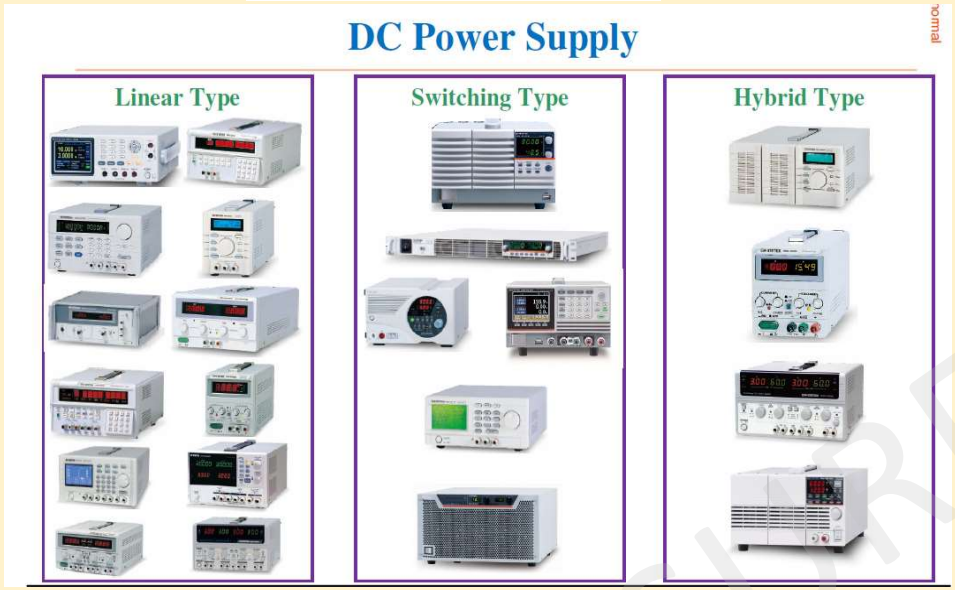
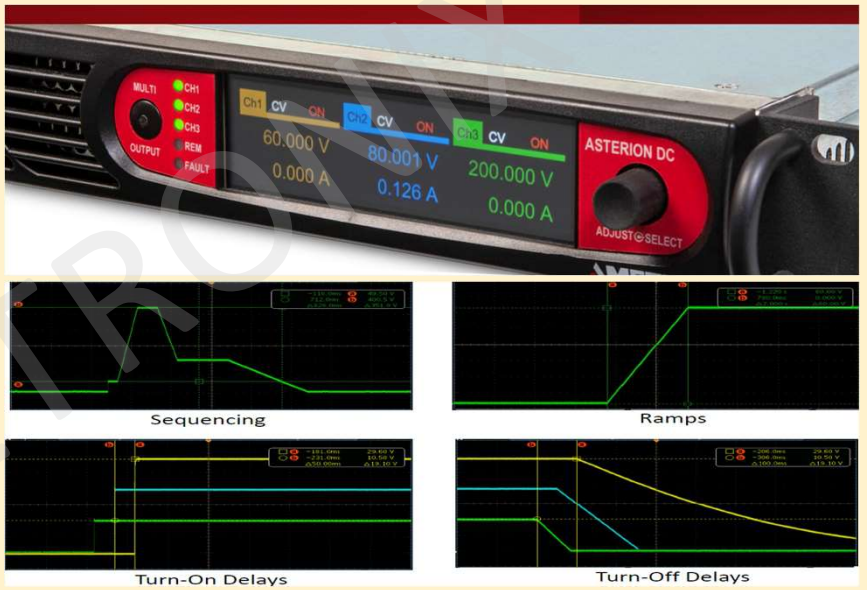
DC Power Source Technology & Applications

GW INSTEK
Simply Reliable



AMETEK®



บริษัท เมเชอร์โทรนิกซ์ จำกัด
2425/2 ถ. ลาดพร้าว แขวงสะพานสอง
เขต วังทองหลาง กทม. Tel. 02-5141234
www.measuretronix.com email : wichit@measuretronix.com

แหล่งจ่ายไฟ DC Power Supply

- ทำไมต้องใช้?

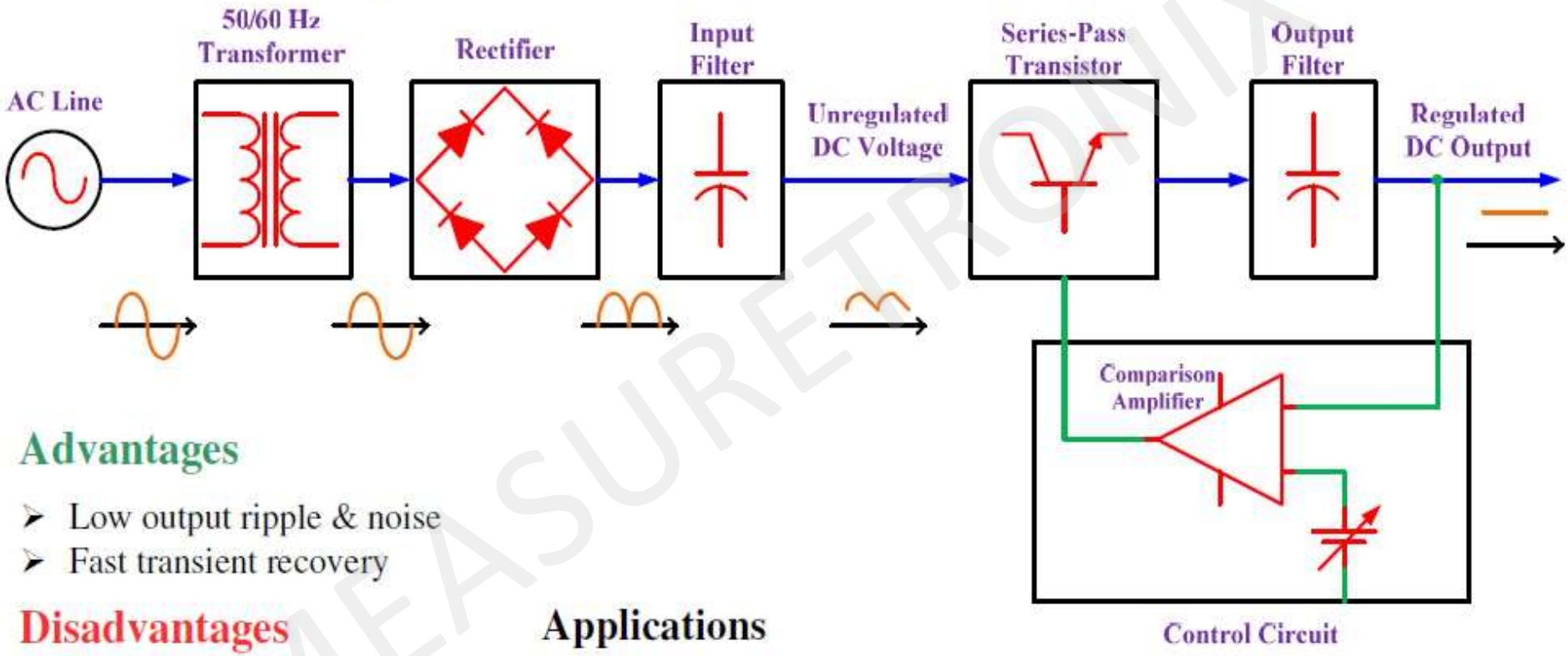
  เพื่อทดสอบผลิตภัณฑ์

การทดสอบไหนที่ต้องใช้ Power supply?

