Matsusada Precision

Programmable DC Turbo Power Supplies

TB Series

NEW

Variable Range Output

DC Turbo Power Supplies

"Turbo Function" is installed so that it can output widely in compact size!

TB series

35V to 1000V

1080W Model

720W Model

360W Moldel

www.matsusada.com

TB series

DC power supplies with wider output coverage

Wide range output is possible with “turbo function”installed.

TB series is programmable DC power supply with distinctive turbo function which realises 3 times wider coverage of output voltage and current in comparison to conventional DC power supply with equivalent output power.

All TB series allow flexible voltage and current output within its rated power, resulting user not to require to seach for power supply with unnecessary wider rated voltage and current.
Thus single TB unit can be used for much wider user applicaton.

Not only its flexible output, but the general performance of the power supply is pursued to achieve overwhelming quality, resulting; power factor correction circuit with 0.99 power factor, speedy and accurate 4 digit display panel as well as adoption of precision rotary encoder. TB series’s high energy efficiency contributes to user’s reduction of CO2 emission.

Digital communication(*1) with LAN(Ethernet*2), USB, RS-232C, RS-485 and GPIB is optionally selectable, best for automatic measuring or integration to production equipment.

(*1) A conversion adapter or additional option is required separately.

(*2) Ethernet is the registered brand of Xerox Co., Ltd.

Following Applications, for Example

Evaluation of electrics elements for automobile
Covered from 12V to Higher Volt. by this One Unit.

Evaluation for devices
For devices with different rated values.

Evaluation with series / parallel connected power supplies
Suitable for battery, capacitor evaluation with series / parallel connected power supplies.

Evaluation of Communication Equipment
To various Tests for Servers and Rooter.

Evaluation of Power Conditioners
For simulation of Solar Battery and Fuel Battery.

Features

It realizes Wide Range Output by installed Turbo Function.

CV / CC preference function helps to **suppress voltage / current overshoot** at output trigger.

Simplified Simulation of Secondary Battery, Solar Battery and Fuel Battery is possible with **the variable internal resistance.**

Usage for High Speed Response and Usage to Keep Voltage is applicable by **Switching Function for Sink/Anti-Sink.**

Best fit to Research and Development by **the Low Noise Switching System.**

Free to Service Space with **the Power Factor Correction Circuit** and **Worldwide Input System.**

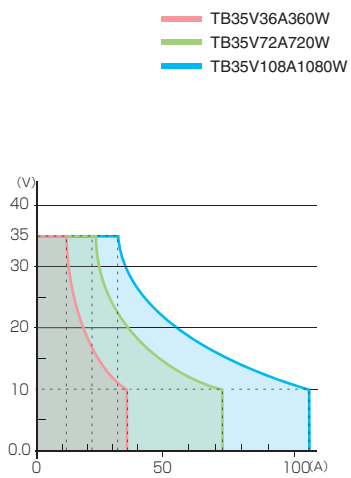
Lineup

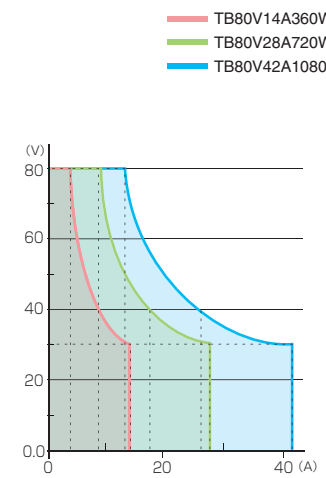
Model	Maximum Output			Ripple		Dim. (P.9)
	Volt	Current	Power	(mVrms)	(mArms)	
TB35V36A360W	35V	36A	360W	10	70	A
TB35V72A720W		72A	720W	15	150	B
TB35V108A1080W		108A	1080W	20	200	C
TB80V14A360W	80V	14A	360W	10	30	A
TB80V28A720W		28A	720W	15	60	B
TB80V42A1080W		42A	1080W	20	80	C
TB160V8A360W	160V	8A	360W	15	20	A
TB160V15A720W		15A	720W	20	30	B
TB160V22A1080W		22A	1080W	25	50	C
TB250V5A360W	250V	5A	360W	40	15	A
TB250V10A720W		10A	720W	50	20	B
TB250V15A1080W		15A	1080W	50	25	C

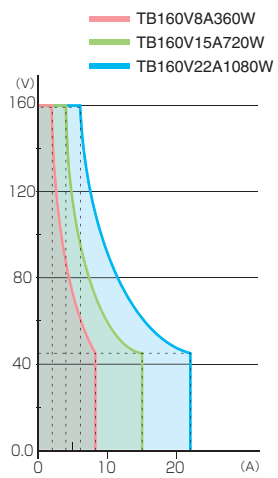
Model	Maximum Output			Ripple		Dim.
	Volt	Current	Power	(mVrms)	(mArms)	
TB350V3A360W	350V	3A	360W	To be released soon. Please ask sales office for details.		
TB350V6A720W		6A	720W			
TB350V9A1080W		9A	1080W			
TB650V1.6A360W	650V	1.6A	360W			
TB650V3.2A720W		3.2A	720W			
TB650V4.8A1080W		4.8A	1080W			
TB850V1.2A360W	850V	1.2A	360W			
TB850V2.4A720W		2.4A	720W			
TB850V3.6A1080W		3.6A	1080W			
TB1000V1A360W	1000V	1A	360W			
TB1000V2A720W		2A	720W			
TB1000V3A1080W		3A	1080W			

Images of Output Range

Possible to output wide range volt. and current compared with traditional DC power supplies by the turbo function.







