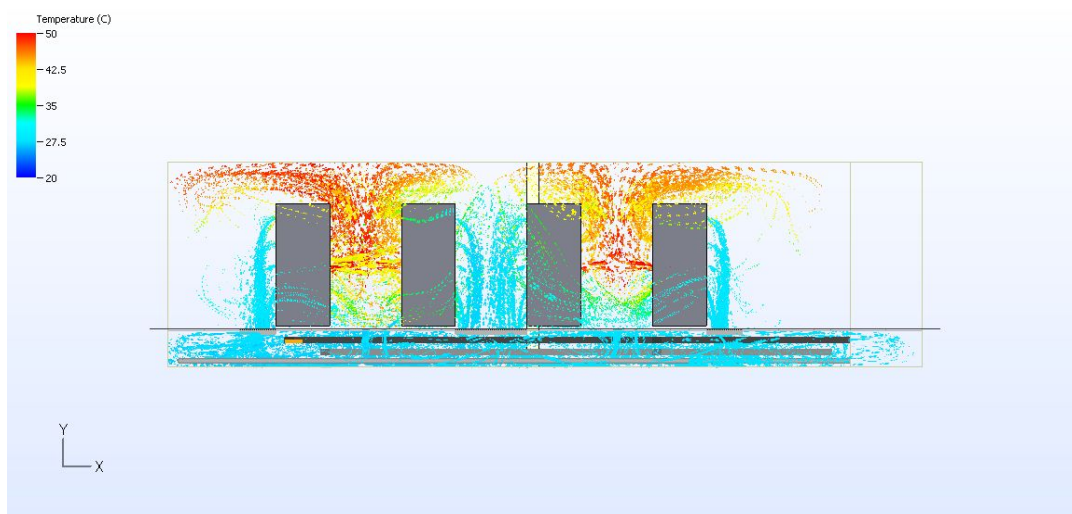
Once the verification of the cooling system has been proven the load % and time periods may be adjusted against testing time constraints.

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 **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 |
| | | | | | |

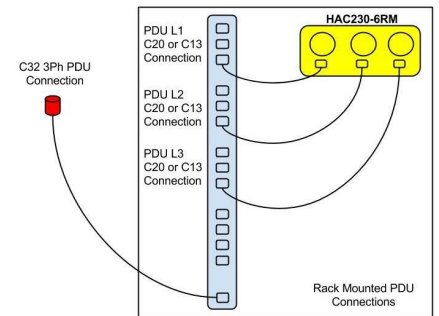


Fig.

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 | | | | |

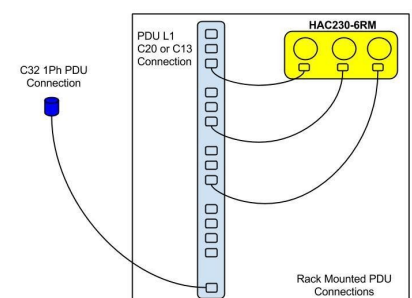


Fig. B

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 | | |
| Total | 29A | | | |
| HAC230-6RM | | Cable type | Tap off box sockets | |
| Panel Socket | Single phase | BLUE plugs 3 x 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 | | | |
| Total | 29A | | | |

| HAC230-6RM | | Cable type | Tap off box sockets | |
|--------------|--------------|--------------------------------|---------------------|---------------------|
| Panel Socket | Single phase | RED plugs 3 x C19 cables to | Current rating | Three Phase Sockets |
| C20 | 9.6A | 16A | 16A | 16A RED |
| C20 | 9.6A | 32A | 32A | 32A RED |
| C20 | 9.6A | 63A | 63A | 63A RED |
| Total | 29A | | | |

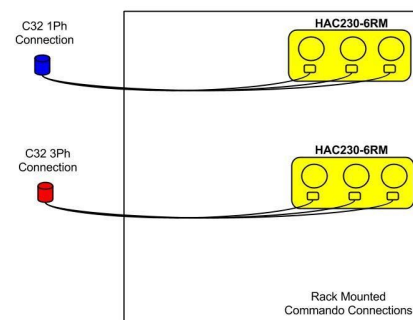


Fig. C



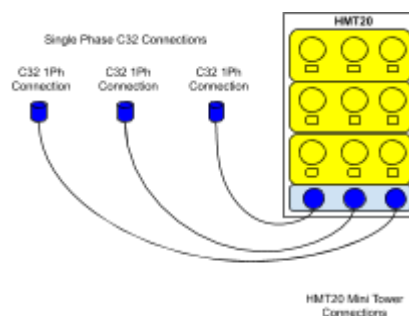
Case #2: Using HeatLoad Mini-Tower Server Simulators

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



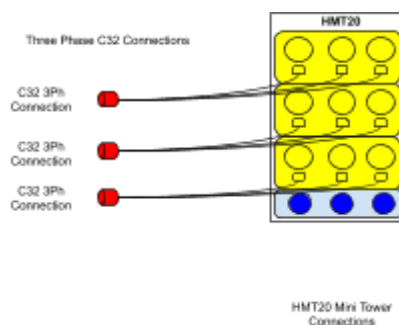
Single Phase

Connect directly via the mini-tower panel mounted sockets



Three Phase

Connect via the mini-tower panel mounted sockets



Case Size

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

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 |
| Operation Availability | > '99999' for IST testing |
| 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 |

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



Notes

- Information in technical literature, quotations or datasheets are intended to be correct at the time of publication.
- 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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