- ทุกการทดสอบที่ต้องการเสถียรภาพของแหล่งจ่ายไฟ
- เพราะเราต้องการมั่นใจผลการทดสอบว่ามาจาก DUT ไม่ใช่ ”ภาคจ่ายไฟ” ในตัวสินค้าผิดปกติร่วมด้วย
- สินค้า (หรือ DUT) แทบทุกชนิด ที่ใช้ไฟฟ้า

DC Power Supply Topologies

Linear or series-pass



Advantages

- Low output ripple & noise
- Fast transient recovery

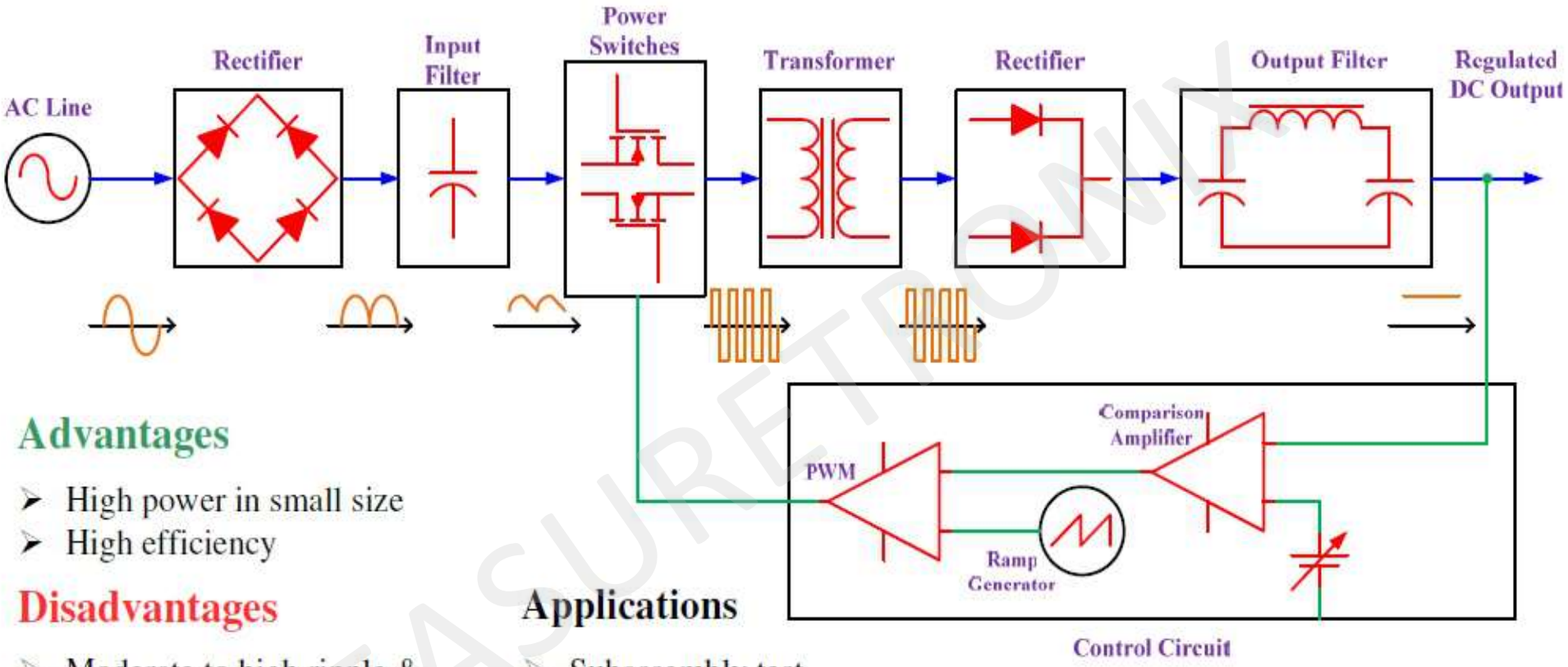
Disadvantages

- Low efficiency
- Heavy
- Physically large

Applications

- Bench & laboratory
- Automated test

Switched mode (SMPS)



Advantages

- High power in small size
- High efficiency

Disadvantages

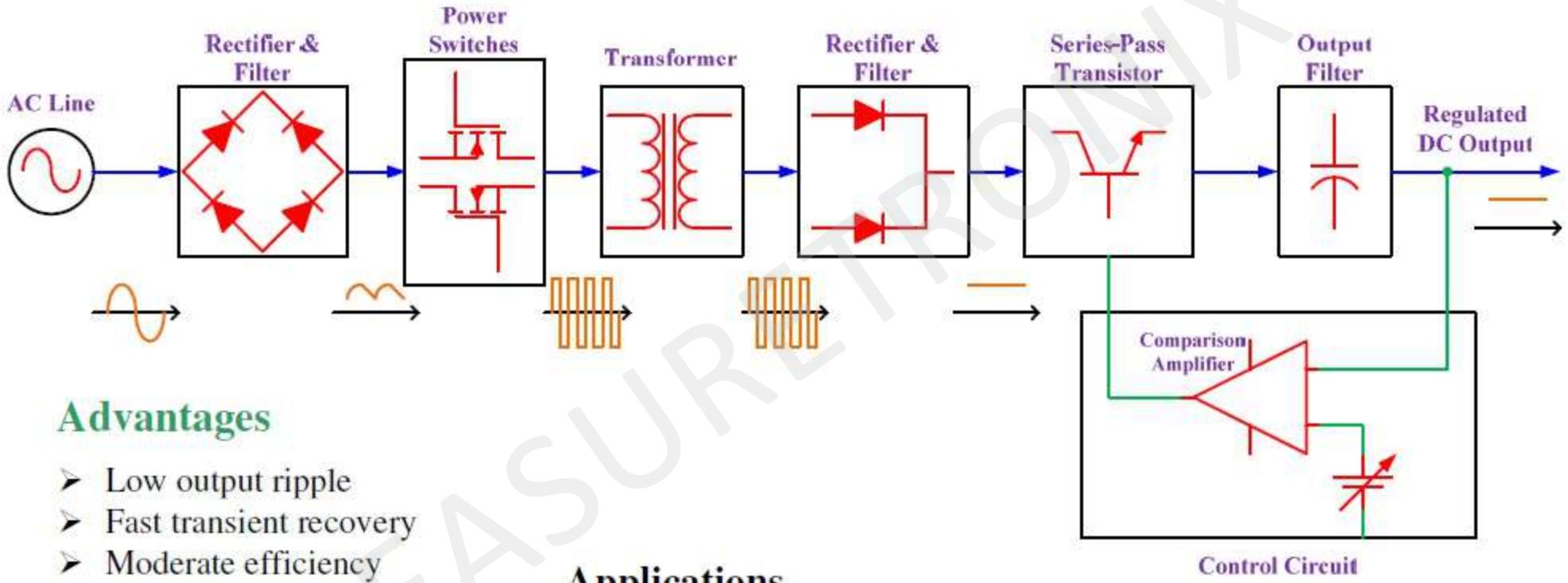
- Moderate to high ripple & noise
- Moderate transient recovery

Applications

- Subassembly test
- Burn-in
- Bench & laboratory
- Electromechanical test

DC Power Supply Topologies

Hybrid (Switching + Linear)



