



Vapour Phase Cooled M.F Load

B8050

Features

Vapour phase cooled

Balanced and unbalanced inputs available

High thermal capacity provides inherent safety margin

Combines dummy load and balancing load function in parallel systems

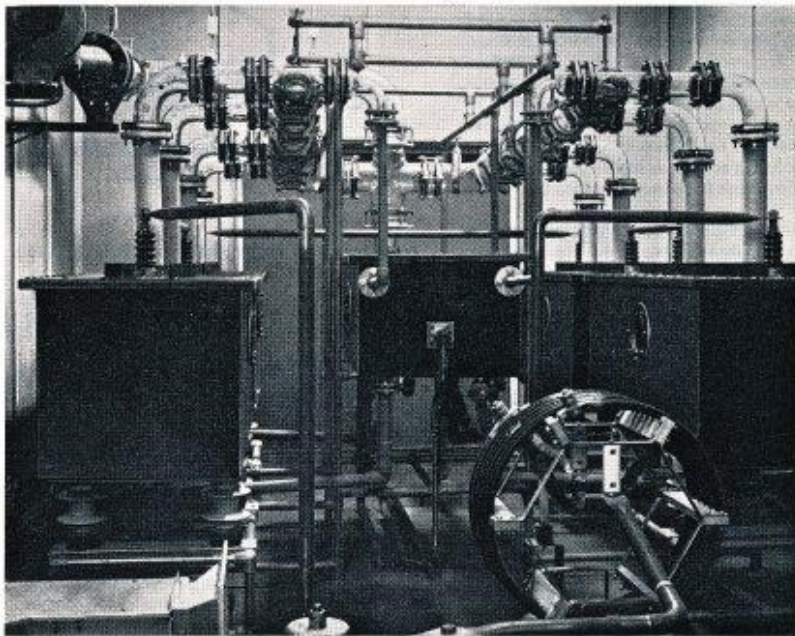
When used as balancing load does not require continuously running cooling fan

Description

High-power test loads present a particular design problem in the choice of coolant. Because of the amount of heat dissipated, air convection cooling is not suitable. Forced air, water and vapour (latent heat) cooling are each possible, and for normal applications, such as a dummy antenna, all are practical solutions. However, another valuable use for such artificial loads also arises in paralleling equipment, when the main load can also be used as the balancing load in the combining network. In this case, the failure of one transmitter automatically leads to half the power of the remaining transmitter being dissipated in the balancing load. If the safe dissipation of the load used depended upon forced air or water it would be necessary to maintain a continuous circulation of the coolant, which on economic grounds alone is undesirable. To avoid this a system is required having a high thermal inertia, allowing safe operation for a short period while the coolant replenishing or circulation system is brought into use.

A vapour-cooled load (in which the heat is removed from the load elements by boiling water to produce steam) fulfils these requirements and has the additional feature that the load elements operate at a low temperature, i.e. just over 100°C.

The B8050 series of vapour-cooled loads are built up to the required resistance by means of series-parallel groups of resistance elements, each element being immersed in low conductivity water in a specially constructed stainless steel tank. Typically one such tank holds approximately 250 litres of water and can dissipate 90kW plus the additional power resulting from 100% sine



Typical test load

wave modulation continuously. The water vapour produced by the load can be exhausted directly to atmosphere, or passed to a heat exchanger which may in turn be water or air cooled. For high-power loads the use of a heat exchanger is to be recommended as the condensate can then be returned to the system for re-use.

A Typical High-power Vapour-phase Cooled Load

A typical 375kW 100% sine-wave modulated carrier power load employs four load tanks grouped around a common level control tank. As power is dissipated in the load tanks the level of the water is automatically maintained by gravity feed from the level tank. The steam is condensed in a heat exchanger and then returned to the level tank. The overall water level in the system is maintained by replenishing from a separate header tank, the flow being controlled by a ball float valve in the level tank. Typically the header tank holds about 900 litres of distilled or de-ionized water, and is mounted at such a height that sufficient reserve flow can be provided to maintain the water level in the load tanks should the heat exchanger cooling fail, the steam then being automatically released to atmosphere. Typically, this condition can be maintained for about half an hour.

The load as supplied will include a matching

network if necessary, depending upon the maximum v.s.w.r acceptable and the operating frequency.

Automatic safety devices and indications are installed and the equipment is therefore completely suitable for unattended operation. A steam sensor in the heat exchanger is used to switch on the cooling fan. Even if the heat exchanger fails to start, the steam is allowed to escape to atmosphere and no dangerous pressures can build up in the system. Failure of the heat exchanger would be indicated by an external alarm, and if the level of the water in the header tank falls below a safe level a further alarm is given. If the water level in the level control tank falls to an unsafe level the transmitter is switched off.

Carrier power in the load can be determined by measuring either the r.m.s current with a current transformer and a thermocouple type ammeter, or by measuring r.m.s volts from a peak reading voltmeter, together with a measurement of load impedance.

The resistive element is insulated from the load tank and the B8050 test load can therefore be supplied in either balanced or unbalanced form without complication.

The equipment described so far constitutes the minimum to form a working load. In practice, depending upon site layout, availability of suitable water and other conditions, it may be desirable to add further items.

