DBM20 Instruction Manual

BEFORE USING THE PRODUCT

Be sure to read this instruction manual thoroughly before using this product. Pay attention to all cautions and warnings before using this product. Incorrect usage may lead to an electrical shock, damage to the unit or a fire hazard.

⚠ **DANGER**

Never use this product in locations where flammable gas or ignitable substances are present.

DANGER

Ne jamais utiliser ce produit en présence de substances inflammables ou explosives.

⚠ **INSTALLATION WARNING**

- When installing, ensure that work is done in accordance with the instruction manual. When installation is improper, there is risk of electric shock and fire.
- Installation shall be done by service personnel with necessary and appropriate technical training and experience. There is a risk of electric shock and fire.
- Do not cover the product with cloth paper or etc. Do not place anything flammable around. This might cause damage, electric shock or fire.

⚠ **WARNING ON USE**

- Do not touch this product or its internal components while circuit in operation, or shortly after shutdown. You may receive a burn.
- While this product is operating, keep your hands and face away from it as you may be injured by an unexpected situation.
- There are cases where high residual voltage remains inside the product. Therefore, do not touch even if they are not in operation as you may get injured due to high voltage and high temperature. You may also get electric shock or burn.
- Do not make unauthorized changes to this product nor remove the cover as you may get an electric shock or may damage the product. We will not be held responsible after the product has been modified, changed or disassembled.
- Do not use this product under unusual condition such as emission of smoke or abnormal smell and sound etc. Please stop using it immediately and turn off the product. It may lead to fire and electric shock. In such cases, please contact us. Do not attempt to repair, as it is dangerous for the user.
- Do not operate and store these products in environments where condensation occurs due to moisture and humidity. It may lead to fire or electric shock.
- Do not drop or apply shock to this product. It may cause failure. Do not operate these products when mechanical stress is applied.

PRECAUTIONS D'USAGE

- Ne pas toucher ce produit ou l'un de ses composants internes pendant qu'il est sous tension, ou peu après la mise hors tension. Vous pourriez vous brûler.
- Ne pas modifier ce produit sans autorisation ni retirer son capot, vous pourriez recevoir une décharge électrique ou endommager le produit. Nous ne saurions être tenus responsables après que le produit ait été modifié, changé ou démonté.
- Ne pas utiliser ce produit dans des conditions anormales comme la présence de fumées ou d'odeurs inhabituelles ou de bruits suspects etc. Merci d'arrêter l'utilisation immédiatement et d'éteindre le produit. Il pourrait se produire un feu ou un choc électrique. Dans de tels cas, merci de nous contacter. Ne pas essayer de réparer le produit, c'est dangereux pour l'utilisateur.
- Ne pas utilizer oustocker le produit dans un environnement exposé à la condensation ou à l'humidité Cela peut provoquer un feu ou un choc électrique.

⚠ **CAUTION ON MOUNTING**

- Follow connections to input/output terminals indicated in the instruction manual before switching on.
- Input/output wires are to be short and thick as possible.
- Do not use this product in special environment with strong electromagnetic field, corrosive gas or conductive substances and direct sunlight, or places where product is exposed to water or rain.
- Mount this product properly in accordance with the instruction manual, mounting direction and shall be properly ventilated.
- Please turn off the input power when doing wiring to connect to the input/output of the product.
- When installing in environment where conductive foreign, dust and liquid may be present, please consider penetration and take actions to prevent the above foreign material from entering the buffer module by installing filter. In order to prevent trouble or malfunction.

⚠ **CAUTION ON USE**

- Product individual notes are shown in the instruction manual. If there is any difference with common notes, individual notes shall have priority.
- Before using this product, be sure to read the catalog and instruction manual. There is risk of electric shock or damage to the product or fire due to improper use.
- Input voltage, Buffer current, Buffer power, ambient temperature and ambient humidity should be kept within specifications, otherwise the product will be damaged, or cause electric shock or fire.
- If the built-in fuse is blown, do not use the product even after replacing the fuse, as there is risk of abnormality inside. Kindly request repair to our company.
- This product with built-in protection circuit, depending on usage conditions, built-in protection circuit may not work. It is recommended to provide a separate protection circuit (element, fuse, etc.), insert fuse at the input to prevent smoke, fire during abnormal operation.
- This product is made for general purpose electronic equipment use and is not designed for applications requiring high safety (such as extremely high reliability and safety requirements. Even though high reliability and safety are not required, this product should not be used directly for applications that have serious risk for life and physical safety). Take sufficient consideration in fail-safe design (such as providing protective circuit or protective device inside the system).
- When used in environments with strong electromagnetic field, there is possibility of product malfunction.

⚠ **CAUTION ON USE**

- When used in environment with corrosive gas (hydrogen sulfide, sulfur dioxide, etc.) , there is possibility that they might penetrate the product and lead to failure.
- When used in environments where there is conductive foreign matter or dust, there is possibility of product failure or malfunction.
- Provide countermeasure for prevention of lightning surge voltage as there is a risk of damage due to abnormal voltage.
- Connect together the frame ground terminal of the product and the ground terminal of the equipment for safety and noise reduction. If these ground is not connected together, there is a risk of electric shock.
- Take care not to apply external abnormal voltage to the input/output. Especially, applying reverse voltage or overvoltage more than the rated voltage to the input/output as it may cause failure, electric shock or fire.
- Depending on product failure mode, there is possibility of hazardous voltage occurance at the input/output terminal. Therefore, the input/output of this product must be protected in the end use equipment to maintain ES1.
- This product contains a printed circuit board utilizing surface mounted devices. PCB stress such as bending, twisting, etc., could cause damage. Please handle with care.