Advantages

- Low output ripple
- Fast transient recovery
- Moderate efficiency

Disadvantages

- High cost

Applications

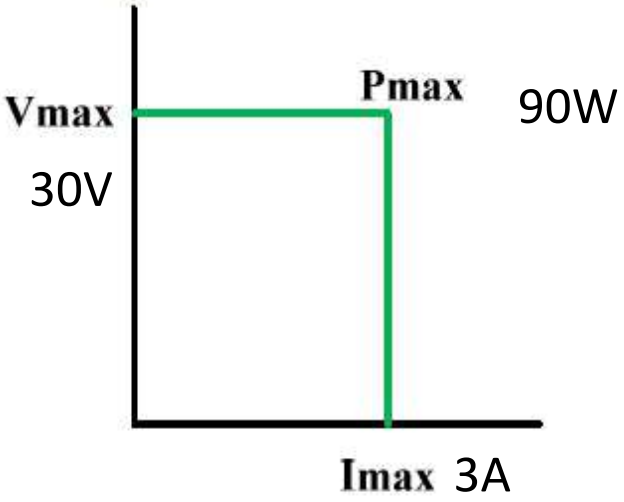
- Bench & laboratory
- Automated test

ควรเลือก DC Power Supply ชนิดไหนให้ตรงกับงาน ?

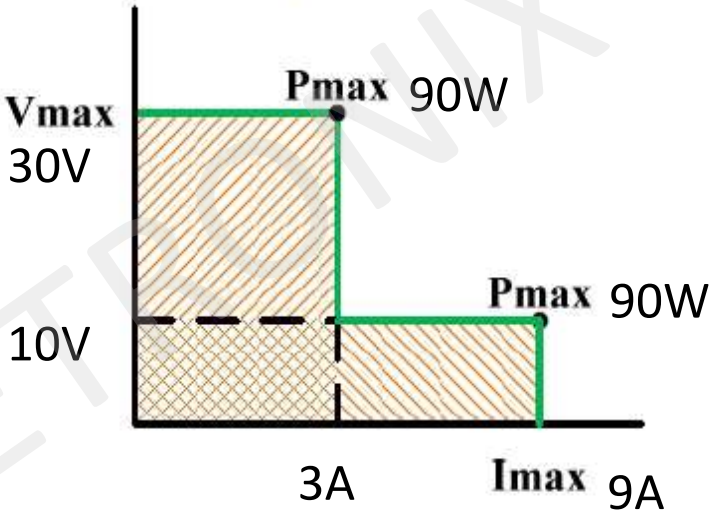
	Advantages	Disadvantages
Linear DC Source	• Fast output transient response • Low output noise and ripple voltage • Low common mode noise current • Cost competitive at lower output power levels (<500W)	• Low efficiency • Large physical size and weight • Higher cost at higher power (>500W)
Switching DC Source	• High power conversion efficiency • Small size and light weight • Cost effective, especially at high power.	• High output noise and ripple voltage • High common mode noise current • Slow transient response
Hybrid DC Source	• High power conversion efficiency • Small size and light weight • Fast output transient response • Low output ripple voltage and current	• High cost

