

# DUMMY LOADS

## INTRODUCTION

**DEFINITION:** A dummy load is a high power single terminal device intended to terminate a transmission line. They are primarily employed to test high power microwave systems at full power capacity.

**DISSIPATIVE MATERIAL:** Three types of dissipative material are employed in Mega Industries' dummy loads: (1) lossy plastic, (2) refractory ceramic, and (3) water.

The lossy plastic consists of particles of lossy material suspended in plastic medium. This material may be designed to provide various attenuations per unit length but is limited as to operating temperature. It is employed primarily for low frequency and low power applications.

The refractory material is a rugged substance that may be operated at temperatures up to 1600°F. It is virtually incapable of being machined and consequently must be fired in finished form. Such material is employed in most high power applications.

The dissipative properties of water are also employed for dummy load applications. Energy from the guide is coupled through a leaky wall to the water which flows alongside the main guide. Water loads are employed for extremely high power and calorimetric applications.

**HEAT TRANSFER:** Three methods of heat transfer are employed: (1) free air convection, (2) forced air cooling, and (3) liquid cooling.

Free air convection loads transfer heat by means of cooler air in contact with the load and by radiation from the black outer surface. Such loads may be provided with fins to increase the outer surface area and thus the heat transfer.

Forced air cooled loads provide much greater heat transfer and power ratings than standard convection cooled units. Our application engineers are prepared to assist in determining proper specifications for forced air models.

Liquid cooled loads utilize flowing water or other coolants to increase heat transfer. The coolant is passed in direct contact with the load housing to optimize heat flow.

**FREQUENCY RANGES:** The exact operating frequency range of each dummy load should be specified on each order or inquiry. While dummy loads can be supplied to operate over full waveguide bands, generally faster delivery and a more economical unit can be furnished for use over narrower frequency ranges.

**POWER RATINGS:** The power rating of a dummy load is a complex function dependent upon many parameters. Average and peak power, guide pressure, external temperature, guide size, air flow, and availability of auxiliary coolant all play factors in the final power rating of a dummy load. The average and peak powers are interrelated in that the peak power capacity is a function of the operating temperature which in turn is a function of the average power. These are then impacted by the ambient temperature of the cooling medium (air or water).

The tables on the following pages provide power ratings for each model. The independent average power rating assumes CW operation. The independent peak power rating assumes negligible average power. The typical combined average and peak power ratings should be employed in combination. Our application engineers will readily assist in determining proper loads for a particular application.

**HIGHER POWERS:** Mega can supply dummy loads with higher power ratings on request. Longitudinal fins, forced air cooling, and other techniques are also employed to improve high power performance.

**FINISH:** Air cooled high power dummy loads have high surface temperatures and must be finished in such a manner as to increase heat transfer. Mega employs a heat resistant black silicone-based paint (>525°C) for most applications, although custom finishes are available for even higher surface temperatures.

**DA LOADS:** Mega can supply DA loads per MIL-D-3954C. These DA loads are identical to the WF series in all electrical and mechanical respects except that they are supplied with electrical testing certification and a nameplate per MIL-D-3954C.

## SPECIAL DESIGN

The following table indicates the information required for the design of special loads. These parameters are closely interrelated. Anyone specification may be optimized; however, this generally requires the relaxation of other specifications. Our application engineers would be pleased to assist in determining proper specifications for your system application.

### ELECTRICAL

Frequency Range  
Maximum VSWR  
Average Power  
Peak Power  
Guide Pressure  
Other

### MECHANICAL

Connectors or Flanges  
Dimensions  
Weight  
Finish  
Marking  
Mounting Provision  
Coolant  
Coolant Pressure  
Other

### ENVIRONMENTAL

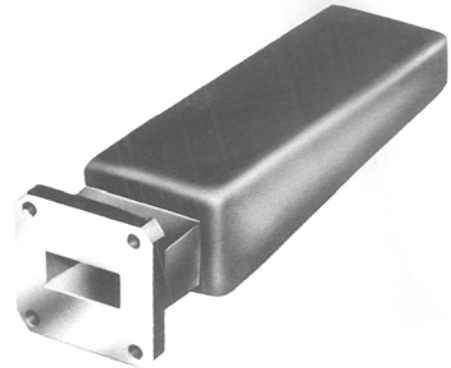
Temperature  
Coolant Flow  
Coolant Temperature  
Humidity  
Shock  
Vibration  
Altitude  
Other

## WE series

## Unfinned Dummy Loads

1.12 - 40 GHz

- **Extremely Rugged High Power Loads**
- **High Temperature Refractory Load Elements**
- **Economic Convection Design**
- **Available with most Common Flanges**



Mega WE series dummy loads are rugged high power units designed to satisfy minimum cost and weight objectives. Models are designed for bands from 1.12 to 40.0 GHz.