NOTE

- When disposing product, follow disposal laws of each municipality.
- Published EMI (RE) or immunity is the result when measured in our standard measurement conditions and may not satisfy specification when mounted and wired inside end-user equipment.Use the product after sufficient evaluation is done at the actual end-user equipment.
- When exporting our products, apply the necessary permissions as required by rules and regulations of Foreign Exchange and Foreign Trade Control Act.
- Catalogue or contents of the instruction manual may be changed without a prior notice. Refer to latest catalogue or instruction manual.
- Reproduction or reprinting the instruction manual or its portion is not allowed without our permission.

PRECAUTIONS DE MONTAGE ET D'UTILISATION

- Respecter les connexions des borniers d'entrée/sortie décrites dans le manuel utilisateur avant de mettre sous tension.
- Ne pas utiliser ce produit dans un environnement exposé à un fort champ émectromagnétique, à des substances corrosives ou conductrices, à la lumière directe du soleil ou à la pluie et l'humidité.
- En cas d'installation dans un environnement où des particules conductrices, de la poussière ou des liquides peuvent être présents, merci d'installer des filtres afin de prévenir toute intrusion de corps étrangers à l'intérieur du produit et d'éviter pannes et dysfonctionnements.
- Ce produit est destiné aux équipements électroniques à usage general et il n'est pas conçu pour des applications à hauts risques (telles que les applications de sécurité ou de grande fiabilité. Même si une grande fiabilité ou une grande sécurité ne sont pas requises, ce produit ne doit pas être utilisé directement dans des applications présentant des risques sérieux pour la vie ou l'intégrité physique). Le principe de défaillance sécuritaire doit être appliqué à la conception (tels que l'installation de circuits ou de composants de protection).
- Connecter la masse du châssis et la borne de terre de l'équipenet pour la sécurité et la réduction de bruit. Si cette connexion n'est pas faite, il existe un risque de choc électrique.
- En fonction du type de défaillance, il eixte un possibilité de pr »sence d'une tension dangereuse sur les bornes de sortie. Ainsi, la sortie de ce produit doit être protégée dans l'équipement final pour conserver la TBTS.

LONG-TERM STORAGE METHOD AND LONG-TERM STORAGE PERIOD

- Please keep the product in carton box.
- Please do not apply excessive vibration, shock or mechanical stress applied directly to the product.
- Please keep away from direct sunlight.
- Temperature and humidity should be within range of product specification (with no condensation)
- For long-term storage temperature and humidity, the following conditions shall be used as a guideline :
  Temperature range : 5℃～30℃
  Humidity range : 40%～60%RH
  Please keep away from the places where temperature and humidity can change drastically
  It can cause condensation on the product or deterioration.
- For long-term storage period, we recommened to use within 2 years after receiving the product.
  There is tendency that the leakage current of the aluminium electrolytic capacitors may increase over time when stored without using for long time.
  This phenomenon can be improved by applying voltage to the aluminium electrolytic capacitors in order to reduce the increased of leakage current through the self-recovery effect of the electrolyte.
  For reference, before using products that have been stored for a long time, please warm-up first for 30 minutes or more without taking load.
  < Criterion for warm up voltage condition>
  (1) Implementation period : 1 year or above after product delivery
  (2) Electrical continuity condition
  Input voltage : Rating
  Load : 0A
  Ambient temperature : Normal temperature
  Time : 30 minutes or more

CE MARKING / UKCA MARKING

CE Marking, when applied to a product or packing material for a product covered by this handbook, indicates compliance with the Low Voltage Directive, EMC Directive and RoHS Directive.

UKCA Marking, when applied to a product or packing material for a product covered by this handbook, indicates compliance with the Electrical Equipment (Safety) Regulations, Electromagnetic Compatibility Regulations and Restriction of the Use of Certain Hazardous Substances in Electrical & Electronic Equipment Regulations.

1. Model Name Identification Method

DBM 20 / □

- Option (*1)
- Output Current
- Model Name

(*1) Type of input and output connector:
Blank : Standard type
/E : Spring type
/CO : With coating on solder side
/CO2 : With coating on both sides

2. Terminal Explanation

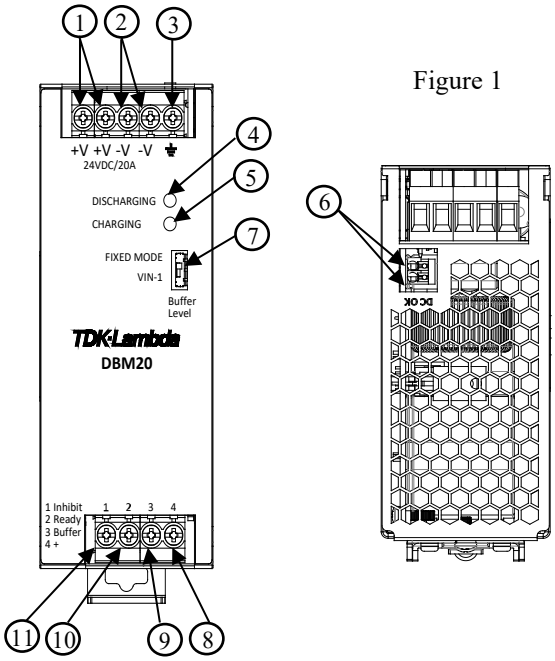


Figure 1

① +V: +Input/Output terminal

② - V: - Input/Output terminal

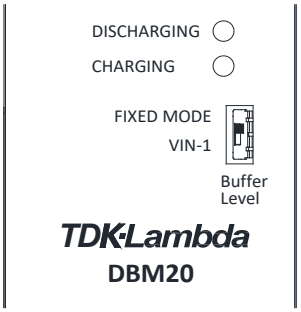
③ ⏚: Earth Terminal

④ RED LED: Discharging Indicator. LED will be ON during Buffering mode.