Output Characteristics

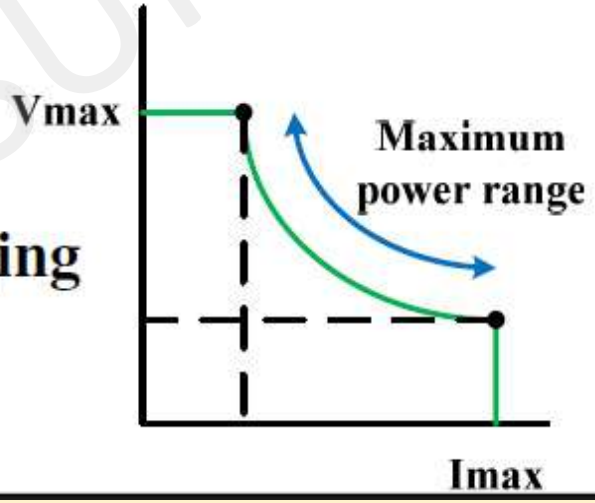
Single-range



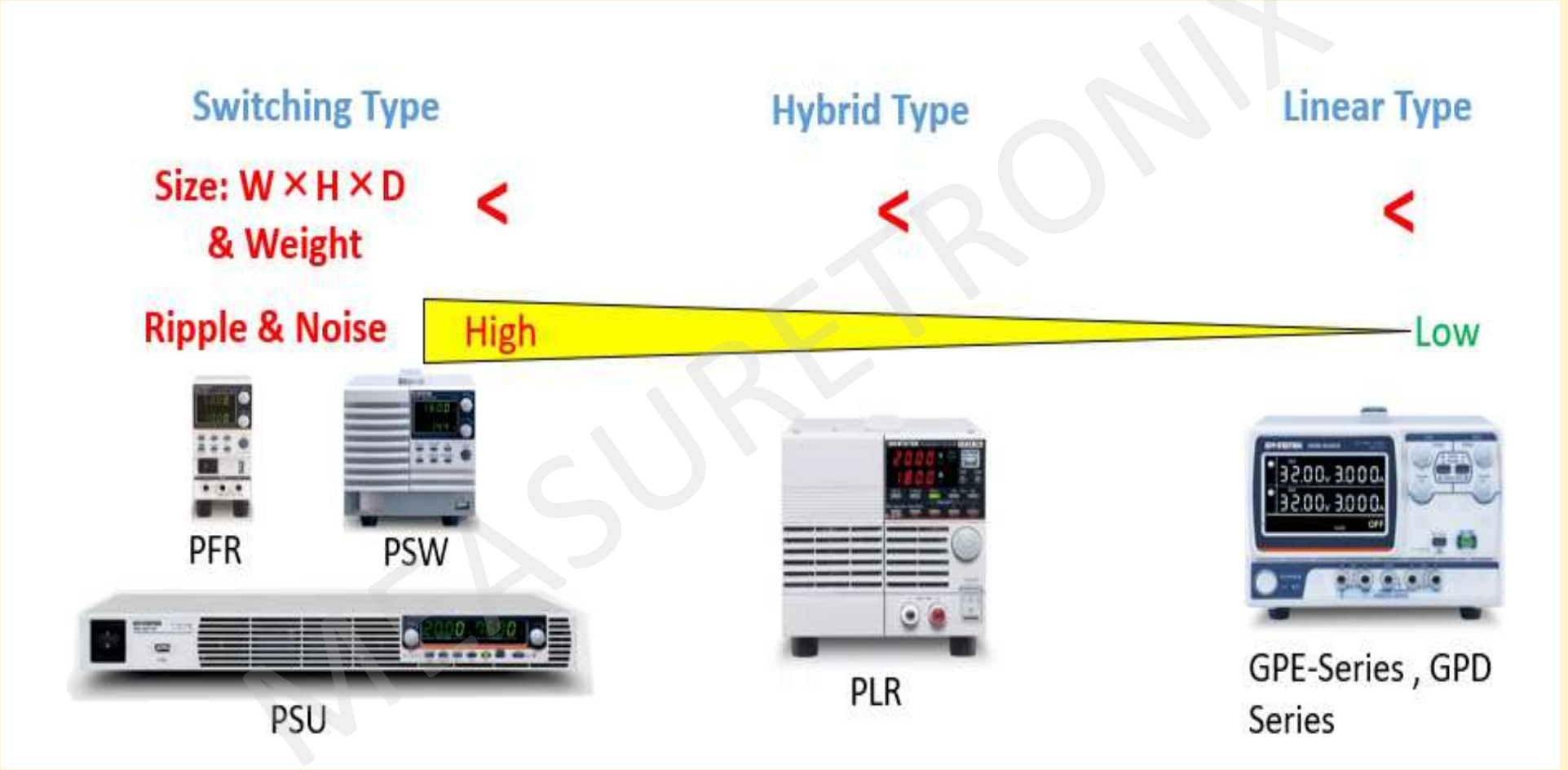
Dual-range



Multi-rang or Autoranging



การจัดเรียงตามชนิด DC Power Supply ของ GW

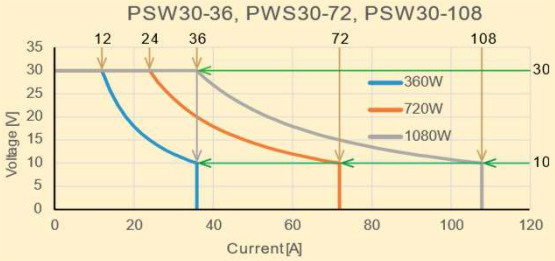


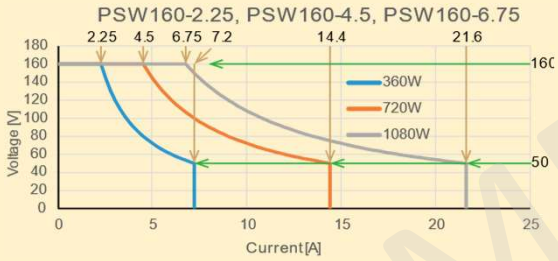
Multi-range of PSW series

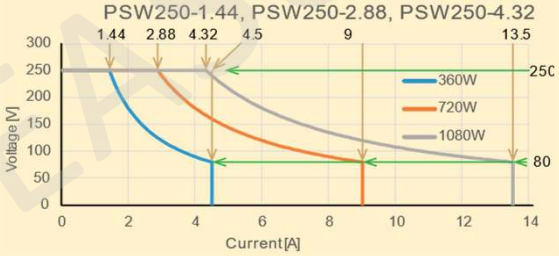


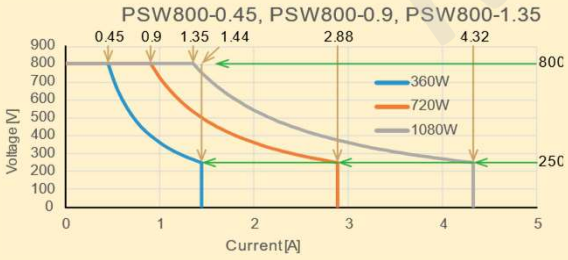
- Voltage Rating:30 V ~ **800 V**,
  Output Power Rating: 360/720/1080W
- **Output ON/OFF Delay Function**
- **CV/CC Priority Mode**
- **Adjustable Slew Rate**
- **Bleeder Circuit Control**
- **Internal Resistance function**

3 Times Multi-Range (V&I) Operation



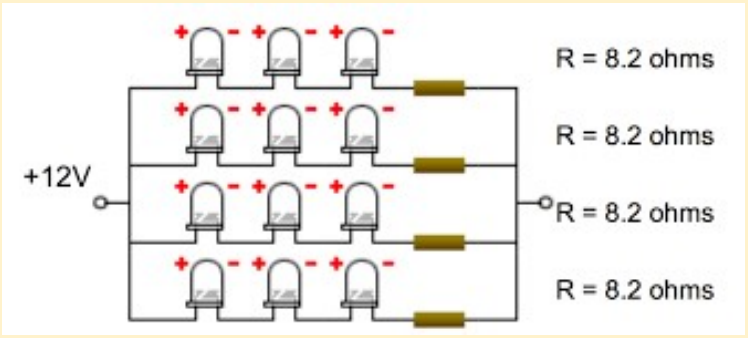


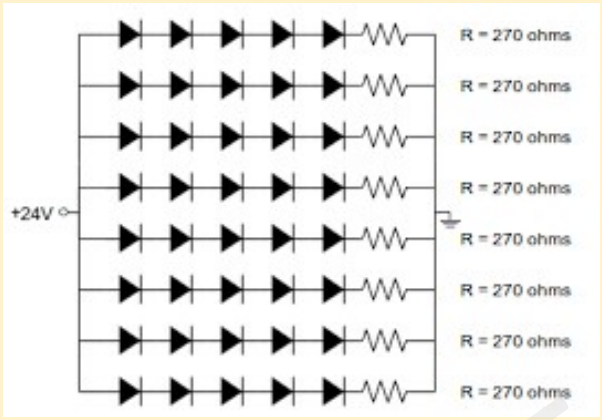




	Output Power	Output Voltage	Output Current
PSW 30-36	360W	0-30V	0-36A
PSW 80-13.5		0-80V	0-13.5A
PSW 160-7.2		0-160V	0-7.2A
PSW 250-4.5		0-250V	0-4.5A
PSW 800-1.44		0-800V	0-1.44A
PSW 30-72	720W	0-30V	0-72A
PSW 80-27		0-80V	0-27A
PSW 160-14.4		0-160V	0-14.4A
PSW 250-9		0-250V	0-9A
PSW 800-2.88		0-800V	0-2.88A
PSW 30-108	1080W	0-30V	0-108A
PSW 80-40.5		0-80V	0-40.5A
PSW 160-21.6		0-160V	0-21.6A
PSW 250-13.5		0-250V	0-13.5A
PSW 800-4.32		0-800V	0-4.32A

Multi-range Application Example





Different lighting devices are built upon different LED Array arrangements with different voltage input, however, within a constant power range. A good fit for multi-range power supply application.

CC / CV Priority Mode

PFR PSW PSU

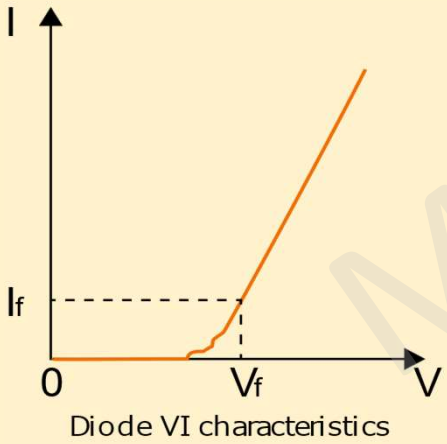
Suppresses overshoot during transient phenomena such as diode load characteristic.

PSW, PSU and PFR can select constant voltage (CV) priority mode and constant voltage (CC) priority mode.

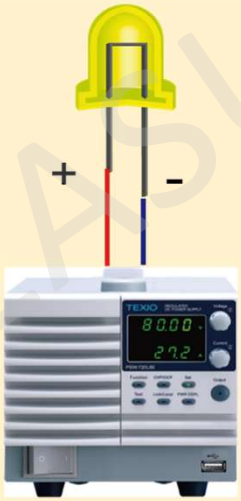
Diode load such as LED rises with CC operation.

