etronics

Custom Disc Resistors Assemblies

Direct Water Cooling Type (W)

Direct Water Cooling Type (W), based on SP Type will comply with all the requirements for no disconnection, high overload resistance, non-inductive, higher impulse current durability, compact design, higher electric power capacity, especially highly reliable protection of thyristor element. W Type is designed to be cooled with water like thyristors, so that the resistor can be used at a high electric power without being heated up.

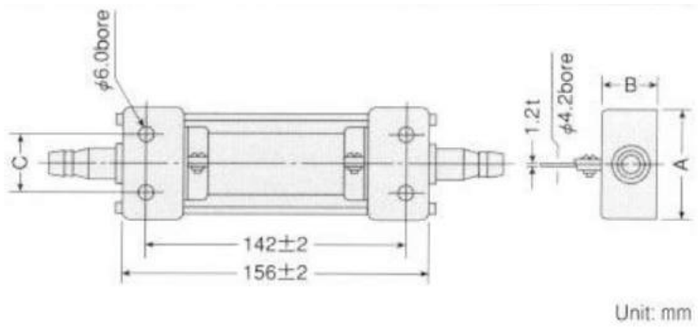
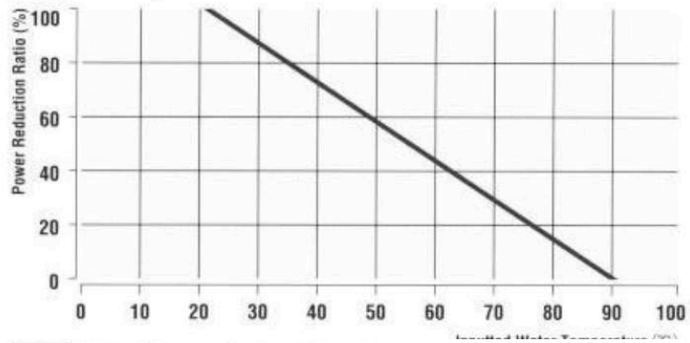


Fig. 11 Derating Curve



- **Standard Specifications:**
(Standard Resistance Tolerances +/-10%)

Type No.	Rated Power (W)	Max Power (W)	Dimensions (mm) A	B	C	Resistance Ω
W- 500D	350	500	50	30	20	1~100
W- 1000D	750	1000	60	45	30	1~100

Hose Joint Material : Polycarbonate. Stainless steel is also available.

Fig. 12 Water Flow vs. Surface Temperature Increase(W-500D)

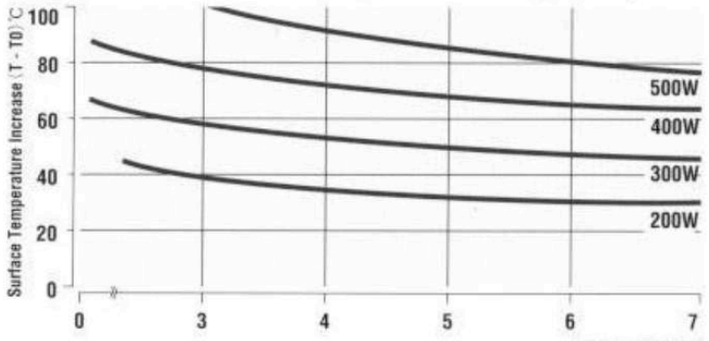


Fig. 13 Water Flow vs. Surface Temperature Increase (W-1000D)

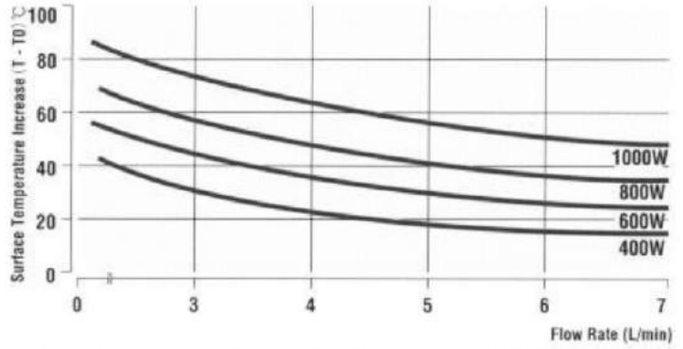


Fig. 14 Power vs. Surface Temperature Increase (W-500D)