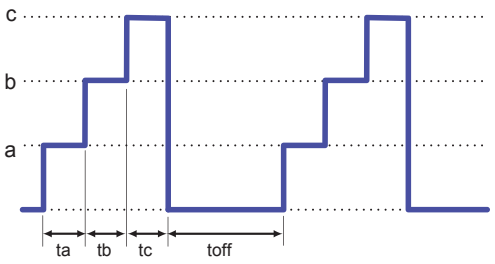
Principal Functions

Function for Pulse & Ramp Sequence and Master Follow

Output control as next A to D are possible.

A. Pulse Sequence

Sequential operation is possible by using voltage and current set on each memory a, b and c in combination with multi-set function. Not only continuous operation, but also it is possible to specify the times.
It is best fit to evaluation tests for products as various operations, like as repeat of a and b only or repeat of b, c and off only, are enabled by setting time of memory a, b, c and off to 0.0.

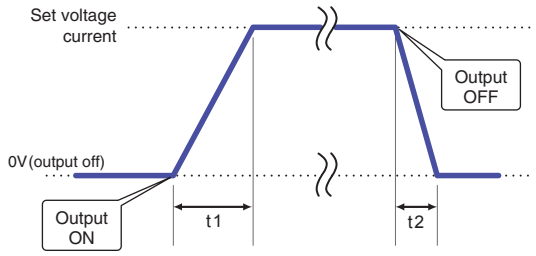


ta, tb, tc and toff can be set to 0.0s, 1.0s to 99.9h, respectively

B. Ramp

It enables to make ramp action up to set voltage or current (or from the set voltage or current to 0V or 0A). It is useful to like to rise (reduce) voltage or current slowly.
It helps sensitive electrical load not to get damaged by overshoot.

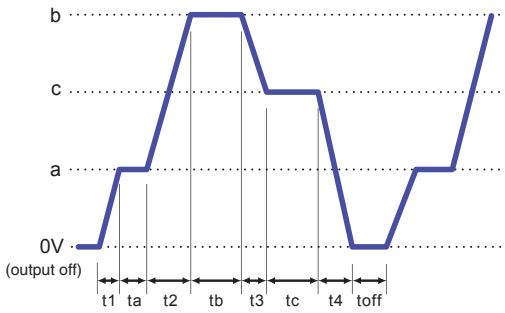
* For ramp action, it is possible to select “both of set voltage and current”, “only set voltage” or “only set current”.



t1 and t2 can be set to 0.0s, 0.1s to 999s, respectively

C. Pulse Sequence + Ramp

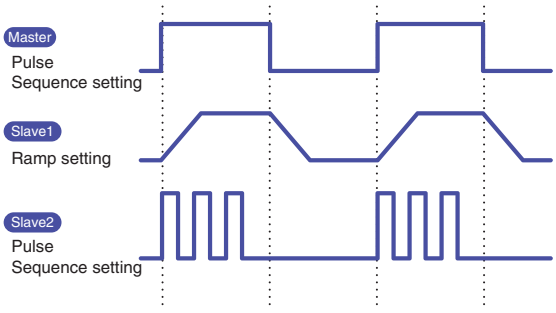
It is also possible to use pulse sequence combined with ramp action.
If multi-set function is combined with the too, it is able to make sequence action by using voltage or current set on memory a, b and c. Not only continuous operation, but also it is possible to specify the times.
It is useful in various aspects as it is possible to rise (reduce) voltage or current slowly up to 3 set value.



Range of 0.0s, 0.1s to 999s for t1 to t4 and range of 0.0s, 1.0s to 99.9h for ta to tc and toff can be set respectively.

D. Master Follow

Pulse sequence actions at master-slave and output signal to slave units at ramp action are transmitted. By this function, it is possible to make slave units to output on different output condition from the master unit.

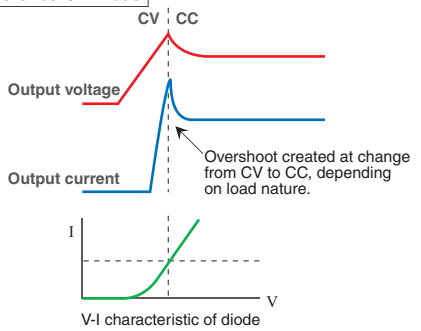


Note : Accuracy of the timer at sequence action ±0.5%. Please take care usage at long running.

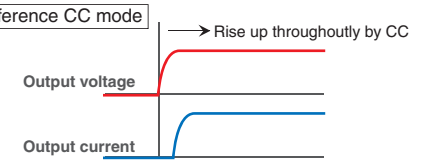
CC / CV Preference setting

CV(constant voltage) or CC (constant current) mode can be selectable for operation preference. Electrical load such as diodes whose resistance value can dramatically change at certain point, current overshoot may take place if power supply is triggered on by CV mode.
TB series power supply can help to suppress creation of overshoot by choosing CC mode trigger as preference. This feature is highly valued for lowering the risk of damaging expensive load typically such as high power laser diode module.

Preference CV mode



Preference CC mode

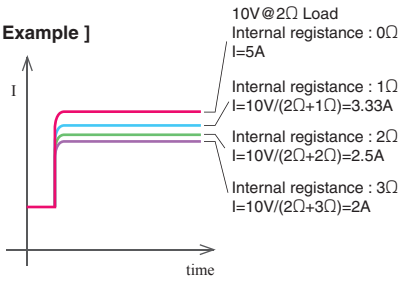


* More help not to create overshoot even at preference CC mode is to set the voltage as low as possible to such value that still allows CC mode operation, but not to set it maximum.