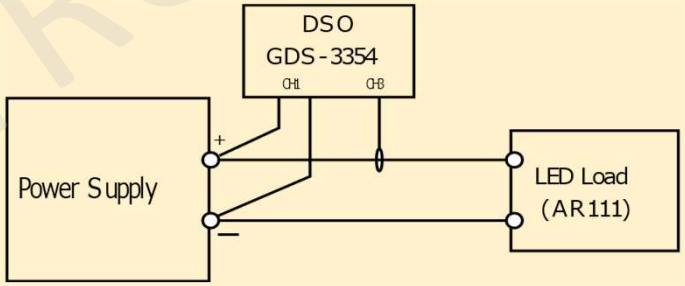
CC priority mode suppresses overshoot at turn-on with load rising at CC operation when power supply output is on.

CC / CV priority mode is best for LED test.

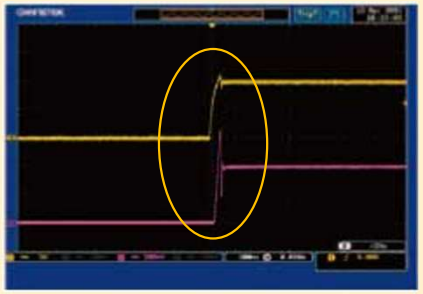


Diode VI characteristics

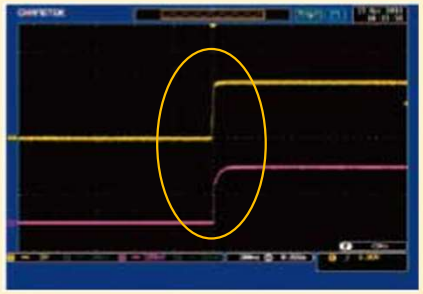




Results of experiments of LED operation using Digital Oscilloscope GDS-3354



CV Priority mode :
Inrush current and surge voltage are generated at LED forward voltage Vf



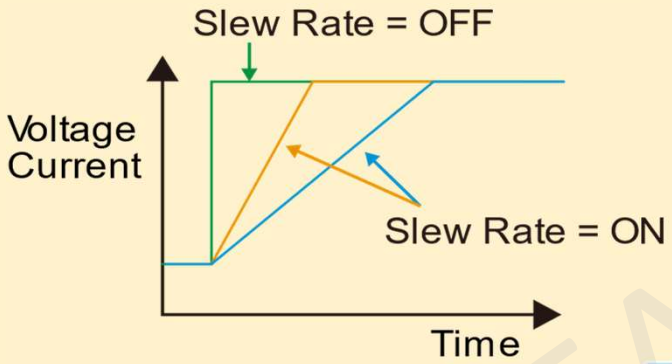
CC Priority mode :
Suppresses the generation of inrush current and surge voltage at forward voltage Vf of LED.

Adjustable Slew Rate

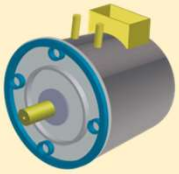
PFR PSW PSU

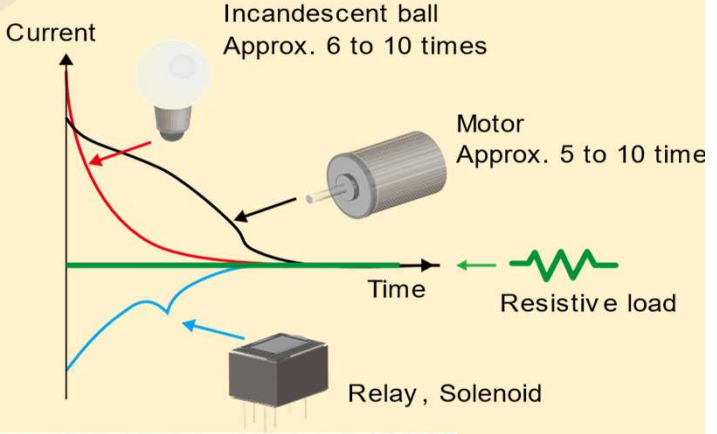
The slew rate setting is helpful to restrain inrush current of a load by changing the power output rising time.

For PSW, PSU and PFR, it is possible to turn on / off the slew rate function of its output voltage and output current. With slew rate function on, changes in voltage and current slew rate are available to prevent the inrush current from damaging the DUT.



Inrush Current





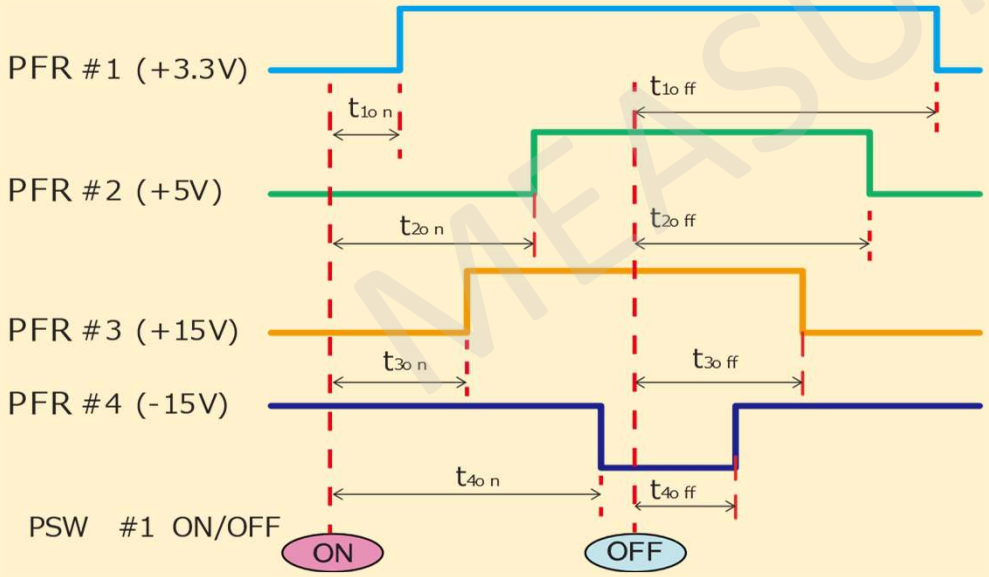
Slew rate setting range	
0.01V/s ~ 60.00V/s	PSW30-XX
0.1V/s ~ 160.0V/s	PSW80-XX
0.1V/s ~ 320.0V/s	PSW160-XX
0.1V/s ~ 500.0V/s	PSW250-XX
1V/s ~ 1600V/s	PSW800-XX

Output ON/OFF Delay Function

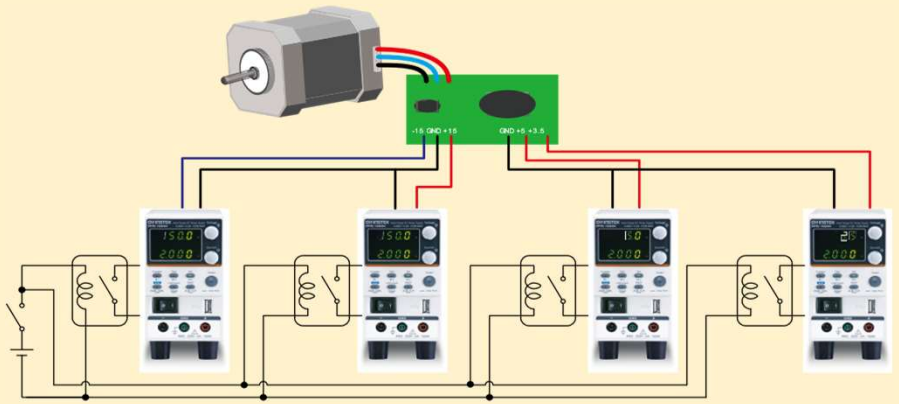
PFR PSW PSU

The Output ON / OFF Delay Function is an effective way to execute the order of turning on and off the powers of motor and control board following the set sequence and timing.