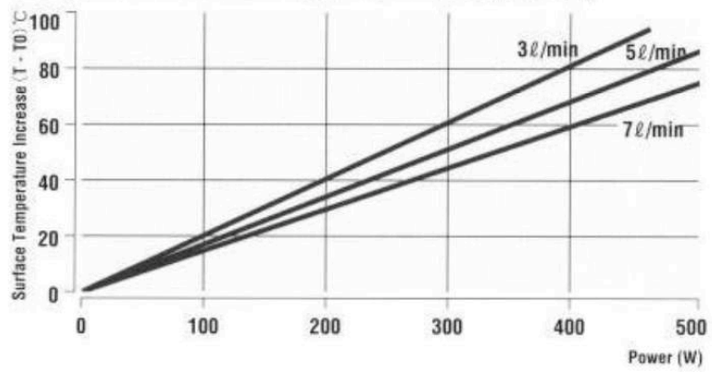
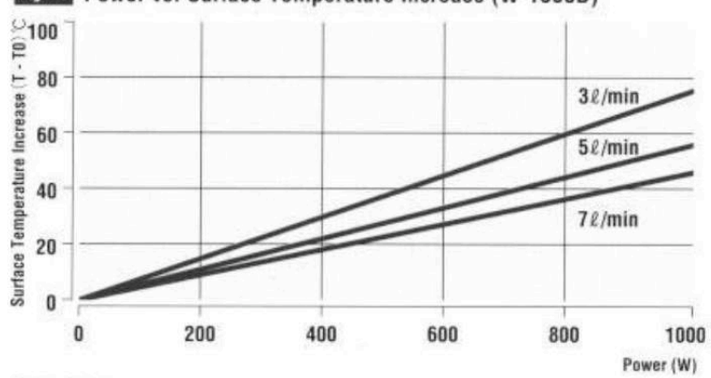
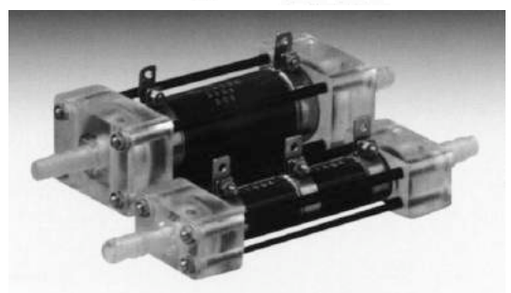


Fig. 15 Power vs. Surface Temperature Increase (W-1000D)



- **Note:**

1. The Resistors will be supplied with the hose joint for Ø12mm hose ID as the standard specifications. Please inform the hose ID, if a hose with the other ID are to be used
2. Use pure water with 1MΩ minimum for cooling.
3. Water pressure is to be 0,59 Mpa maximum.
4. In mounting, use bolts with Ø4mm. The fastening torque is to be 0,49 MNm approximately.
5. Fasten the hose bands at torque of 0,98-1,47 MNm. The excessive torque force will result at broken hose couplings.
6. Water is to run at flow rate of 5L/min minimum. Don't stop water running.
7. Mount the resistor vertically. Water is to run from the lower to upper ports of the resistor. (Even when plural resistors are connected, let water run from the lower to upper ports of all the resistors.)
8. Use the resistor within the surge voltage range of 1,800V.
9. The resistor is made of ceramic. Please handle the resistors with care.



Disk Type **(ASD & ASW)**

ASD & ASW are our proprietary resistors unparalleled in our country to provide the circuits with a large current at a high voltage, developed based on the most advanced technology inherent in applications are shown right

- **Typical Applications:**

  Breaking & closing of a SF6gas circuit breaker, impulse generator control, capacitor discharge, transformer on load tap changers, surge absorber, and high-voltage high-current circuits

Fig. 16 Specific Resistance vs. Impulse Withstand Voltage (1.2×50μs)