⑤ GREEN LED: Charged Indicator. LED will be ON during Ready mode.

⑥ DC OK: Relay (Photo Mosfet). Logic low when input voltage is within specification.

⑦ Buffer Level: Switch up for Fixed mode and switch down for VIN-1 mode.



⑧ + : Common supply 3.3 - 30V(max)

⑨ Buffer: signal will turn “high” during discharging mode.

⑩ Ready: signal will turn “high” after bulk electrolytic capacitors are charged up.

⑪ Inhibit: pull to TTL “low” to activate the inhibit mode.

3. Terminal Connecting Method

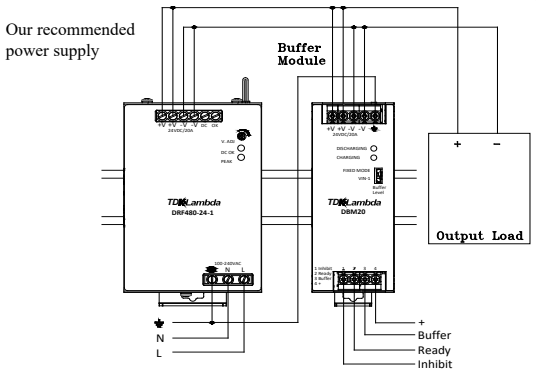
Pay attention to the input/output wiring. If it is connected to wrong terminal, the buffer module will be damaged.

- When connecting input and output wiring, input voltage should be off
- The ⏚ terminal must be connected to the ⏚ protective earth terminal or chassis of the equipment.
- When connecting or removing input and output wires, do not apply stress to unit.
- Power supply should be fixed directly to the input connector of the buffer module. Please refer to wiring diagram shown in 3.1 below.
- According to EN/UL62368-1 multi-strand flexible cables connected to the input require ferrule.

3.1 Wiring for power supply and buffer module.

(1) General input/output wiring

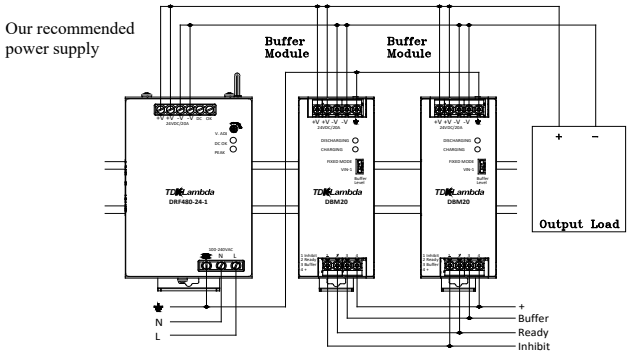
Figure 2



When using the power supply other than our recommended power supply, refer to 3-1 (3) when using the buffer module with power supply other than our recommended power supply.

(2) Parallel of buffer units

Figure 3

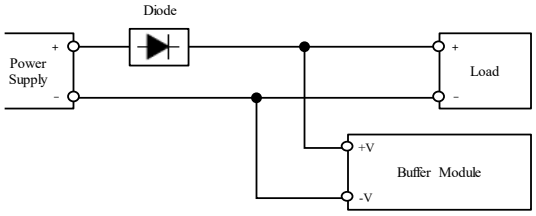


When using the power supply other than our recommended power supply, refer to 3-1 (3) when using the buffer module with power supply other than our recommended power supply.

(3) When using the buffer module with power supply other than our recommended power supply.

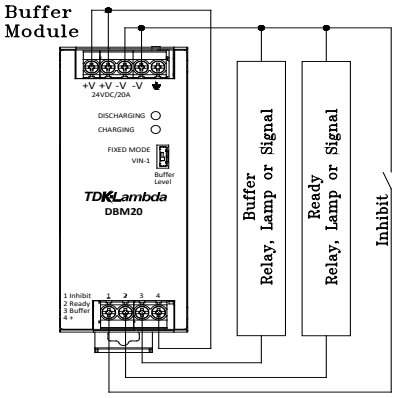
When using for a power supply other than our recommended power supply, pay attention to the suction current to the power supply. The suction current may damage the power supply.

- Connect a backflow prevention diode to the power output side.
- Set the power supply output voltage in consideration of the forward voltage (Vf) of the backflow prevention diode. For the input voltage range of the buffer module, refer to 4-1. Input voltage range.
- Use the output voltage and output power of the power supply within the specifications.
- When using a backflow prevention diode, make sure that the forward current rating of the diode is equal to or higher than the load current.
- Also, pay attention to the temperature of the backflow prevention diode.



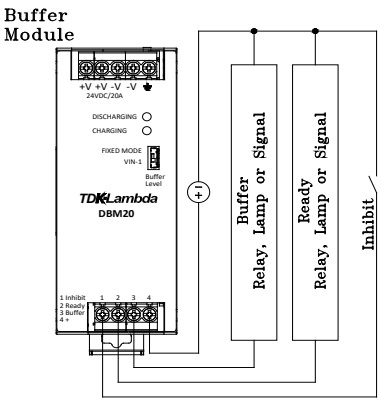
(4) Signal wiring with internal voltage supply

Figure 4



(5) Signals wiring with external voltage supply

Figure 5



4. Explanation of Functions and Precautions

4-1. Input Voltage Range

4-1.1 Fixed mode: input voltage range is 23 – 30VDC.
4-1.2 VIN-1 mode: input voltage range is 24 – 30VDC

Input voltage which is out of specification or reversed, may damage the unit.