Programmable internal registive value (CV mode only)

Power supply internal resistance value become programmable, whereby output voltage can drop due to load current.
This is best fit for simulating battery, solar cell panel, fuel cell buttery.
(Programmable range of the internal resistance value is 0Ω to rated voltage / rated current)

[Example]



Function for Multi-setting

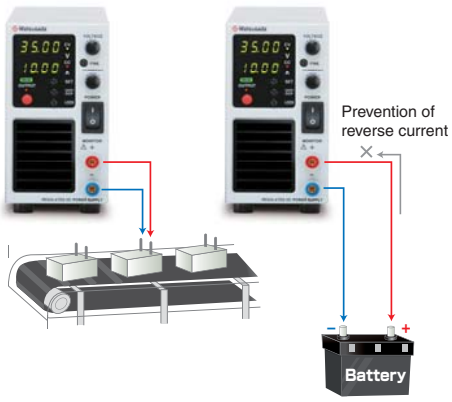
3 values for voltage and current are memorized in addition to usual ones of preset. It is very useful for experiment to collect repeatedly data and inspection of products.

2 Modes for Lock

Either of 2 Modes can be selected and set, "Full Lock" that locks all operation from the front panel or "Normal Lock" that locks only output ON / OFF.
(It is possible to emergency stop with the power switch in every mode.)

Switching function of Sink / Anti-Sink

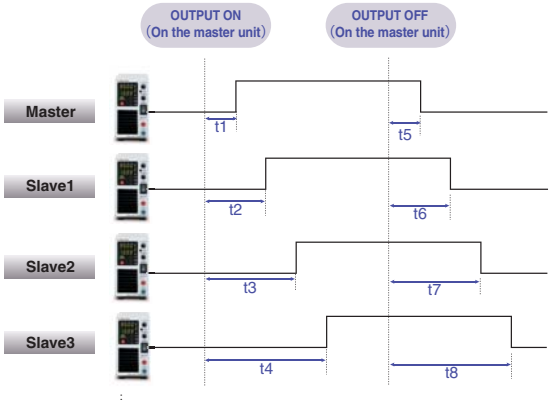
Sink Function is built in power supplies, it is safe as able to lower voltage quickly at cut-off output or even when lower voltage from high voltage setting point. And, when make continuously burn-in with short interval, it is possible to disconnect and change work quickly after cut-off operation of output. Conversely, when supply power to battery, condenser and so on which is capacious load, it decrease reverse current from the load to power supplies and avoids voltage depression by using Anti-Sink Function at cut-off output or when lower setting voltage.



Note : It is impossible to stabilize by reverse current control. If the load is what reverse voltage becomes higher than rated voltage (induced load, regenerative motor, etc.), please protect the power supply by connecting dummy resister, reverse current protection diode and so on.

Delayed Trigger Function

Function to delay the OUTPUT ON / OFF time. It is possible to use in case single unit of TB series is used, and also when connecting several Matsusada power supplies(*1) using master-slave connection terminal(*2) and output voltage / output current are set individually, delay trigger function can be used.(*3)



Total 16 units * t1 to t8 can be set in the range 0.0s to 99.9s.

*1 : R4K-36 series, R4K-80 series, RK-80 series, RK series and REK series. Detail catalog for each model is available. Please contact nearby sales office.

*2 : Can be connected up to 16 units.

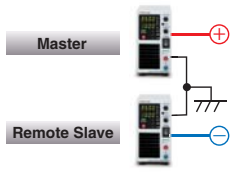
*3 : Only for slave-local. In case of slave remote control, exact same model of power supply need to be used. Also, in case of slave-local, each output voltage and current can be set individually. In case of slave-remote, output voltage and current can be set with one-control function which each slave unit follows the master unit setting.

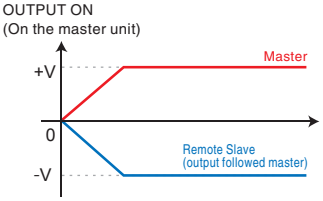
Dual Tracking and Multi-Output

Dual tracking control, so that output of plus and minus are controlled at the same time, is possible by connecting the power supply so as to be able to become plus and minus output at master-slave. Multi-output can be configured in combination with actions of local mode and of dual tracking. Plus and minus output voltage and optional output voltage set on a local slave are outputted in synchronizing with ON of the master unit.

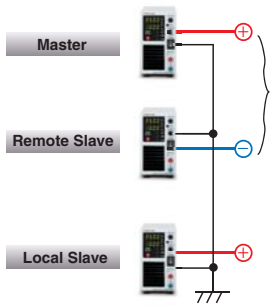
* As for connection, please refer to "examples for operation applied" on Page 11.

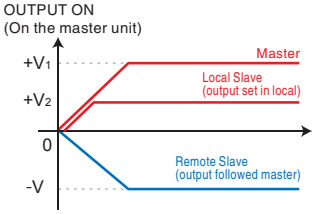
Dual Tracking





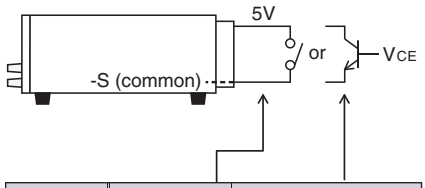
Multi Output





Principal Functions

Remote Switch ON / OFF



Output	Relay	Open Collector
ON	Short	$V_{CE} \leqq 0.4V$
OFF	Open	$V_{CE} \geqq 2V$

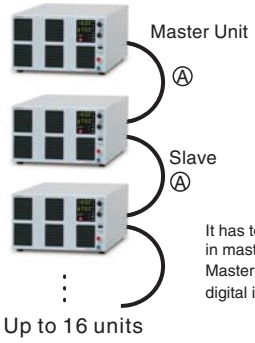
- Sink current 1mA
- Logic of OUTPUT can be made reverse.

Master-slave Control

(Digital interface)

Master unit can control multiple units connected as slave. Please refer to P.4 “D. Master Follow”, P.5 “Delayed Trigger Function” and “Dual Tracking and Multi-Output”.

* This is not a function for parallelly connected power supplies to give out average output current.