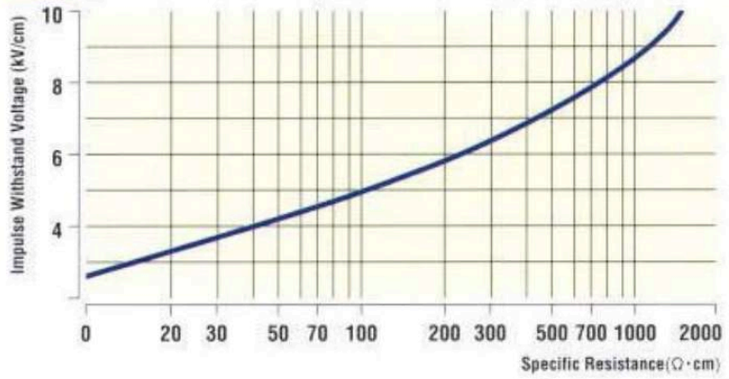
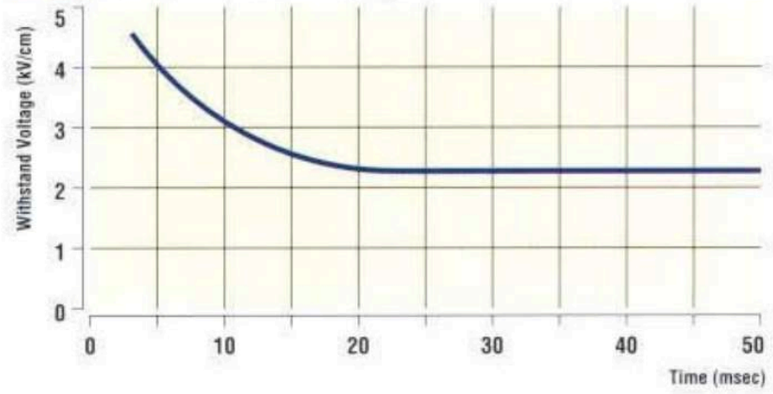
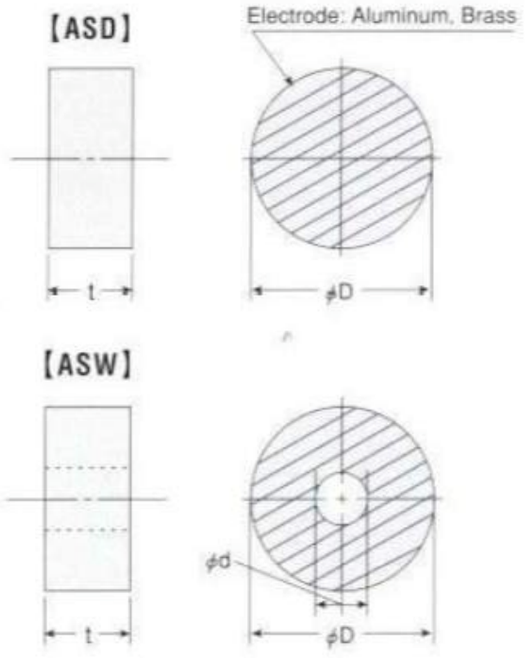