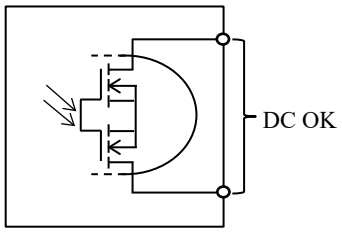
4-2. Nominal Buffer Voltage Range

4-2.1 Fixed mode: during buffering mode the nominal buffer voltage level : 22.4VDC.
4-2.2 VIN-1 mode: during buffering mode the nominal buffer voltage range : 22 - 29.4 VDC (at 20A).

Caution on use :
Kindly take note that the buffer voltage is equal to the input voltage during Ready mode.

4-3. Signal Output

4-3.1 Relay signal is present at the DC OK terminals as indication of the status of input voltage at the input terminal.
In normal operation relay DC OK is close if it is greater, or open if it is lower then the threshold voltage : 18.8 ± 0.5V.
DC OK relay rating : 30V(max) / 200mA(max).



4-3.2 Ready and buffer signals as indicator of the operation status of the buffer module. Ready signal will change to logic high when the bulk electrolytic capacitors charged up to more than 220Vdc typical after starts up, and the green LED lights up. The RED LED will only light up during buffering mode and at the same time the buffer signal change to logic high. RED LED will be off when the bulk electrolytic capacitors discharged to less than 50Vdc typical.

Ready and buffer signals with 10mA max. are common supply type with voltage range 3.3 - 30V.

Caution on use :
a) Kindly take note that both signals may be mistriggered during brown out conditions.
b) In Ready mode, buffer signal may appear if dynamic load occurred.

4-3.3 Inhibit signal with 10mA max. is common supply type with voltage range 3.3 - 30V.

Inhibit function can be activated by simply pulling the inhibit signal line to logic low. The buffer unit will immediate stop the existing charging/buffering operation and start to discharge the energy stored in the bulk electrolytic capacitors to the safe level in about 3 ~ 5 seconds.

Caution on use :
Please do not touch the buffer module immediately after the inhibit function because of high voltage might still present across the bulk electrolytic capacitors.

Please refer to figure 6 for general connection diagram for signals.

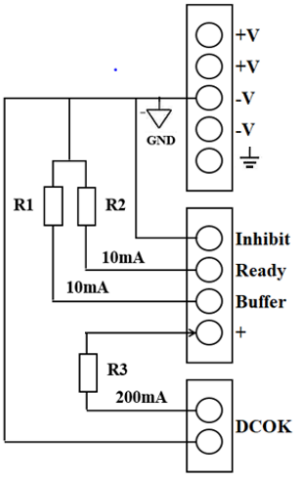


Figure 6

For example :

Common supply	R1 = R2	R3
12V±10%	1500Ω ±5% (1W)	150Ω ±5% (3W)

4-4. Fixed Mode and Vin-1 Mode

Buffer module provides two option for buffer voltage that is fixed mode and Vin-1 mode. Executed using toggle switch to choose between the two options. (refer to Figure 1).

At fixed mode the buffer voltage is set at 22.4V. While in Vin-1 mode, the buffer voltage is typically 1V lower than the regulated output voltage of the power supply source. Vin-1 mode is suitable for adjustable output upstream power supply, this is to keep buffer voltage as close as possible to the regulated output voltage of the power supply

4.5. Input Over Voltage Protection (OVP)

Input OVP circuit will shut down the boost converter if the input to the buffer module is greater than 30V. If the input voltage drops back to the normal operating range of 23 - 30V, the buffer module will operate as per normal again.

4-6. Over Current Protection (OCP)

The OCP function is provided for the buffer voltage. When the buffering current exceeds 105% of the maximum DC buffer current specification, OCP operation will be activated. The buffering current will be automatically recovered when overload condition is removed.

4-7. Parallel Operation

The buffer module can be connected in parallel to increase the buffer time. Please refer to wiring diagram shown in 3-1 (2) for parallel connection. The total output current and charge current must not exceed the maximum output current of the upstream power supply. The voltage may drop due to the overcurrent protection of the upstream power supply.

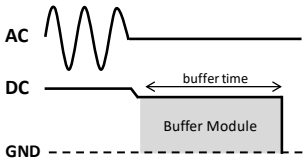
4-8. Series Operation

Not possible.

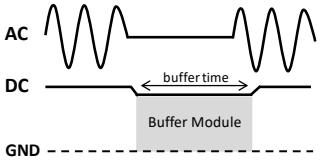
4-9. Buffer Module Operation

The product can be used to :

a) To extend the hold up time after AC loss.

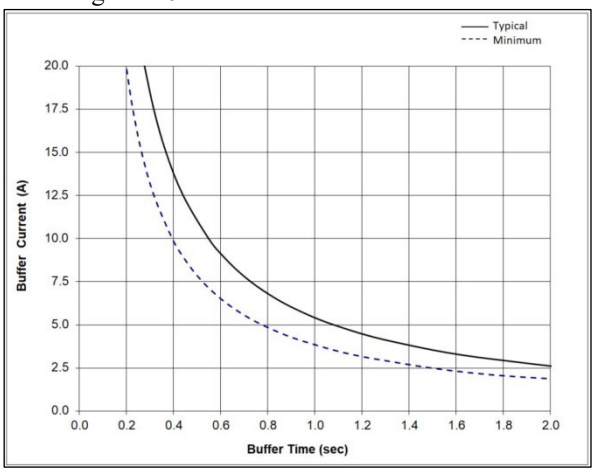


b) To bridge the mains failure



4-10. The Buffer Current versus Buffer Time for Fixed Mode and Nominal buffer Voltage.