The WE loads employ high temperature refractory load elements designed to meet the strictest standards. These load elements are in direct contact with the waveguide walls for optimum heat transfer and can withstand extremely high temperature, temperature gradients and thermal shocks. For additional cooling fins see the WF series.

These loads can be supplied to operate over the full indicated waveguide frequency band. Generally faster delivery and a more economical unit can be furnished for use over narrower frequency ranges. Always specify your frequency and VSWR requirements.

The table below provides power ratings for each model. The independent average power rating assumes CW operation, and the independent peak power rating assumes negligible average power. The combined average and peak power ratings should be employed together.

Designs to meet special requirements for bandwidth, size, flanges, etc., are available on request. (8/14)

### General Specifications

Load Material:	Refractory
Test Pressure:	35 psig. max.
Housing Finish:	Black, Silicone-based Pyromark 1200 >525°C (1,000°F)
Material:	Aluminum
Flange Finish:	Iridite Per MIL-C-5541

### Other Waveguide Loads:

Finned Loads:	WF series
Superfined Loads:	WG series
Liquid Cooled Loads:	WL series
Load Inserts:	WD/WZ series

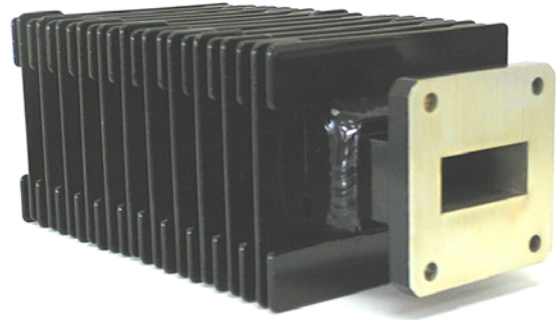
Model	Frequency Range	Waveguide Size		Power Ratings				VSWR Max.	Approximate Dimensions Inches/Ounces			
				Independent*		Combined			L in.	W in.	H in.	Wt. lbs.
		RG	WR	W Avg.	kW <sup>‡</sup> peak	W Avg.	KW <sup>†</sup> peak					
WE-0005	1.12-1.70	103	650	2250	65,000	1500	20,000	1.15	32.9	6.9	8.7	67.0
WE-0015	1.70-2.60	105	430	1500	30,000	1000	10,000	1.15	21.8	6.0	6.4	21.0
WE-0025	2.60-3.95	75	284	1200	12,500	750	4,000	1.10	14.0	5.3	5.3	7.5
WE-0035	3.95-5.85	95	187	800	5,250	500	1,800	1.10	9.8	3.7	3.7	3.9
WE-0045	5.85-8.20	106	137	500	2,750	300	1,000	1.10	7.9	3.2	3.2	2.3
WE-0050	7.05-10.0	68	112	300	1,750	175	750	1.10	6.3	1.9	2.2	1.0
WE-0055	8.20-8.80 8.80-12.4	67	90	250	1,250	150	350	1.15 1.10	5.7	1.7	1.9	0.8
WE-0065	12.4-18.0	349	62	150	650	100	250	1.10	4.1	1.3	1.7	0.4
WE-0075	18.0-26.5	121	42	125	225	75	100	1.15	4.1	1.0	1.3	0.2
WE-0085	26.5-40.0	96 <sup>†</sup>	28	75	125	50	75	1.20	4.2	0.8	1.0	0.2

<sup>†</sup> Aluminum Equivalent    \*See text    <sup>‡</sup> at pressure of 35 psig    <sup>†</sup> at pressure of 10 psig

**WF series**

**Finned Dummy Loads  
1.12 – 40.0 GHz**

- **Extremely Rugged High Power Loads**
- **High Temperature Refractory Load Elements**
- **Transverse Cooling Fins**
- **Available with most Common Flanges**



Mega WF series dummy loads are rugged commercial loads for use in the harshest environments. This model is designed to meet tight electrical and mechanical specifications for bands from 1.12 to 40.0 GHz.

The WF loads employ heavy duty transverse cooling fins and high temperature refractory load elements designed to deliver reliable performance. The load elements are in direct contact with the waveguide walls for optimum heat transfer and can withstand extremely high temperature, temperature gradients and thermal shocks. The WG series is a similar finned design, but with additional fins for enhanced heat transfer. For lower powers, unfinned models may meet the need and the WE series can be used.