Fig. 17 Time vs. Withstand Voltage



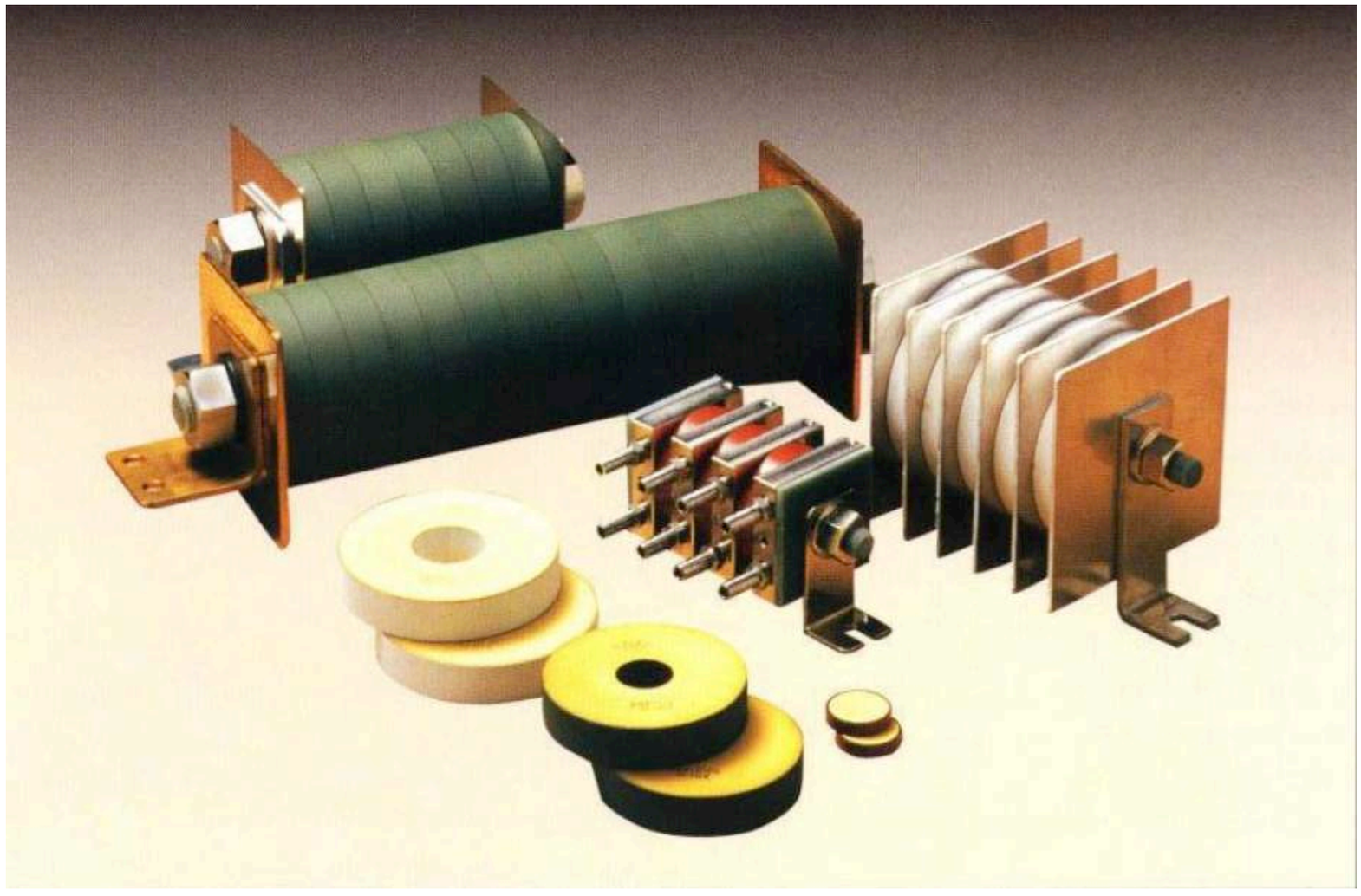
- **Characteristics:**

Item	ASD.ASW Characteristics
Bulk density	2,65
Specific heat	500~750 J/(kg*K)
Thermal conductivity	1,2W/(m*K)
Temperature coefficient	-0,05 ~ -0,1%/°C
Thermal expansion coef.	4,0 ~ 7,0 X10^-6
Max. working Temp.	250°C
Allowable injection energy	300J/cm^3
Contact Pressure	0,39Mpa



Type No	Dimensions (mm) - ØD	Dimensions (mm) - Ød	t	Resistance Value Range(Ω)	Allowable Injection Energy (J)
ASD 4025	40±0,5	-	25±0,5	1,6 ~ 100	9,0k
ASD 6025	60±0,8	-	25±0,5	0,7 ~ 90	21,0k
ASD 7525	75±0,8	-	25±0,5	0,5 ~ 56	33,0k
ASD 9525	95±0,8	-	25±0,5	0,3 ~ 36	52,5k
ASW 7525	75±0,8	30±0,8	25±0,5	0,5 ~ 78	27,6k
ASW 9525	95±0,8	30±0,8	25±0,5	0,3 ~ 40	47,0k
ASW 11025	110±1,0	30±0,8	25±0,5	0,2 ~ 28	65,5k
ASW 12025	120±1,0	30±0,8	25±0,5	0,2 ~ 24	79,5k
ASW 12725	127±1,5	33±1,5	25±0,5	0,2 ~ 20	88,5k

Custom Disc Resistors Assemblies



Indirect Water Cooling Type (WD)

The resistors are designed to be indirectly cooled with water running through the water-cooled block assembled on the both side of the resistors. In view of the current trend to exploit the large power applied circuits with semiconductors, demands are increasingly getting higher for non-inductive resistors with a compact design but a large energy capacity. WDs connected in series or in parallel will comply with the requirements on the voltage and current load.