The Output On/Off delay feature of PSU, PSW and PFR enables the setting of a specific time delay for output on after the power supply output is turned on, and a specific time delay for output off after the power supply output is turned off.
When multiple Power Supply units are used, the On/Off delay time of each unit can be set respectively referring to fix timepoints. This multiple-output control can be done through the analog control terminal at rear panel or through the PC programming with standard commands.



motor and control board



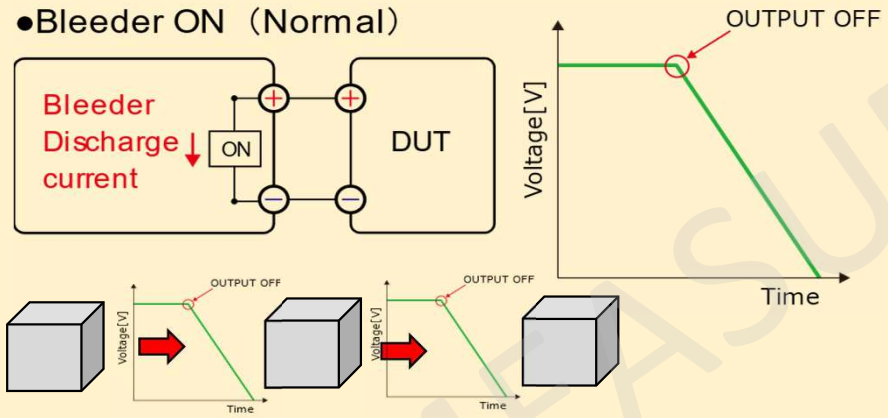
Bleeder On / Off control

PFR PSW PSU

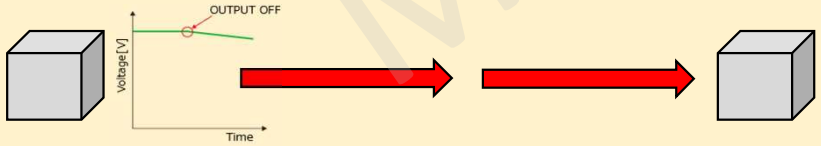
PFR, PSW and PSU can turn on/off the bleeder circuit.

Normally, a capacitor is included in the output stage of the power supply. A bleeder circuit is built to discharge the remained electric charge in the capacitor when the output of the power supply is turned off. (Power supply with large electric power is dangerous even after power off, because the remained energy at the output is big)
Bleeder circuit should be turn off for testing batteries or capacitors. The bleeder discharge path will rapidly discharge the battery after the power off.

●Bleeder ON（Normal）

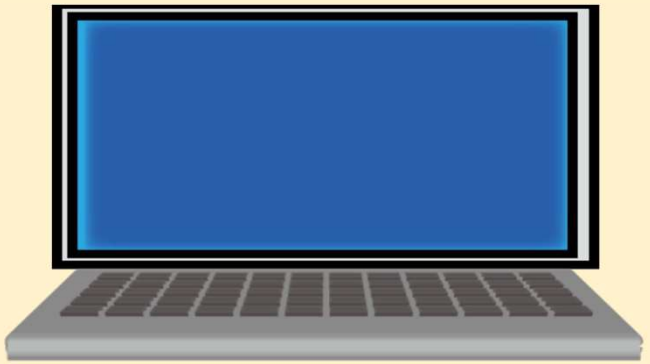


If the bleeder is on the voltage drops quickly so you can quickly replace the DUT.

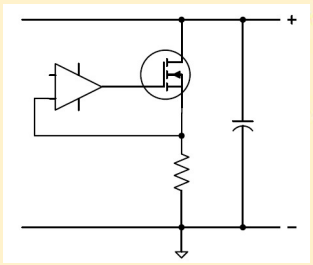


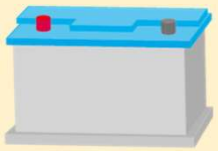
If the breeder is off, the voltage will not drop soon so you can not change the DUT quickly.

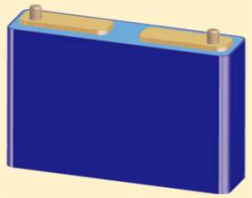
Bleeder Off is suitable for Battery test.



REVERSE CURRENT PREVENTION DIODE





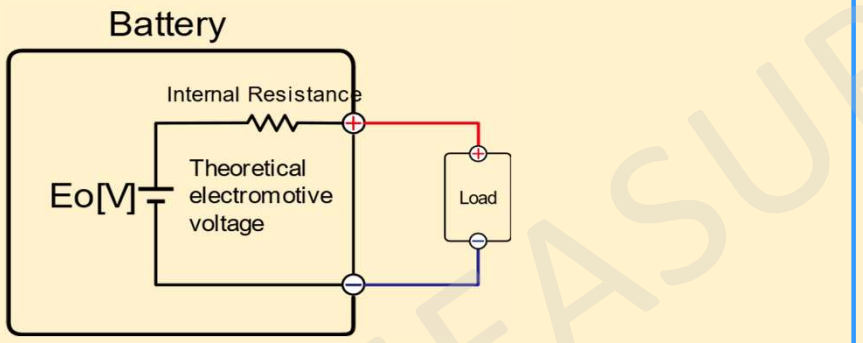


Adjustable Internal Resistance

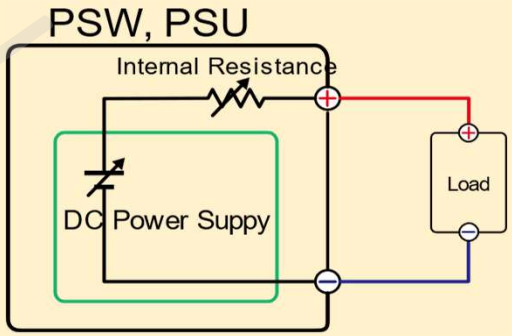
PSW PSU

PSW, PSU adjustable internal resistance function can simulate battery characteristics .

The internal resistance of the PSW can be adjusted to the level of battery's internal resistance, so as to simulate the battery to do the test .



simulate batteries



Vout =Vset- Vr

Adjustable Internal Resistance

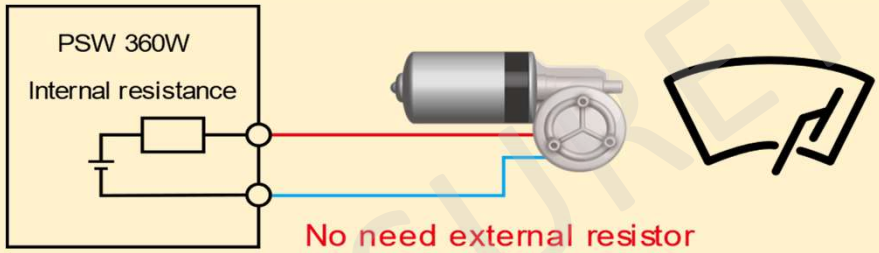
PSW PSU

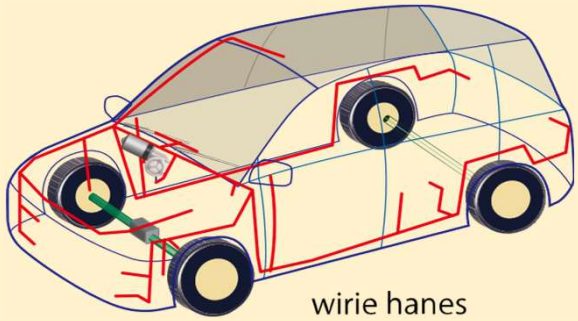
PSW's internal variable resistance function can simulate Wire Harness resistance.