The header tank may be in such a position that it can easily be filled with water by hand

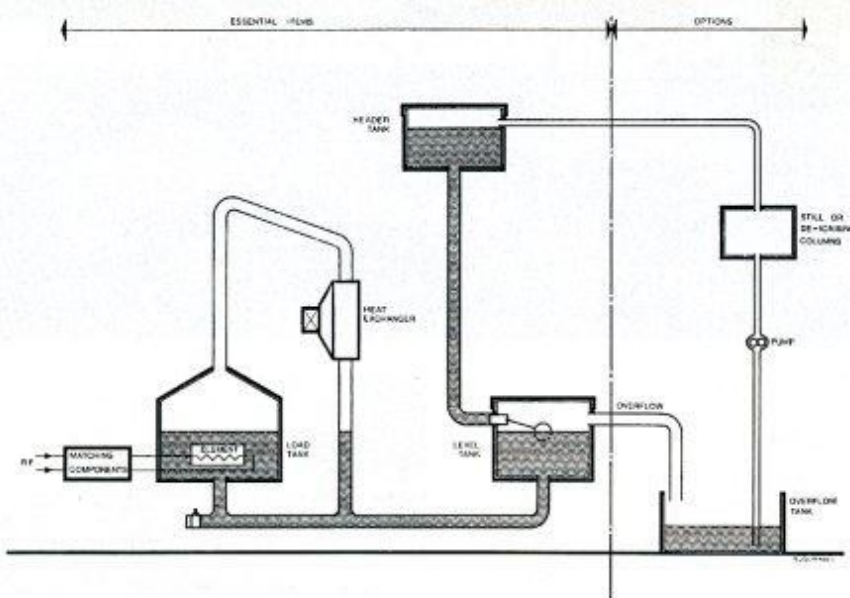
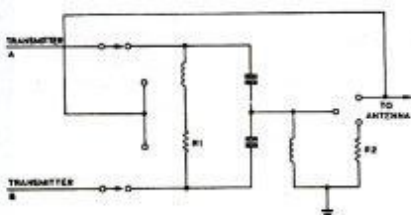
(demineralized or distilled water is usually delivered in polythene containers which can be handled by one man). However, if this is not so, some form of simple pump may be required.

Depending upon the steam capacity of the load, i.e. the volume contained within the steam piping, it may be necessary to install an overflow tank to avoid unreasonable loss of water. Overflow of water tends to occur when closing down the system, as a result of the steam in the system condensing. Usually this overflow is so small that it can be run to waste. This may not be true if, for example, the heat exchanger is considerably distant from the load thus resulting in a high volume of connecting steam pipe. In these circumstances it is advisable to install a small overflow tank which may conveniently be placed at floor level. A pump is then necessary to return overflow water to the header tank. Where a pump is also necessary to replenish the system (as described earlier) the one pump can be used for both purposes, additional water being added, when required, to the overflow tank to be pumped into the header tank.

When sufficiently pure water is not readily or economically available, purifying equipment should be installed. This may be either resin ion-exchange columns, producing deionized water, or a still, to produce distilled water. These need not be large units, since the loss of water is normally very small. Where a vapour-phase cooled transmitter is associated with the load a common purifying equipment can be used. The source of water for the purifying unit can be the same as that used for domestic purposes on site. Overflow water from the system may also be passed through the purification system before re-use in order to remove contaminants.

It should be noted that the area housing the test load should be securely interlocked with the transmitter power supply isolator to ensure that power cannot be applied to the load in such a way as to cause danger to personnel. In addition, depending upon the site and local conditions, it may be necessary to screen the load enclosure to reduce r.f. radiation.

All the equipment described can be engineered, supplied and installed by Marconi, who will be pleased to advise on receipt of details of full requirements and local conditions.



Diagrammatic representation of B8050 Vapour Phase Cooled M.F. load

Use of the B8050 with Paralleled Transmitters

To take advantage of the B8050 load for transmitter paralleling equipment it is only necessary to install the load in two halves with suitable r.f. switching to produce the circuit shown in simplified form below left. The switch positions shown provide the normal working condition. Failure of one transmitter would lead to half of the power of the remaining transmitter being dissipated in R_1 . By switching one transmitter direct to antenna and bringing R_2 into use the net resistive load is then of the correct value and capacity to accept the full power of the remaining transmitter. (The reactive components cancel in this configuration.)

Ordering Information

When ordering or enquiring about this equipment, the following details will assist us to deal promptly with your requirements.

- 1 Power rating required.
- 2 Working frequency or frequencies.
- 3 Expected ambient temperature range.
- 4 Altitude of site.
- 5 De-ionizing or distilling equipment: is this required?
- 6 Details of proposed accommodation area.

A typical equipment list will contain the following items

Stainless steel load tanks fitted with load elements (1 tank for 90kW, 2 for 180kW, 4 for 375kW).
Level tank with inlet valve and water level alarms.
Header tank, with water level indications and alarms.

Steampipe assembly.
Water feedpipe assembly.
Overflow pipe.
Control and indicating equipment.
R.F. matching components.
Installation hardware.
1 set of handbooks.

Optional items

De-ionizing or distilling equipment
Heat exchanger
Overflow tank
Pump for replenishing header tank
Interlocked enclosure.
R.F. screening for enclosure.

Unless otherwise instructed these items are included in any offers made

Data Summary

Power dissipation: Approx 90kW 100% sine wave modulated power per load tank (up to four load tanks can be associated with one level tank).

Working frequency: Supplied adjusted to specified frequency in the band 525kHz to 1605kHz.

Input: Balanced or unbalanced.

Input impedance: Normally 100Ω, other values can be provided, e.g. (100Ω + j100Ω), 50Ω or 200Ω. Please inquire if other values are required.

V.S.W.R.: With simple reactance correction, not more than 1.1 up to 1000kHz. With matching circuit, not more than 1.05 up to 1605kHz. In each case the match holds over at least a 50kHz bandwidth.

Dimensions: Vary according to requirements. A typical 375kW load occupies a plan area approximately 3.5m by 2.8m (11ft 6in by 9ft 2in). A minimum ceiling height of 3m (10ft 2in) is recommended for the installation of the load.

This document gives only a general description of the product(s) and shall not form part of any contract. From time to time changes may be made in the products or in the conditions of supply.

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