• Typical Applications:

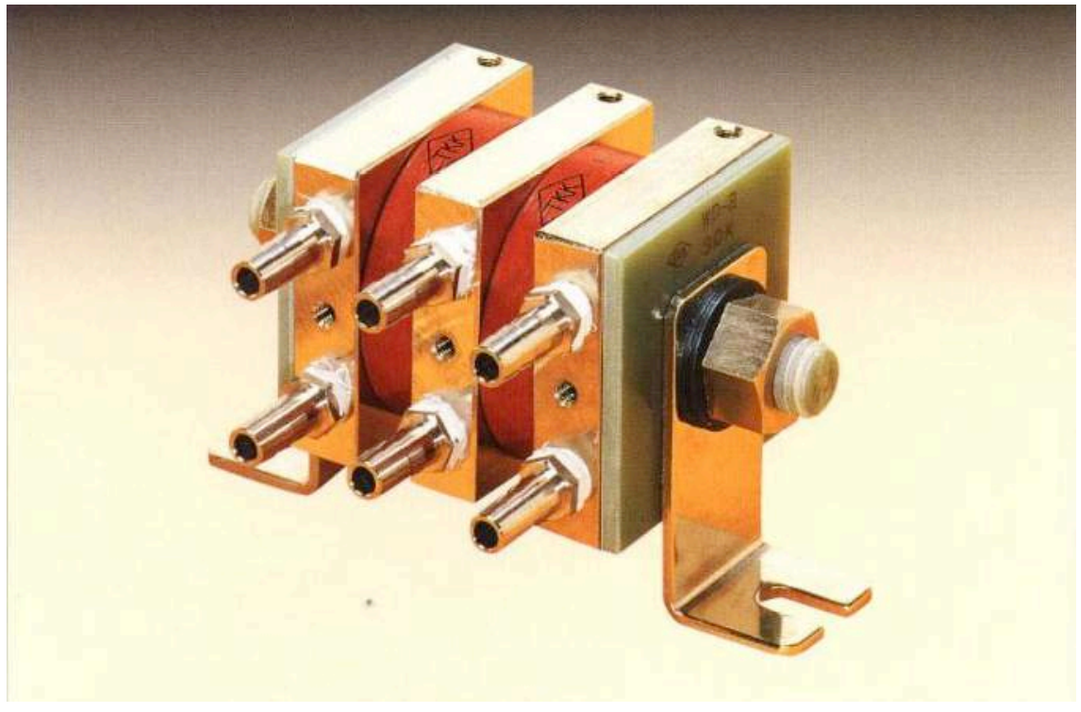
1. Surge absorber of high frequency thyristor inverter
2. Load resistor of high voltage circuits
3. Dumping resistor of the nuclear fusion
4. Large capacity load resistor

• Features

1. No water leakage
2. Short time rating power is as large as 500 W per element
3. Large absorbing energy
4. Higher withstand voltage. 10 kV per element at 1,2 x 50 µs waveform.
5. Mounting legs are insulated from elements.
6. Non-inductive resistor
7. Large current capacity due to the large cross-sectional area of the element.

• Characteristics:

Item	Characteristics of individual resistor used for WD
Individual Resistor	ASW 7515
Element dimensions	Ø75XØ20X15tmm
Bulk density	2,2 ~ 2,7
Specific Heat	630 ~ 1250 J/(kg*K)
Thermal Conductivity	1,2 W/(m*k)
Thermal Coefficient	-0,05 ~ 0,1%/°C Max
Thermal Expansion Coefficient	4 ~ 7X10^-6
Max working temperature	250°C
Allowable injection energy	10 kJ Max
Allowable current	800 A Max



Indirect Water Cooling Type (WD)

- **WD Standard Specifications:**

Type No.	Rated Power (W)	Element Qty	Dimensions (mm) A	B	C	Resistance Range (Ω) Min	Max	Allowable Injection Energy (J)
WD-1	350	1	61	110	131	0,5	20	10k
WD-2	770	2	94	143	164	1	40	20k
WD-3	1050	3	127	176	197	1,5	60	30k
WD-4	140	4	160	209	230	2	80	40k
WD-5	1750	5	193	242	263	2,5	100	50k