Buffering time 0 – 2 seconds



NOTE : Ta=25ºC and initial capacitance

Kindly refer to product specifications for more details regarding hold up time.

4-11. Buffer Ripple and Noise

The standard specification for maximum ripple value is measured according to measurement circuit shows in figure 7. When load lines are longer, ripple becomes larger. In this case, electrolytic capacitor, film capacitor, etc might be necessary across the load terminal.

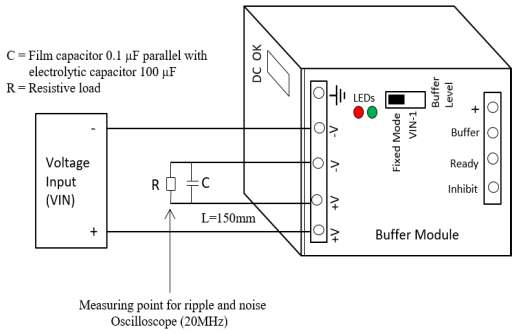
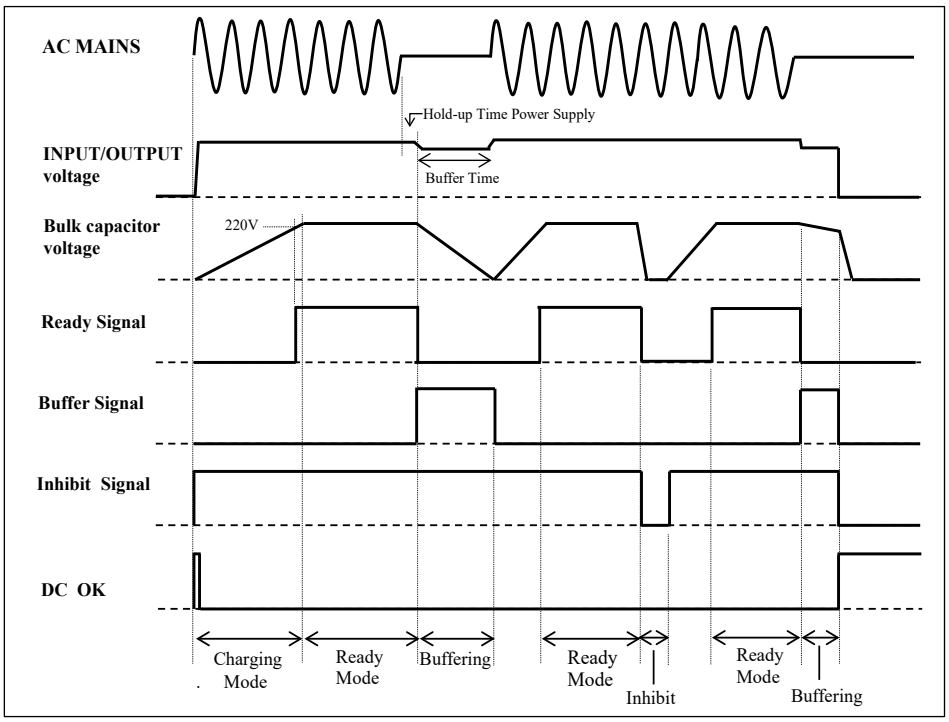