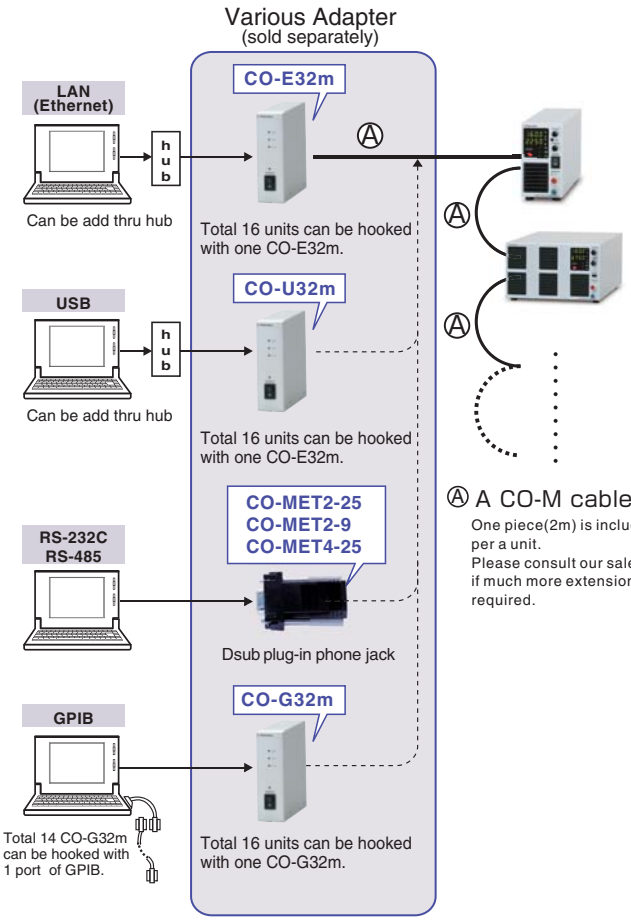


Ⓐ CO-M cable
One piece(2m) is included per a unit.
Please consult our sales staff, if much more extension required.

It has to hook with each same model in the same series in master-slave.
Master-slave function can only be effective with standard digital interface.

Digital Interface

In addition to digital control with LAN (Ethernet), USB, RS-232C, RS-485 and GPIB, one control is enabled in master-slave operation.

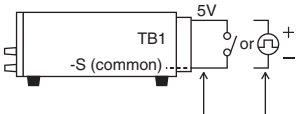


Ⓐ A CO-M cable
One piece(2m) is included per a unit.
Please consult our sales staff, if much more extension required.

When noisy environment is presumed, -LGob (optical interface) is required.
See page 10. for detail.

Remote Control

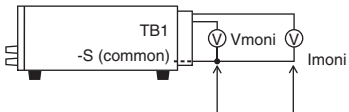
● Switching Remote / Local



Mode	External Relay	TTL
remote	short	LOW
local	open	HIGH

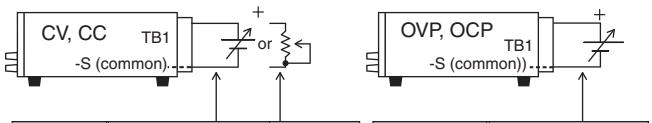
Each mode for Voltage, Current, OVP, OVP can be switched with relay or TTL signal.

● Output Monitor



Output 0 to MAX	0 to 10Vdc approx. Output imp. 1kΩ	0 to 10Vdc approx. Output imp. 1kΩ

● Output Control

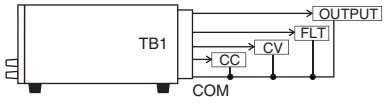


Vout-Iout	Cont Volt	R★
0 to MAX	0 to 10Vdc approx. Input Imp. 500kΩ	0 to 10kΩ approx.

Vout-Iout	Cont Volt.
0 to Max X5 to 110%	0 to 10Vdc approx. Input Imp. 20kΩ

★Possible to switch 10kΩ to 0kΩ for Fail-Safe

● Output of Status



ON at OUTPUT status
ON at abnormal status★
ON at CV or CC status

★ ON for the status of OVP, OCP, OTP, reverse sense connection and door switch (LD).

COMMON is floating with the output of Open Collector for each COMMON.
Voltage Resistance 30Vdc, Sink Current 5mA