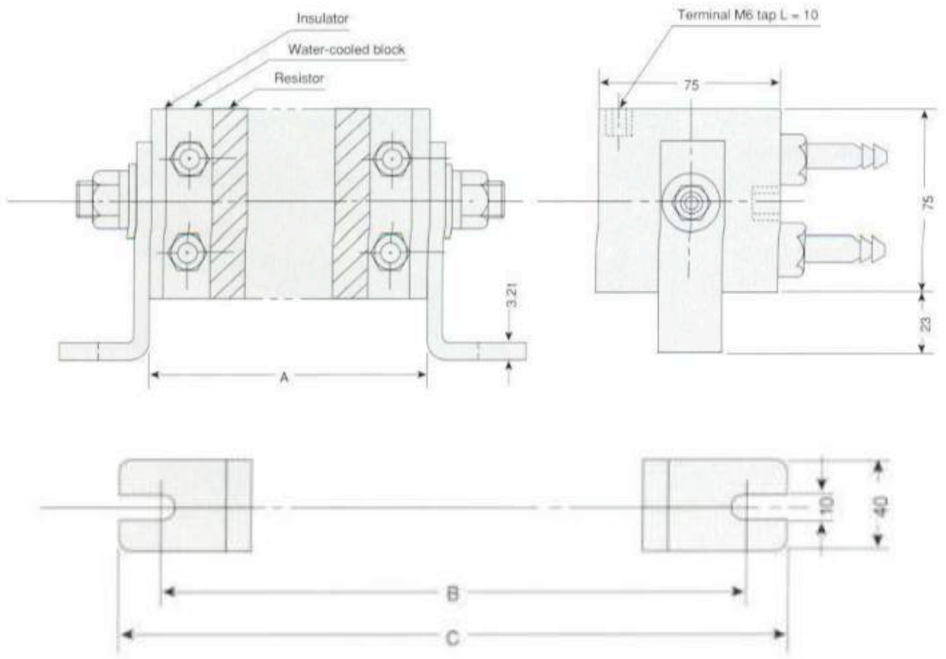
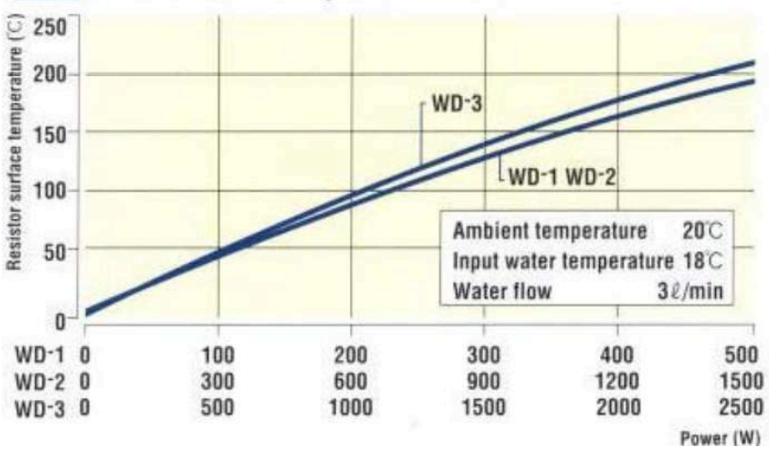


Fig.18 Power vs. Surface Temperature Increase



Resistor surface temperature represents the maximum temperature taken at the centre of the upper surface of the element on the water outlet side

Fig.19 Power vs. Water Temperature by Flow Rate (WD-2)