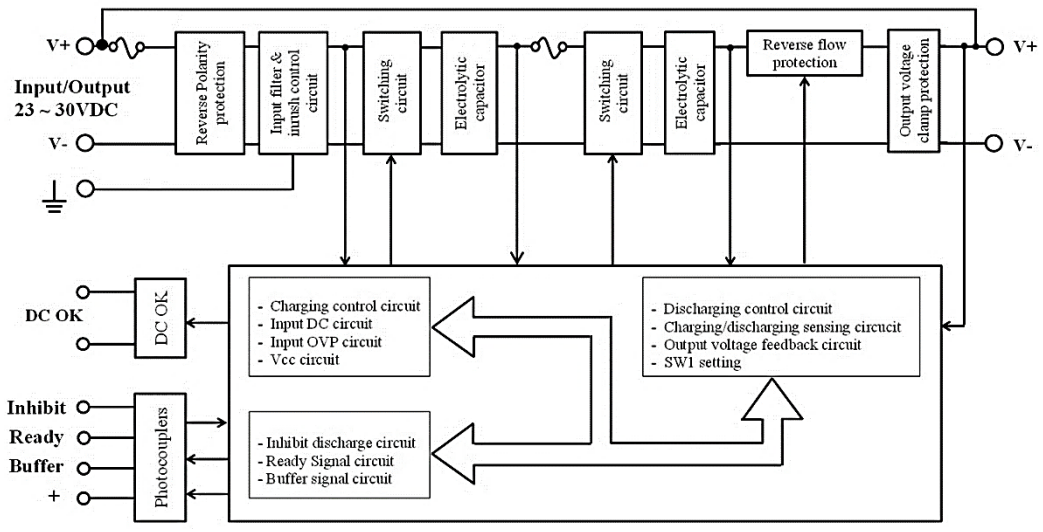
Figure 7

4-12. The Timing Sequence Chart

(1) The buffer module is connected to the upstream power supply. After AC input to the power supply, the output from the power supply which is connected to the input/output of the buffer module will charge up the internal circuit of the buffer module.
(2) Once the input/output voltage reaches the threshold voltage of DC OK circuit, the DC OK signal will change from logic high to logic low.
(3) After approximately 40s, the bulk electrolytic capacitors voltage will be charged up to 220Vdc typical and the Ready signal change from logic low to logic high.
(4) If the AC input shutdown or brown out conditions, the output voltage from the upstream power supply will go down. In this case, the input/output voltage of the buffer module will go down as well. The buffer module senses this change and it will activate buffer mode. Please refer to section 4-2. for the nominal buffer voltage level that the buffer module to supply back to the output line of the upstream power supply.
(5) While buffering take place, buffer signal will change from logic low to high. And Ready signal will change from logic high to low.
(6) During the upstream power supply is still turn ON case and customer system will like to activate the inhibit function by pulling inhibit signal from logic high to logic low, the buffer module will shut down the internal converters and bulk electrolytic capacitors will be discharged in 3 ~ 5s.
(7) Once the inhibit function is deactivated, buffer module will resume to normal operation automatically.



4-13. The Block Diagram

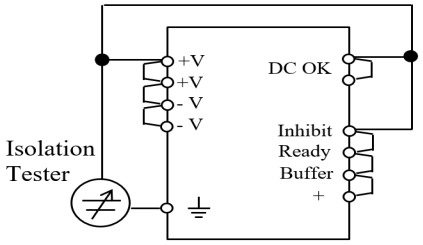


4-14. Isolation Test

Isolation resistance between input/output & signal ports to ⏚ shall be more than 100MΩ at 500VDC. For safety purposes, voltage setting on DC isolation tester must be done before the test. Ensure that the unit is fully discharged after the test.

Input/Output & signal ports ~ ⏚: 500VDC, 100MΩ or more

Figure 8

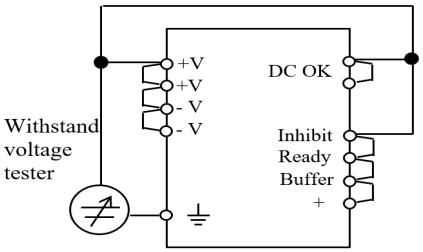


4-15. Withstand Voltage

This model is designed to withstand 500VAC between input/output & signal ports to ⏚ each for 1 minute. When testing withstands voltage, set current limit of withstand voltage test equipment at 100mA. The applied voltage must be gradually increased from zero to testing value and then gradually decreased for shut down. When timer is used, the buffer module may be damaged by high impulse voltage at timer switch on and off. Connect input/output & signal ports as follows :

Input/Output & signal ports ~ ⏚: 500VAC 1min 100mA

Figure 9



5. Mounting Directions

5.1. There are 3 mounting methods recommended.

(A) Standard Mounting

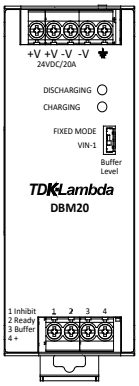


Figure 10

(B)

Figure 11

(C)

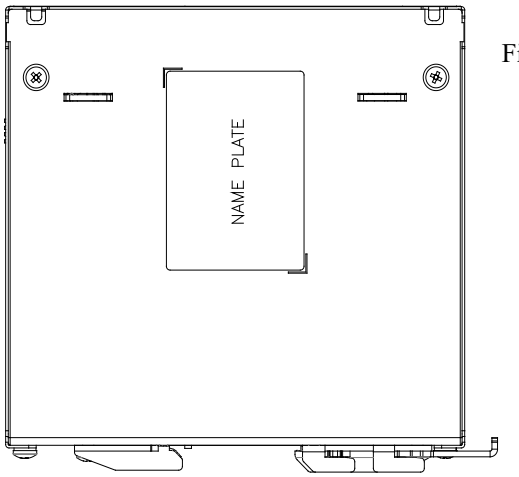


Figure 12

5.2. Mounting spacing vs. airflow

Do not exceed the buffer derating. Please refer to section 6. Leave enough space surround the units to ventilate heat efficiently.