Specifications

Input Voltage	100 to 240VAC, 50 / 60Hz Single Phase Power Factor at 100VAC input and max. output : 0.99typ.
Input Current	6Amax(360W Model), 11Amax(720W Model), 18Amax(1080W Model) at 100VAC input
Output Control	Local : Constant Voltage Rotary Encoder on the Front Panel *if output power is set beyond max. output volt., output current is lowered automatically. Constant Current Rotary Encoder on the front Panel *if output power is set beyond max. output current, output volt. is lowered automatically. (Max. power : 420.2W for 400W Model, 840.5W for 800W Model, 1680W for 1600W Model) Remote : Constant Voltage External Control Voltage 0Vdc to 10Vdc or External Variable Resistor 0Ω to approx. 10kΩ Constant Current External Control Voltage 0Vdc to 10Vdc or External Variable Resistor 0Ω to approx. 10kΩ
Voltage Regulation	For Input : 0.05% of maximum output (to±10% of AC change) For Load : 0.1% of maximum output (to 10% to 100% of load change)
Current Regulation	For Input : 0.05% of maximum output (to±10% of AC change) For Load : 0.1% of maximum output (to 10% to 100% of load change)
Stability	0.05% / 8H of maximum output voltage
Temp. Coefficient	0.01% / ºC of maximum output voltage 0.04 / ºC of maximum output current
Output Display	Output Voltage : 4 digits for digital indicator (±0.5%rdg±5 digit, at 23ºC±5ºC) Output Current : 4 digits for digital indicator (±0.5%rdg±5 digit, at 23ºC±5ºC)
Monitor Output	Output Voltage Monitor : 10V / max. output voltage Output Current Monitor : 10V / max. output current
Protection	● Overvoltage Protection (OVP) : Cut off the output at the set point ● Overcurrent Protection (OCP) : Cut off the output at the set point Range of set : approx. 5% to 110% of Rating Setting Method : Rotary Encoder on the front Panel or External Control Voltage 0Vdc to 10Vdc ● Over Power Protection (OPP) : Cut off the output at the set point 378W for 360W Model, 756W for 720W Model, 1134W for 1080W Model Reset : Manual return with OUTPUT switch or remote switch ● Over Temp. Protection (OTP) : Cut off the output at abnormal internal heating Reset : Manual return with OUTPUT switch or remote switch(after lowered to normal temp.) ● Input Voltage Drop , Blackout Protection : Cut off the output at input voltage drop Reset (after returned to normal voltage or from blackout) at Power Fail. Protec. (=Re-output Prevent.)...Manual return with OUTPUT switch or remote switch at Power Fail. Protec. (=Re-output Prevent.) canceled...Automatic return ● Remote Sense Connected in Reverse ●Interlock (LD)
Miscellaneous Functions	● Prevention of Miss Operation by Locked Key（A change of normal lock and full lock is possible.） ● Digital Master-Slave Operation (16 units can be hooked in series or parallel.) ● Last set Memory ● Noise Control for Forced Cooling ●Remote Sensing ● ON / OFF with Remote Switch (TTL or External Relay) ●Signal Output for Status (CV, FLT, OUTPUT) ● Delayed Trigger Function : Separated setting for ON Delay / OFF Delay (0.0 to 99.9sec) ● Multi Set Function : 3-memory for voltage or current can be set separately with usual voltage or current.
Transient Response Time	Recovery Time 1ms (at constant voltage operation, time returned to within 10% of set voltage for load change of 70% to 100%)
Operation Temperature	0ºC to +50ºC
Storage Temperature	−20ºC to +70ºC
Humidity	20% to 80% RH (no condensation)
Dielectric Strength Voltage	For 1minute at 1000V between the input power supply and the output terminal and between the input power supply and the chassis.
Grounding Withstand Volt.	±250V-DC (Grounding positive or negative terminals are possible)
Accessories	● Instruction Manual (1) ●Cover for remote connector (1) ● CO-M cable, 2m length (1) ●AC input cable, 3cores for single phase type (1)

A lot of Digital Control Functions

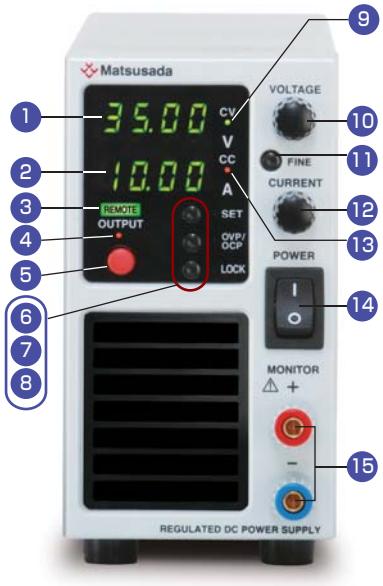
Control Functions	●Output ON / OFF set ●Digital Control for 16 units(-LGob models : 32units) ●Package Control for Multi-hooked Units ●Display of Various Status (Error Display / Status of Output / OVP / OCP / OPP / OTP / ACF / Reverse Connection of sense / Interlock)	
Writing Function	Setting for Output Volt. / Output Current	Percent Mode (100.00%), * Volt. / Current mode (Max. Rated Value for Volt. / Current)
	Setting for OVP / OCP	Percent Mode (100.00%), Volt. / Current mode (Max. Protection Value to Overvoltage / Overcurrent)
Read Function	Measuring for Output Volt. / Output Current	Percent Mode (100.00%), * Volt. / Current mode (Max. Rated Value for Volt. / Current)
	Set Values of Output Volt. / Output Current	Percent Mode (100.00%), * Volt. / Current mode (Max. Rated Value for Volt. / Current)
	Setting of OVP / OCP	Percent Mode (100.00%), Volt. / Current mode (Max. Protection Value to Overvoltage / Overcurrent)

* Minimum value for each model is the same with the minimum displayed digit the indicator on the front panel.

Description of functions (Below image is 360W model.)

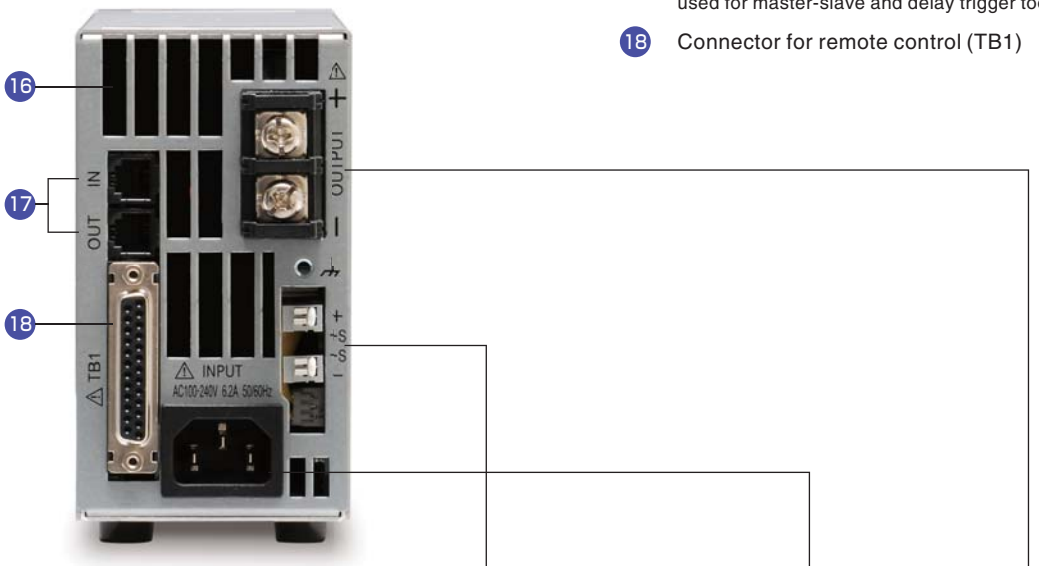
Front Panel

360W model only is equipped with FINE switch(11) , which enables to jump into neighboring digit at voltage / current setting.