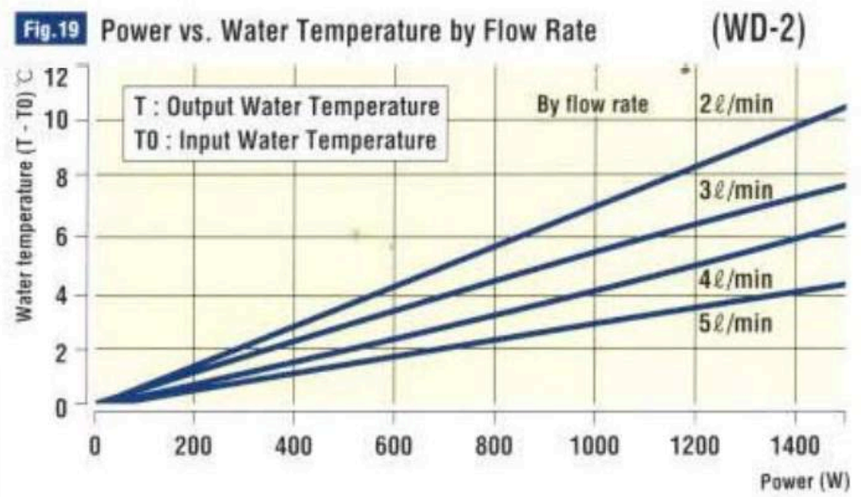
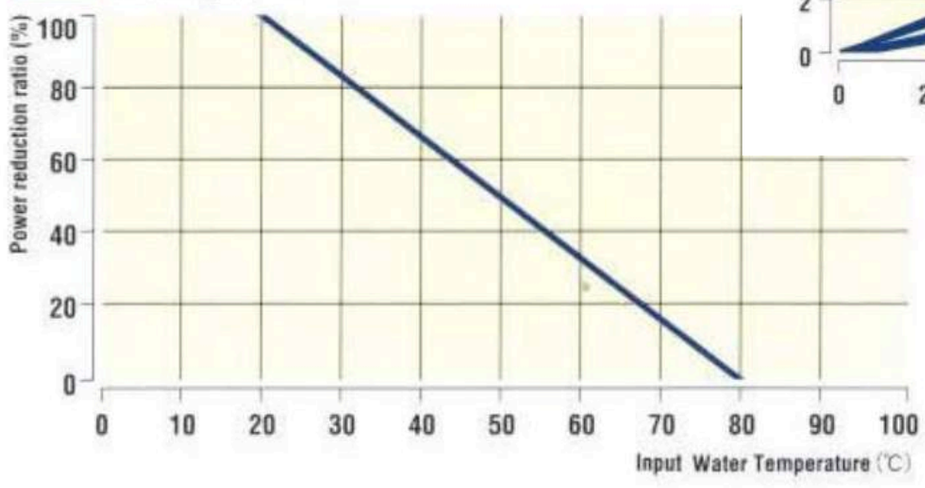
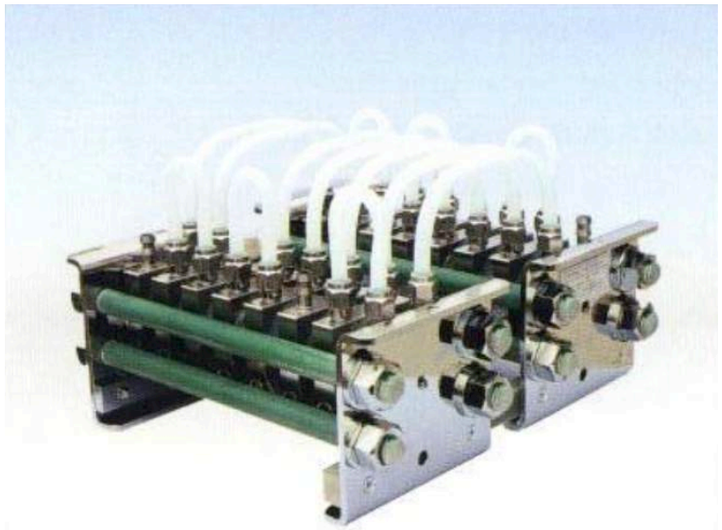