Example : simulate Wire Harness resistance

PSW30-36 Internal resistance setting range : 0.000Ω~0.833Ω

Windshield wiper motors for automobiles



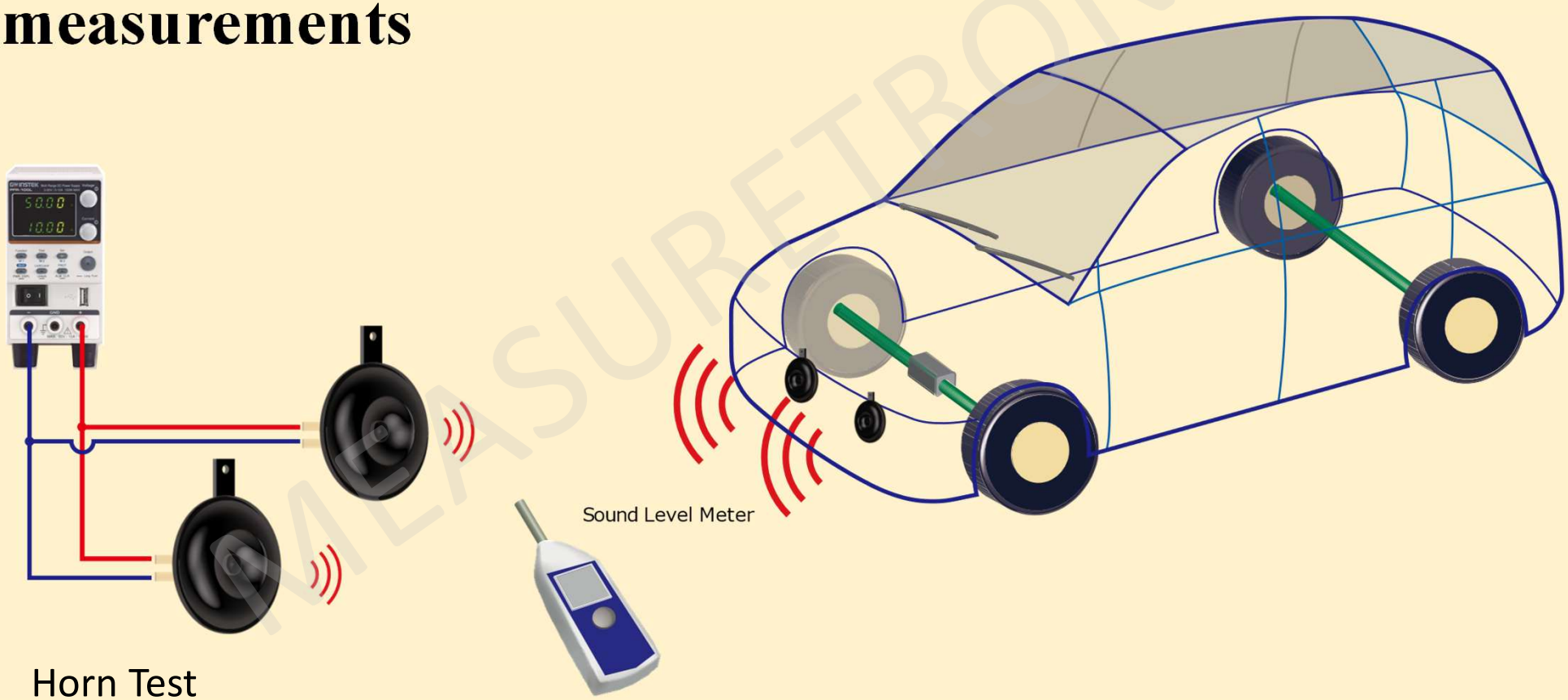


In the test of the Windshield wiper motor, automobile manufacturers may be asked to test a voltage drop (Example: series resistance 50 mΩ) due to wiring. Generally, a resistor is inserted in series with the power supply. However, if the internal resistance variable function of the PSW is used, the test including the voltage drop can be performed by the power supply.

DC Power Supply Feature and Applications

PFR Series

Fan-less Power supply is suitable for sound test & measurements



Horn Test

Test Script (1)

PFR PSW PSU

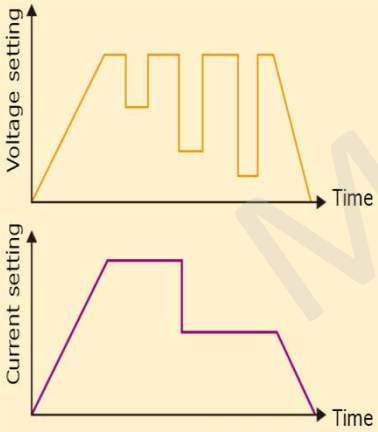
Test Script Application – Solving Complex Test Pattern

If you want to test products and parts under various voltage and current conditions, they are generally controlled by a PC. However, the power supply of GW Instek has its own TEST Script function that the power supply itself controls the complicate condition.

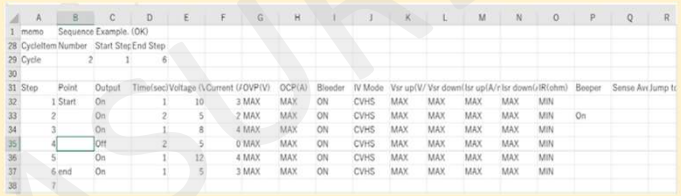
Complex testing is possible by inputting items necessary for testing in the CSV file, saving the file in the USB memory, storing i in the power supply itself, and executing it. Because you can store 10 patterns on the main body, if you repeat several tests, yc can respond by simply replacing the execution contents.

Test pattern you plan to do

Voltage, Current ,Time, etc.