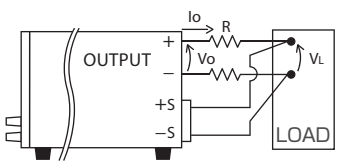


1. Display Output Voltage and OVP setting
2. Display Output Current and OCP setting
3. Display Remote Programming,
   lighted during remote control of Voltage / Current.
4. Display OUTPUT
   lighted during output.
5. ON / OFF Switch for Output,
   used for ON / OFF for output at remote and reset of Protections.
6. Preset Switch for Output
7. Setting Switch OVP / OCP
8. Setting Switch Key Lock
9. Display Constant Voltage Operation Mode
10. Setting Knob for Output Voltage(shared OVP Setting)
11. FINE Switch
    change over set digit at setting output voltage and current.
12. Setting Knob for Output Current(shared OCP Setting)
13. Display Constant Current Operation Mode
14. ON / OFF Power Switch
    it has priority over all actions for safety.
15. Terminals for a Monitor(up to 20A)
16. Ventilation Hole
17. Digital Interface
    used for master-slave and delay trigger too.
18. Connector for remote control (TB1)

Rear Panel



Remote Sensing



Prevent to degrade stability due to volt. drop (Vo-VL) by resistance(R) of output wiring or contact resistance. (up to max. 0.5V)

Input Terminal

- 360W, 720W Model
  : AC inlet
- 1080W Model
  : Terminal board

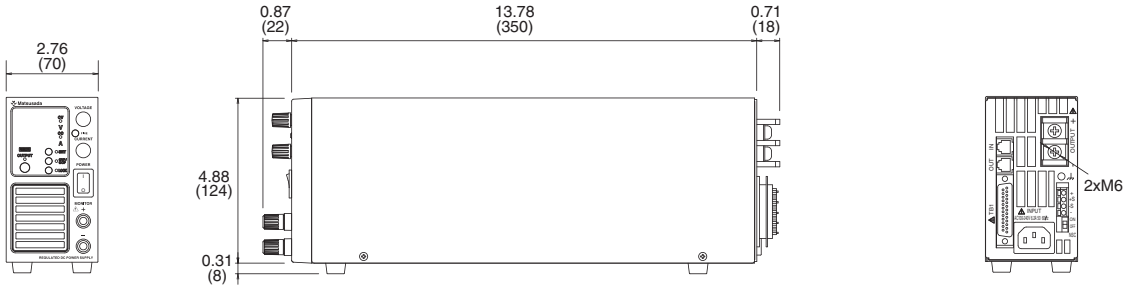
Output Terminal

- 360W Model
  : Terminal board
- 720W, 1080W Model
  : Busbar

Dimensions inch(mm)

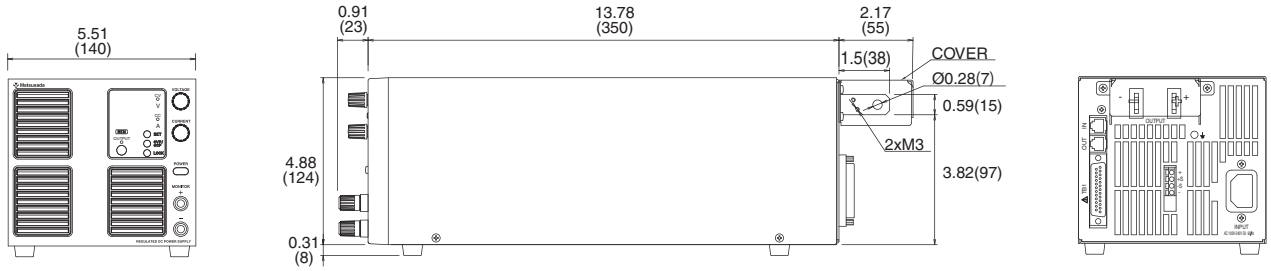
A 360W Models

Weight : 3kg approx.



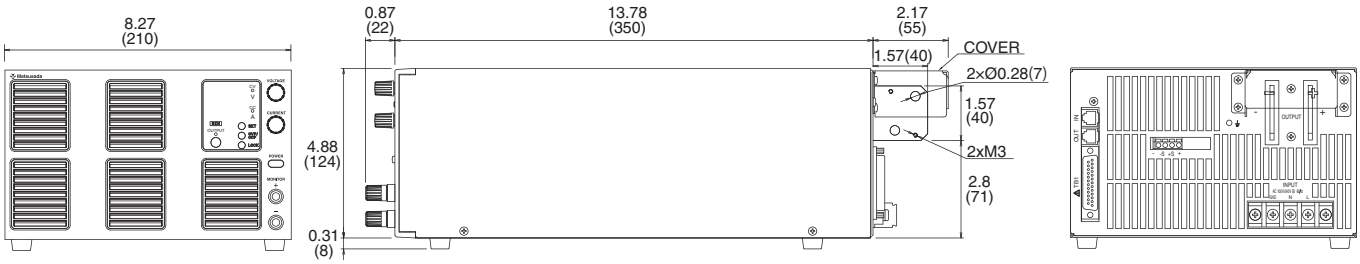
B 720W Models

Weight : 5kg approx.