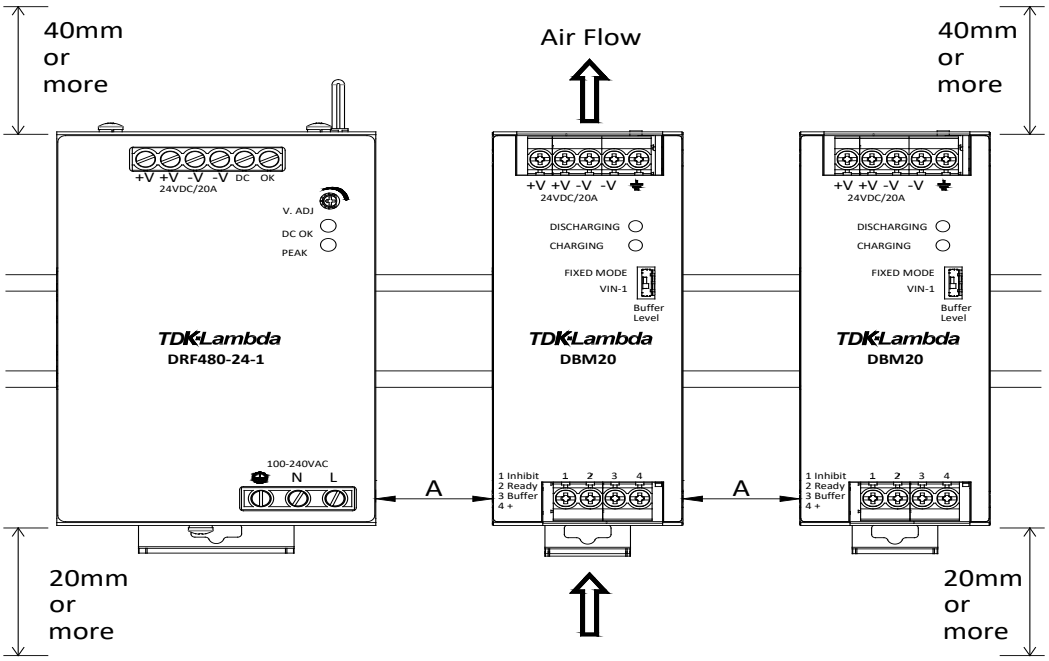


Figure 13

Minimum Installation clearances:
40mm on top, 20mm at the bottom, A=5mm which is recommended on the left and right side when products are permanently loaded with full 480W in Ready mode.
In case the adjacent device is a heat source, A=15mm clearance is recommended.

The ambient temperature (T_a) is reference 20mm from the bottom of the unit.

5.3. ⏚ terminal on input/output connector

⏚ terminal must be connected to the Protective earth terminal of the equipment. If not connected to the Chassis(Conductor), the conducted noise, radiation noise and output noise will increase.

5.4. Buffer Module mounting on DIN RAIL (TS35 or equivalent)

Make sure input and output wires are disconnected before mounting buffer module onto rail

5.4.1 Refer to figure 14.
5.4.2 Tilt the unit slightly rearwards, fit the unit over top hat rail

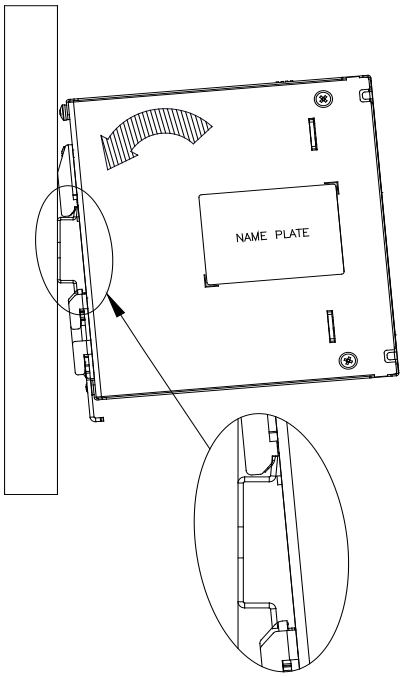
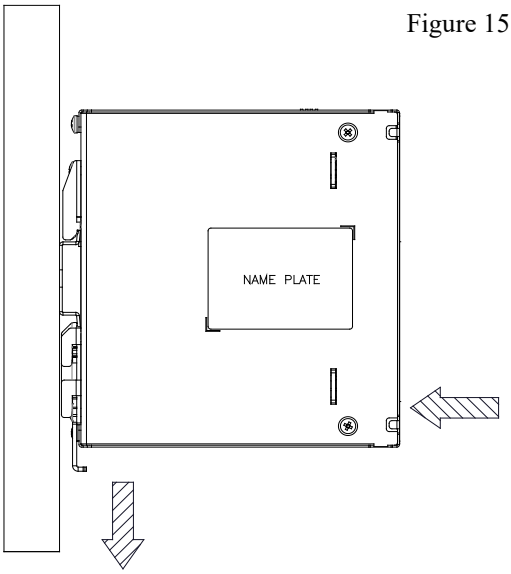


Figure 14

5.4.3 Refer to figure 15 below.
5.4.4 Slide it downward until it hits the stop.
5.4.5 Press against the bottom front side for locking. Shake the unit slightly to check the locking action.
5.4.6 In order to tighten the unit mounting, the Din rail stopper attached on both sides of the unit is recommended.

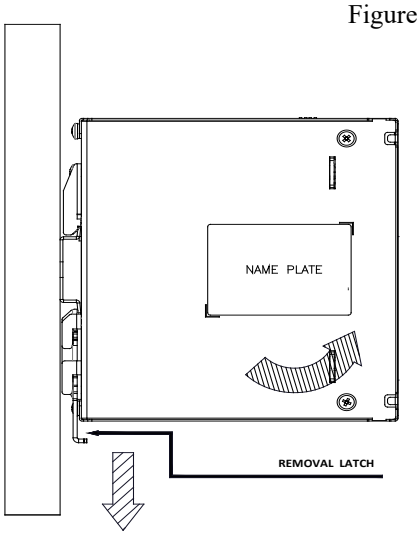
Figure 15



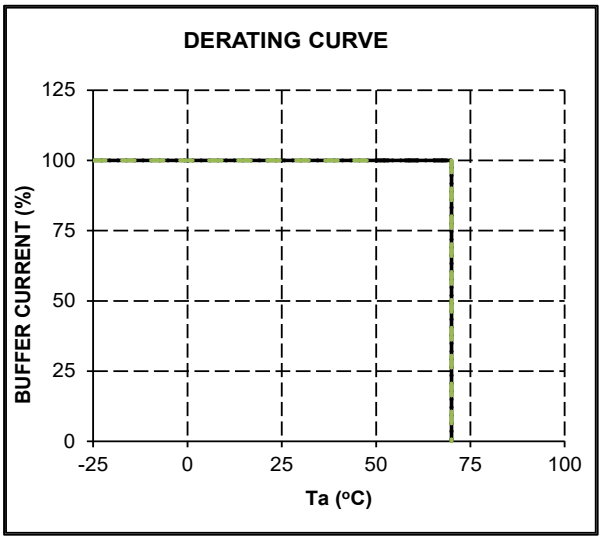
5.5. Buffer Module removal from DIN RAIL

5.5.1 Refer to figure 16.
5.5.2 Switch off power and disconnect your system from the supply network. Pull the Latch on the rear lower edge of the unit downwards and gently lift lower front edge of the unit (tipping upwards) and remove it.