Fig.20 Derating Curve

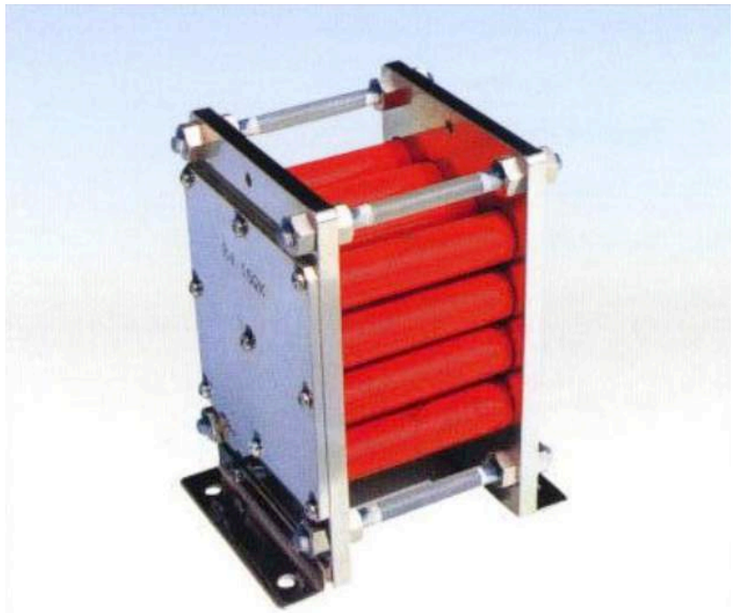


Assemblies

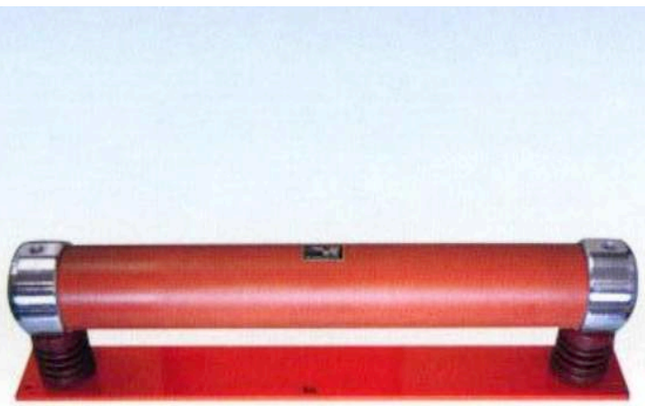


- **Water cooling resistors for snubber circuit in a large capacity GTO thyristor**
  Resistor :WS-14
  Electric Power : 14kW (Flow rate: 6L/min)

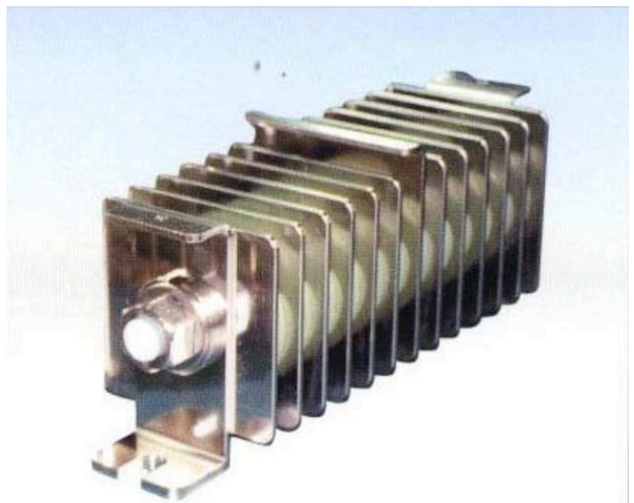
- **A set of end spark protector**
  Resistor : ASU
  Three types : Ø14, Ø40 x Ø28, Ø50 x Ø38mm)



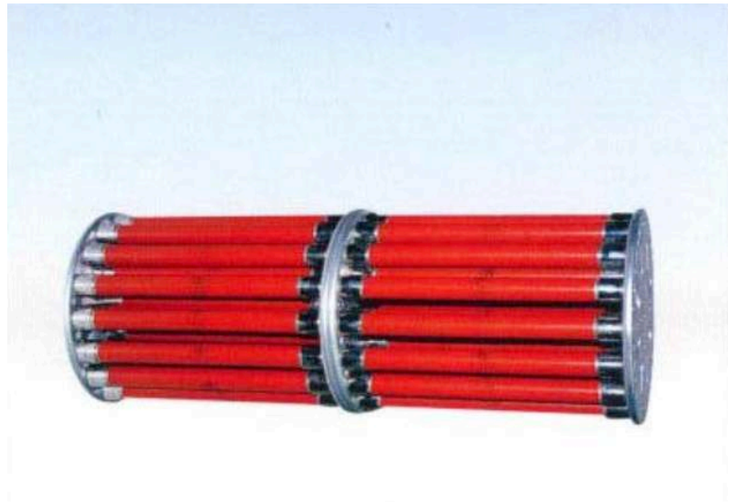
- **Control and discharge resistor for lightning surge generator**
  Resistor : AS
  Max Current : 7,500A
  Allowable Injection Energy : 4kJ



- **Capacitor discharge resistor**
  Resistor : 10 pieces of ASW7525 connected in series and contained in insulating tubing
  Allowable Injection Energy : 135kJ



- **Load resistor**
  Resistor : 12 pieces of ASW12725 connected in series per unit together with radiation fin
  Allowable Injection Energy : 550kJ/unit



- **Transformer protecting resistor**
  Resistor : ER100AS connected in series of two sets consisting of 30 pieces in parallel.
  Allowable Injection Energy : 180 kJ

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