C 1080W Models

Weight : 6kg approx.

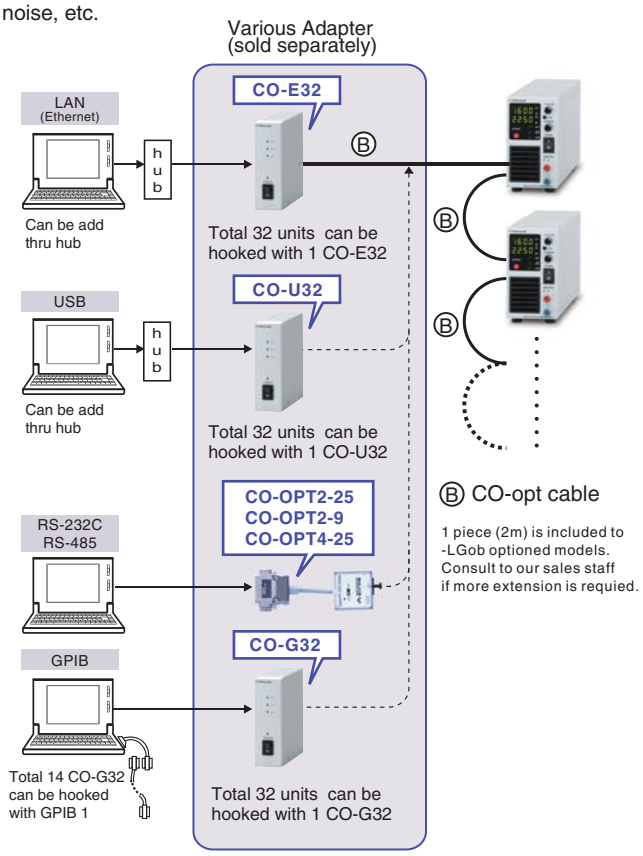


Options

-LGob : Optical interface Board *1

-LGob	Optical Interface board + Optical cable 2m
-LGob(Fc5)	Optical Interface board + Optical cable 5m
-LGob(Fc10)	Optical Interface board + Optical cable 10m
-LGob(Fc20)	Optical Interface board + Optical cable 20m
-LGob(Fc40)	Optical Interface board + Optical cable 40m

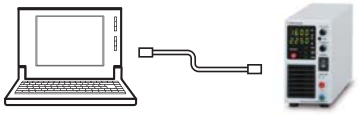
Insulation control is made with optical communication.As perfect insulation is made by optical fiber it is able to forestall miss operation as transient phenomenon caused by surge, dielectric thunder or foreign noise, etc.



★When use them under following conditions, select -LGob always.
- •Noisy environment as in a factory. (Ex. A motor or a coil is used near to load or power supply)
- •Used in high voltage floating. (250V and higher)
- •Our power supply and controller (PC or PLC) can not be installed within 2m.

-LUs1 : USB Interface Board *1

Digital control is enabled through USB.

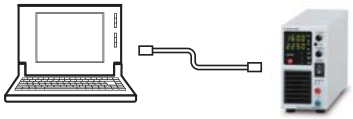


USB hub needs between PC and TB if control plural TB.

OS for Personal Computers : Microsoft Windows Xp / Vista / 7 / 8
Both of 32 bits and 64 bits are applicable
(Microsoft and Windows are registered trademark of Microsoft Corp. in USA and other.)

-LEt : LAN(Ethernet) Interface Board *1

Digital control is enabled thru LAN (Ethernet).



Hub needs between PC and TB if control TB thru Ethernet.

-L(Mc0.5), -L(Mc0.15) : Change Communication Cable Length

Length of CO-M cable is to be 0.5m and 0.15m, respectively.
(only either one is selectable.)

-LZ : Handle for carrying

Applicable to all model (additional 8mm height).

-LIc : Output current accumulation function *2

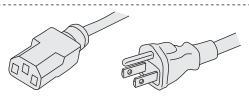
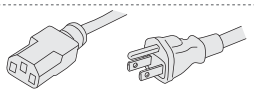
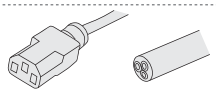
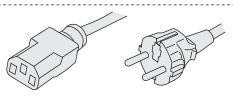
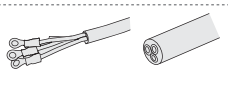
Accumulate the output current and display its value(up to +9999.999Ah).
Accumulated value is stored even when output is off.
Also, accumulated value which stop the output can be set preliminarily, it is very suitable to the application such as controlling plating solution.

*1 : These options can not be selected together.
Please refer to the catalogue of digital controller for power supplies “CO series” for the detail of digital interface function.
*2 : Please consider the location of usage. High humidity environment can be the cause of failure and corrosion.

How to Order Please suffix above optional codes on the tall of Model NO.
[Example] TB35V36A360W-LGob(Fc10)IcZ、TB160V22A1080W-LIc(Mc0.5)Z

AC Input Cable

Contact nearby sales office in case of using TB series in European countries.

CABLE TYPE 1 (Standard Attach. of 360W Models)	CABLE TYPE 8 (Standard Attach. of 720W Models)	CABLE TYPE 3 (Applicable 360W, 720W Models)	CABLE TYPE 4 (Applicable 360W, 720W Models)	CABLE TYPE 5 (Standard Attach. of 1080W Models)
125V / 10A	125V / 15A	250V / 10A	250V / 10A	250V / 25A
				

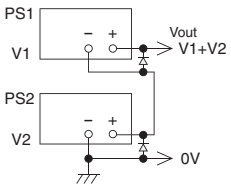
Please use the AC cable suitable for use environment and the area. CABLE TYPE3 and 4 correspond to CE marking.