These loads can be supplied to operate over the full indicated waveguide frequency band. Generally faster delivery and a more economical unit can be furnished for use over narrower frequency ranges. Always specify your frequency and VSWR requirements with any request.

Designs to meet special requirements for bandwidth, size, flanges, etc., are available on request. (8/14)

**General Specifications**

Load Material:	Refractory
Test Pressure:	35 psig. max.
Housing Finish:	Black, Silicone-based Pyromark 1200 >525°C (1,000°F)
Flange Type:	
<2.6 GHz:	Contact
>2.6 GHz:	Flange Cover
Material:	Aluminum
Flange Finish:	Iridite Per MIL-C-5541

**Other Waveguide Loads:**

Unfinned Loads:	WE series
Superfinned Loads:	WG series
Liquid Cooled Loads:	WL series
Load Inserts:	WD/WZ series

Model	Frequency Range	Waveguide Size		Rated Power*		VSWR Max.	Approximate Dimensions Inches/lbs.			
		RG	WR	W Avg.	Test kW pk		L in.	W in.	H in.	Wt. lbs.
WF-0005	1.12-1.70	103	650	8000	2200	1.15	32.9	8.9	11.4	90.0
WF-0025	2.60-3.95	75	284	4500	3200	1.10	14.0	4.9	6.4	11.5
WF-0035	3.95-5.85	95	187	2000	1000	1.10	9.8	3.6	4.1	5.1
WF-0045	5.85-8.20	106	137	1000	710	1.10	8.0	3.1	3.9	3.3
WF-0050	7.05-10.0	68	112	600	460	1.10	6.3	2.5	3.1	1.5
WF-0055	8.20-8.80 8.80-12.4	67	90	500	290	1.15 1.10	5.7	2.8	2.8	1.3
WF-0065	12.4-18.0	349	62	250	160	1.15	4.3	2.4	2.4	0.75
WF-0075	18.0-26.5	121	42	150	80	1.15	4.2	2.2	2.2	0.37
WF-0085	26.5-40.0	96 <sup>†</sup>	28	75	100	1.20	4.2	2.0	2.0	0.37

<sup>†</sup> Aluminum Equivalent

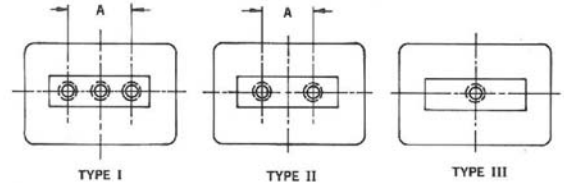
\*When tested in accordance with MIL-D-3954C

## WG series

## Super High Power Dummy Loads 1.12 – 40.0 GHz



- Highest Power Air Cooled Loads
- High Temperature Refractory Load Elements
- Transverse Cooling Fins
- Available with most Common Flanges



Mega WG series dummy loads are designed to offer superior performance that exceeds that offered by the standard military DA loads. Improved fin location, slight physical size alterations, and other enhancements make this increase in performance possible.

The WG loads employ transverse cooling fins and high temperature refractory load elements that are designed to conform to the rigorous requirements of demanding environments with high vibration and wide temperature swings. These load elements are in direct contact with the waveguide walls for optimum heat transfer. They can withstand extremely high temperature, temperature gradients and thermal shocks.

These loads can be supplied to operate over the full indicated waveguide frequency band. Generally faster delivery and a more economical unit can be furnished for use over narrower frequency ranges. Always specify your frequency and VSWR requirements with any request.

Designs to meet special requirements for bandwidth, size, flanges, etc., are available on request.

Power Ratings: The Independent Average Power ratings assume CW operation and the Independent Peak Power ratings assume negligible average power. The Combined Power ratings should be employed together. Forced air cooling is necessary to reach the highest levels listed.