Figure 16



6. Buffer Derating – DBM20



7. The Life Expectancy

The life expectancy of buffer module depends on the life of the built-in aluminium electrolytic capacitors. The life is described in reliability data.

The life of the aluminium electrolytic capacitor varies depending on the method of mounting the buffer module, the load current and the ambient temperature. Please refer to the "Electronic Capacitor Lifetime".

Please do not use the product which passed over the life expectancy. There is a risk of unexpected buffer shutdown and specifications may not be satisfied.

Please contact us for maintenance or exchange the product which exceeded the life expectancy.

8. Wiring Method

Use all wires as thick and short as possible to make lower impedance. Noise can be eliminated by attaching capacitor to the load terminals.

For safety and EMI considerations, connect ⏚ of input/output connector to ground terminal of equipment.

Caution on use :
a) Kindly keep the input wires as short as possible, this is to avoid mistriggering of signals during dynamic load conditions.

9. EMC

This model complies with the provisions of the EMC directive and meets the following standards :
Emissions: EN55032 Class B, CISPR32-B
Immunity: EN61000-4-2, -3, -4, -5, -6

EMI (CE) compliance to be confirmed at system level.
Product is considered as a peripheral accessory to Power supply.

10. DBM20 UL508 Listed Condition

Wiring/Torque recommendation

Model Type	Connector	Wire (AWG)	Max. Torque
DBM20	Input/Output (+V, -V, ⏚)	10 - 24	8.06 kgf.cm (7Ibf.in)
	Signal (Inhibit, Ready, Buffer, +)	16 - 24	8.06 kgf.cm (7Ibf.in)
	Signal (DC OK)	16 - 24	N.A
DBM20/E	Input/Output (+V, -V, ⏚)	10 - 20	N.A
	Signal (DC OK, Inhibit, Ready, Buffer, +)	16 - 20	N.A

1) Wire requirement is rated at minimum 105°C and to use copper conductor only.
2) For use in a Pollution degree 2 environment only.
3) These products are considered for use where maximum surrounding air temperature does not exceed 70°C.
   When installing these products please refer to section **6** for derating.
4) Recommended for indoor use only.

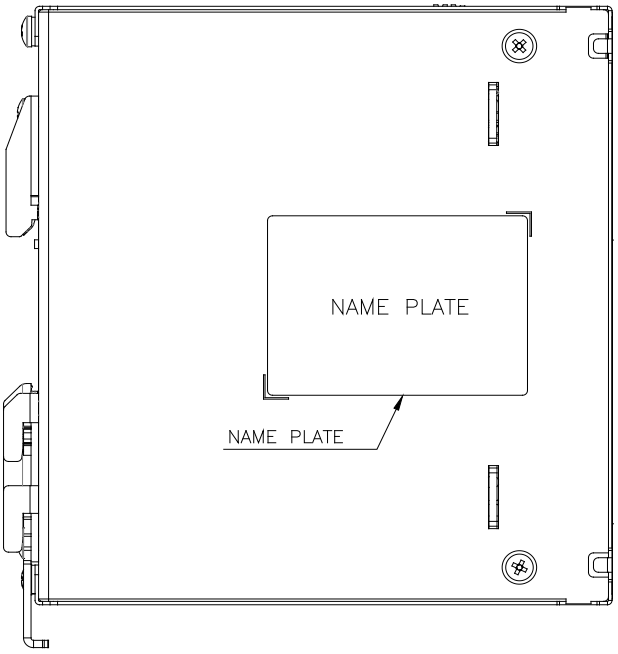
11. Warranty period

This product is warranty for a period of 5 years from the date of shipment.
For damage occurring at normal operation within this warranty period, repair is free of charge.
Please read the General Safety Instruction before using the products.

Product marking:

TDK·Lambda
TDK-Lambda Singapore Pte. Ltd.
(Sales, Services and R&D)
1008 Toa Payoh North #06-01/08, #07-01/03
Singapore 318996
Telephone: +65 62517211
Facsimile: +65 62509171
WEBSITE: www.sg.lambda.tdk.com

Figure 17



NOTE : Model name, input voltage range, nominal output voltage, maximum output current, country of manufacture and safety marking (for only approved products) are shown here in accordance with the specifications.

12. Before concluding that the unit is at fault.

Before concluding that the unit is at fault, make the following checks.

- Check if the rated input voltage is connected.
- Check if the wiring of input and output is correct.
- Check if the wire size is not too thin. Refer to section 10.
- Check if the buffer current and wattage is not over specification.
- Check if the GREEN LED lights up during Ready mode and Buffer mode.
- Audible noise can be heard during dynamic load buffering mode operation.
- Are you using more than the maximum external capacitance of the connected power supply?
  Capacitor below is connected between the input/buffer output terminals of this product. Pay attention that the total capacitance on the load side is within the maximum external capacitance of the power supply.

Input/Output terminal capacitance	
Model	DBM20
Capacitance	1,000uF

13. Returns

Please contact your local sales office or visit our website to arrange return of any faulty product.