Example for Applied Actions

With TB series of the same model, output voltage and current can be increased by connecting power supplies in series or parallel. Control must be set on each indivisual unit. Do not connect together COMMON of 2 units or more as the COMMON of connector for external input and output control (TB1) is connected with output.

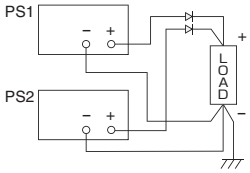
Series Operation

Sum of output is up to 250V. It is impossible to series operation for one exceeds 250V in output volt. Output current is of the min. one of power supply among them.



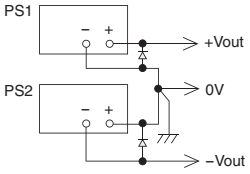
Parallel Operation

Make all setting voltage same value. Output current is sum of each current. In addition, make OVP level for all power supplies maximum to prevent damage.



Split Operation

Possible to output on positive(+) or negative (-).



Technical Notes

Connection and Application Operation

Connection of Loads

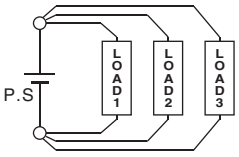
- Connect short with leads of sufficient thickness.
- Use PVC wire (105ºC) which endure enough to applied voltage. Consideration of ampacity and limitation for lead wire length by sensing (0.5V) requires for wiring to the load.

AWG	mm²	Max. current(A)
18	1.1	2
16	1.3	7
14	2.1	11
12	3.3	18
10	5.3	23
8	8.4	39
6	13	67
4	21	106
2	33	170
1	42	209
1/0	53	270
2/0	67	330
3/0	85	350

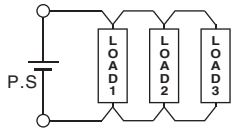
In case of 350A and higher, use multi-cables or a copper bar.

Paralleling of Loads

Good Connection



Wrong Connection

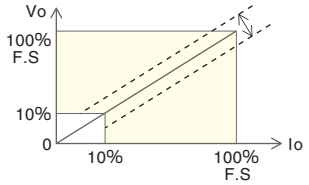


Conception of Specification

Unless other wise specified, specifications on this catalogue are of values at max. rated output (full scale*) after 2 hours warming-up.

Applied range of specifications

Ripple, Stability, Variations and Temp. coefficient are applied “F.S x Catalogue Value” and Linearity of output, Linearity of monitor, Linearity of indications are applied “F.S x value of ±0.5% (*)” at the applied range of 10% to 100% of maximum rated output.



Ripple

Indication is in rms including high-frequency noise.

Preset

Preset value does not indicate exactly actual output state. If require exact setting, set voltage value by making actually output in no-load.
For current, set current value by making gradually current rise in shorted terminals of output.

▶ Please Read Surely

When Select DC power Supplies

- Products on this catalogue are manufactured on consideration for safety fully as direct current power supplies, but please observe the Instruction Manual for operation and earth always grounding terminals for safety.
- Products on this catalogue are manufactured under the premise that applied on ground potential or in the range of series operation. Please consult our sales staff when use them on high potential floating.
- Products on this catalogue are manufactured on consideration for protection against electric discharge from loads fully, but when use them for some of continuous discharge like as spattering or for special withstand voltage test, please consult our sales staff in advance.
- We recommend contact our sales staff and inform them your requirement prior to your selection in order to secure safety as power supply equipment and make your best fit selection.

FAX

USA/Canada : +1-888-652-8651
other countries : +81-6-6150-5089

Customer Inquiry Sheet (TB series)

Please copy this page and above fax number after filling out form below.

■ I would like

☐ A quotation ☐ An explanation of product ☐ A demonstration ☐ To purchase

☐ Other ( )

■ Give us your requirement / comment

■ Please fill in below.

Address:	
Company:	
Dept.:	Title:
Name:	
Tel:	Fax:
E-mail:	

Warranty

We warrant that products contained in this catalog (hereinafter, the “Products”) are free from defects in material and workmanship under normal use for a period of one (1) year from the date of shipment thereof. However, the warranty period for X-ray detectors and X-ray source shall be either one (1) year from the date of shipment or 1,000 hours, whichever shorter.The above warranty shall not apply to any Product which, at our sole judgment, has been:i)Repaired or altered by persons unauthorized by us; or ii)Connected, installed, adjusted or used otherwise than in accordance with the instructions furnished by us (including being used in an inappropriate installation environment, such as in corrosive gas, high temperature and humidity). We are not liable for any loss, damage or failure of the Products after the shipment thereof caused by external factors such as disasters.If any Product is showed to be defective as satisfactory to us, we, at our sole discretion, repair or replace such defective Products at no cost to the purchaser.We assume no liability to the purchaser or any third party for special, incidental, consequential, or other damages resulting from a breach of the foregoing warranty. This warranty excludes any and all other warranties not set forth herein, express or implied, including without limitation the implied warranties of merchantability or fitness for a particular purpose. The Products are not designed and produced for such applications as requiring extremely high reliability and safety, or involving human lives (such as nuclear power, aerospace, social infrastructure facility, medical equipment, etc.). The use under such environment is not covered by this warranty and may require additional design and manufacturing processes. Regarding RoHS compliance, Matsusada Precision Inc. does not intentionally use objectionable substances in the products listed within this catalog. Matsusada Precision Inc. manufactures products using components which, according to our suppliers, are “RoHS compliant parts”. However, Matsusada Precision does not analyze each and every unit to confirm. Therefore, there may be some customized products which do not comply to RoHS. Please contact your nearby sales office for confirmation.

Matsusada Precision Inc.

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