### General Specifications:

Load Material: Refractory  
 Test Pressure: 35 psig. max.  
 Housing Finish: Black, Silicone-based Pyromark 1200 >525°C (1,000°F)

Flange Type:  
 <2.6 GHz: Contact  
 >2.6 GHz: Flange Cover

Material: Aluminum  
 Flange Finish: Iridite per MIL-C-5541

### Other Waveguide Loads:

Unfinned Loads: WE series  
 Finned Loads: WF series  
 Liquid Cooled Loads: WL series  
 Mini and Load Inserts: WD/WZ series

Model	Frequency Range	TYPE	Waveguide Size		Absolute Max Independent Power Rating*		Typical Combined Power Rating*		VSWR Max.	Approximate Dimensions			
			RG	WR	W Avg.	Peak @ 45psig (kW)	Average (W)	Peak @ 30psig (kW)		L in.	W in.	H in.	Wt. lbs.
WG-0005	1.12-1.70	I	103	650	9000	100,000	6000	20,000	1.15	37.6	8.9	11.4	91.0
WG-0015	1.70-2.60	II	105	430	6500	45,000	5000	10,000	1.15	24.4	6.7	8.8	30.0
WG-0025	2.60-3.95	II	75	284	5000	19,000	4000	4,000	1.10	16.6	5.4	6.4	12.0
WG-0035	3.95-5.85	II	95	187	2500	7,750	1800	1,800	1.10	12.2	3.6	4.1	5.5
WG-0045	5.85-8.20	II	106	137	1500	4,250	1000	1,000	1.10	9.5	3.1	3.9	3.5
WG-0050	7.05-10.0	II	68	112	750	2,750	600	750	1.10	7.9	2.5	3.1	1.7
WG-0055	8.20-8.80 8.80-12.4	II	67	90	650	1,750	500	350	1.15 1.10	6.7	2.8	2.8	1.4
WG-0065	12.40-18.00	II	91 <sup>†</sup>	62	400	1,000	250	250	1.10	4.7	2.4	2.4	0.75
WG-0075	18.00-26.50	III	121	42	300	350	150	100	1.15	4.5	2.2	2.2	0.37
WG-0085	26.50-40.00	III	96 <sup>†</sup>	28	300	175	100	75	1.15	4.5	2.0	2.0	0.37

<sup>†</sup> Aluminum Equivalent \*When tested in accordance with MIL-D-3954C

## WL series

## Water Cooled High Power Dummy Loads 1.12 – 18.0 GHz



- **Maximum Power Water Cooled Loads**
- **High Temperature Refractory Load Elements**
- **Mounts in Any Position**
- **Available with most Common Flanges**

Mega WL series dummy loads are the highest power liquid cooled dry loads available in this product family. They are available in the 1.12 to 18.0 GHz region.

The WL dummy loads employ high temperature refractory load elements designed to meet the most demanding requirements. Load elements are in direct contact with waveguide walls for optimum heat transfer. They can withstand extremely high temperature, temperature gradients, and thermal shocks. They are designed to operate at the rated power without coolant for sufficient time to permit detection and correction of coolant system failure.

The units utilize a cylindrical aluminum, copper or stainless steel cooling jacket. Stiffening ribs are employed for mechanical rigidity, improved heat transfer, and optimum coolant flow. Water is used as a coolant. Standard female pipe threads are provided for coolant connections. Coolant flow rates shown are the minimum recommended for proper cooling for peak power values. These units may be mounted in any position but care taken to remove trapped air during operation.

These loads can be supplied to operate at set frequencies over the full indicated waveguide frequency band. Generally faster delivery and a more economical unit can be furnished for use over narrower frequency ranges. Always specify your frequency and VSWR requirements.

The table provides power ratings for each model. The independent average power rating assumes CW operation, and the independent peak power rating assumes negligible average power. The combined average and peak power ratings should be employed together. Additional water flow volumes may be necessary to reach the highest levels listed or if inlet temperatures are above 20 degrees C.

### General Specifications

VSWR:	1.10:1 max.
Coolant:	Liquid
Load Material:	Refractory
Coolant:	
Max. Inlet Temp:	150°F
Test Pressure:	50 psig. max.
Pressure:	100 psig max.
Coolant Connector:	NPT, female
WL-0025, -0035, -0045:	¾ - 14
WL-0050, -0055, -0065:	¼ - 18
Finish:	Black, Silicone-based Pyromark 1200 >525°C (1,000°F)
Flange Material:	Aluminum
Flange Finish:	Iridite per MIL-C-5541

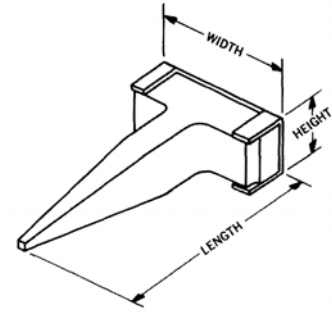
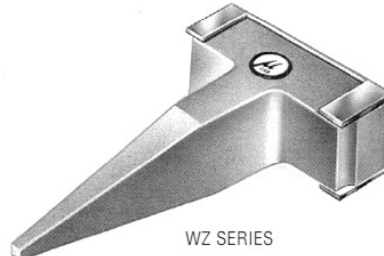
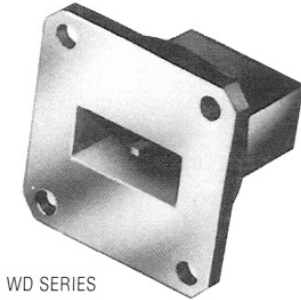
### Other Waveguide Loads:

Unfinned Loads:	WE series
Finned Loads:	WF series
Super-Finned Loads:	WG series
Mini and Load Inserts:	WD/WZ series

Model	Frequency Range	Waveguide Size		Absolute Max Independent Power Rating*		Typical Combined Power Rating*		Min. Flow Rate (gpm)	VSWR Max.	Approximate Dimensions		
		RG	WR	W Avg.	Peak @ 45psig (kW)	Average (W)	Peak @ 30psig (kW)			L in.	Diam. in.	Wt. lbs.
WL-0005	1.12-1.70	103	650	25,000	100,000	12,000	20,000	8	1.15	40.0	9.5	95
WL-0015	1.70-2.60	105	430	18,000	45,000	10,000	10,000	7	1.15	28.5	7.7	45
WL-0025	2.60-3.95	75	284	15,000	19,000	7,500	4,000	5	1.10	17.5	5.9	19
WL-0035	3.95-5.85	95	187	10,000	7,750	4,000	1,800	4	1.10	12.6	4.8	10
WL-0045	5.85-8.20	106	137	5,000	4,250	2,000	1,000	2	1.10	9.0	3.4	4
WL-0050	7.05-10.0	68	112	4,000	2,750	1,500	750	2	1.10	8.1	3.1	3
WL-0055	8.80-12.40 <sup>†</sup>	67	90	3,000	1,750	1,000	350	1	1.10	7.0	2.9	2.3
WL-0065	12.40-18.00	349	62	1,500	1,000	500	250	1	1.10	5.8	2.5	1.3

<sup>†</sup>Operation to 8.2 GHz with reduced VSWR of 1.15:1

\*See text



- **Extremely Rugged High Power Loads**
- **High Temperature Refractory Load Elements**

Mega WD series dummy loads are low cost, miniaturized units with moderate power handling capacity. Models are designed for bands from 7.50 to 11.50 GHz.

The WD loads employ tapered refractory load elements which are capable of withstanding extremely high temperature. These loads are sometimes used as 1 Watt terminations at ambient temperatures as high as 600°F. They are designed to provide optimum performance over approximately 12% frequency bands. Cover flanges are supplied.

The Mega WZ series consists of the tapered refractory load elements as used in the WD series. They can be cemented by the user into a section of waveguide to meet particular requirements.

The table provides power ratings for each model. Independent average power rating assumes CW operation, and independent peak power rating assumes negligible average power. The combined average and peak power ratings should be employed together.

**General Specifications**

Load Material: Refractory  
 Test Pressure: 35 psig. max.  
 Housing Finish: Black, Silicone-based Pyromark 1200 >525°C (1,000°F)  
 Material: Aluminum  
 Flange Finish: Iridite Per MIL-C-5541

\*RoHS compliant coating available

**Other Waveguide Loads:**

Unfinned Loads: WE series  
 Finned Loads: WF series  
 Superfinned Loads: WG series  
 Liquid Cooled Loads: WL series

Model	Frequency Range	Waveguide Size		Power Ratings				Approximate Dimensions inches/ounces			
				Independent*		Combined					
		RG	WR	W Avg.	kW pk @ 40 psig	W Avg.	kW pk @ 30 psig	L in.	W in.	H in.	Wt. oz.

**WD series Mini Load**

WD-0052	7.50-8.50	68	112	150	100	60	60	2.2	1.9	1.9	2.5
WD-0053	8.50-9.60										
WD-0056	8.50-9.60	67	90	100	75	40	40	1.9	1.7	1.7	2.5
WD-0057	9.50-10.60										
WD-0058	10.30-11.50										

**WZ series Load Insert**

WZ-0052	7.50-8.50	68	112	100		15	15 <sup>†</sup>	2.0	1.122	0.497	0.5
WZ-0053	8.50-9.60										
WZ-0056	8.50-9.60	67	90	60		10	10 <sup>†</sup>	1.6	0.900	0.400	0.2
WZ-0057	9.50-10.60										
WZ-0058	10.30-11.50										

\*See text

<sup>†</sup> at 0 psig