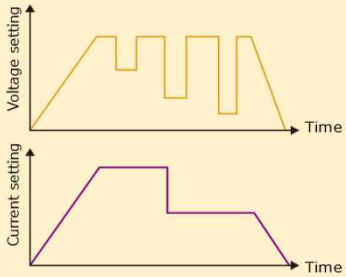


Enter conditions(V, I, Time, etc.) into CSV file



Save CSV file and tst file

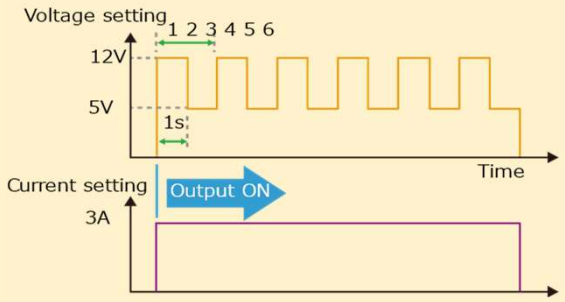
power supply execute test pattern itself



Test Script(2)

PFR PSW PSU

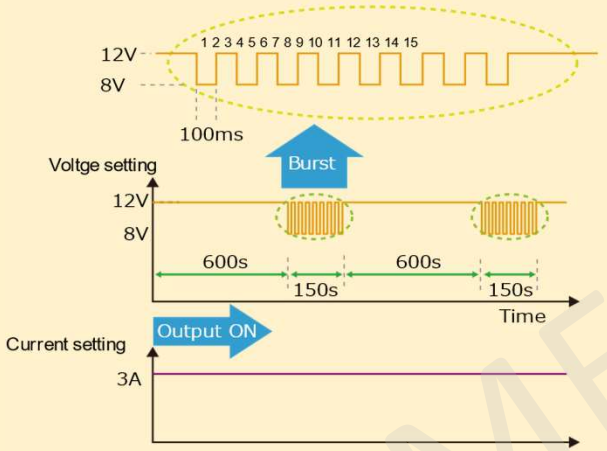
Pattern 1: Pulse output



Repeat Step 2 for 36 times.

	A	B	C	D	E	F
1	memo	Pulse Test				
2	DisplayItems	VI				
3	CycleItems	Number	Start Step	End Step		
4	Cycle	6	2	3		
5	Step	Point	Output	Time(sec)	Voltage (V)	Current (A)
6	1	Start	Off	0.5	0	3
7	2		On	1	12	3
8	3		On	1	5	3
9	4	end	Off	0.5	0	3

Pattern 3: Add Burst noise



Continue steps 1 to 17

	A	B	C	D	E	F
1	memo	Burst				
2	DisplayItems	VI				
3	CycleItems	Number	Start Step	End Step		
4	Cycle	0	1	17		
5	Step	Point	Output	Time(sec)	Voltage(V)	Current(A)
6	1	Start	On	600	12	3
7	2		On	0.1	8	3
8	3		On	0.1	12	3
9	4		On	0.1	8	3
10	5		On	0.1	12	3
11	6		On	0.1	8	3
12	7		On	0.1	12	3
13	8		On	0.1	8	3
14	9		On	0.1	12	3
15	10		On	0.1	8	3
16	11		On	0.1	12	3
17	12		On	0.1	8	3
18	13		On	0.1	12	3
19	14		On	0.1	8	3
20	15		On	0.1	12	3
21	16		On	0.1	8	3
22	17		On	0.1	12	3
23	18	End	Off	0.1	0	0
24						

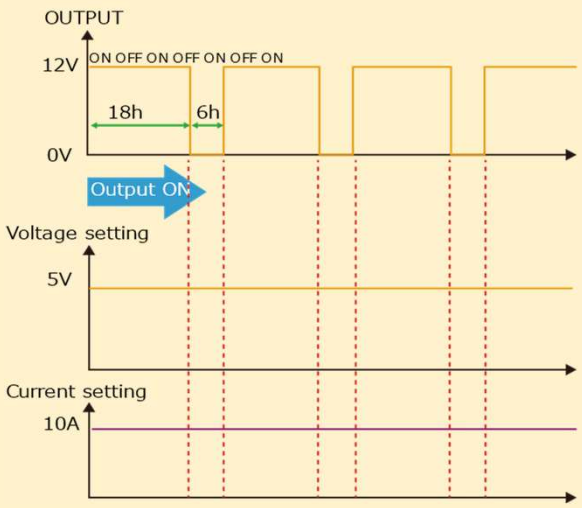
Parameter

- Cycle : 1~1000000000 ; 0 (INF)
- Start Step: 1~20000.
- End Step: 1~20000.
- [Point] Parameter : Start, End, Exit, Pause, Trigin
- Output: 0 (OFF), 1 (ON), OFF, ON.
- Time: 0.05 sec ~ 20 days.
- Voltage: MIN, MAX, <value>.
- Current: MIN, MAX, <value>.
- OVP: MIN, MAX, <value>.
- OCP: MIN, MAX, <value>.
- Bleeder: 0 (OFF), 1 (ON), OFF, ON.
- IV Mode: 0 (CVHS), 1 (CCHS), 2 (CVLS), 3 (CCLS), CVHS, CCHS, CVLS, CCLS.
- Vsr up: MIN, MAX, <value>.
- Vsr down: MIN, MAX, <value>.
- Isr up: MIN, MAX, <value>.
- Isr down: MIN, MAX, <value>.
- IR: MIN, MAX, <value>.
- Beeper: OFF, ON.
- Sense Average: 0 (LOW), 1 (MID), 2 (HIGH), LOW, MID, HIGH.
- Jump to: 1~20000.
- Jump Cnt: 1~10000.

Test Script(3)

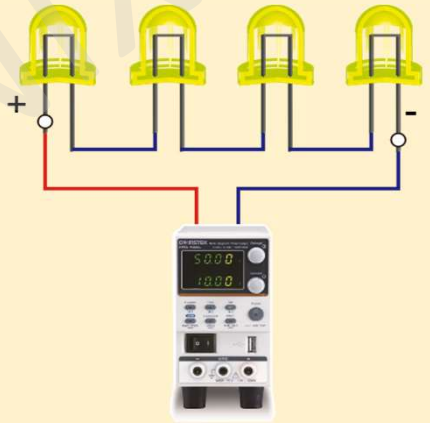
PFR PSW PSU

Pattern 4: Lifetime test



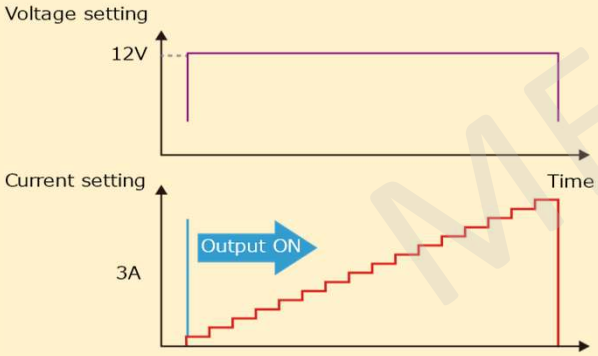
Stay with output-on for18 hours, then output-off for 6 hours, following the same sequence for 100 days.

	A	B	C	D	E	F
1	memo	Burst test				
2	DisplayItems	VI				
3	CycleItems	Number	Start Step	End Step		
4	Cycle	100	2	3		
5	Step	Point	Output	Time(sec	Voltage (V)	Current (A)
6	1	Start	On	0.5	24	1
7	2		On	64800	25	1
8	3		Off	21600	26	1
9	4	end	Off	0.5	0	0



This example execute Output On and Off.
Another way is to set the current and voltage to zero.
CC priority

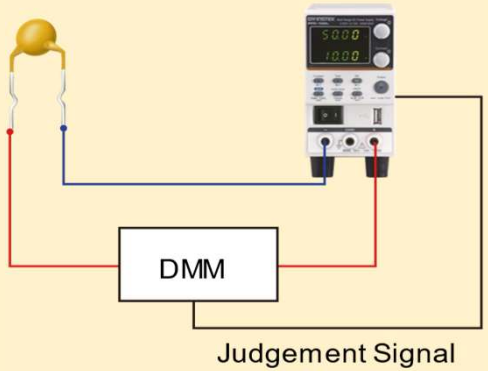
Pattern 5: PPTC device (resettable fuse) test



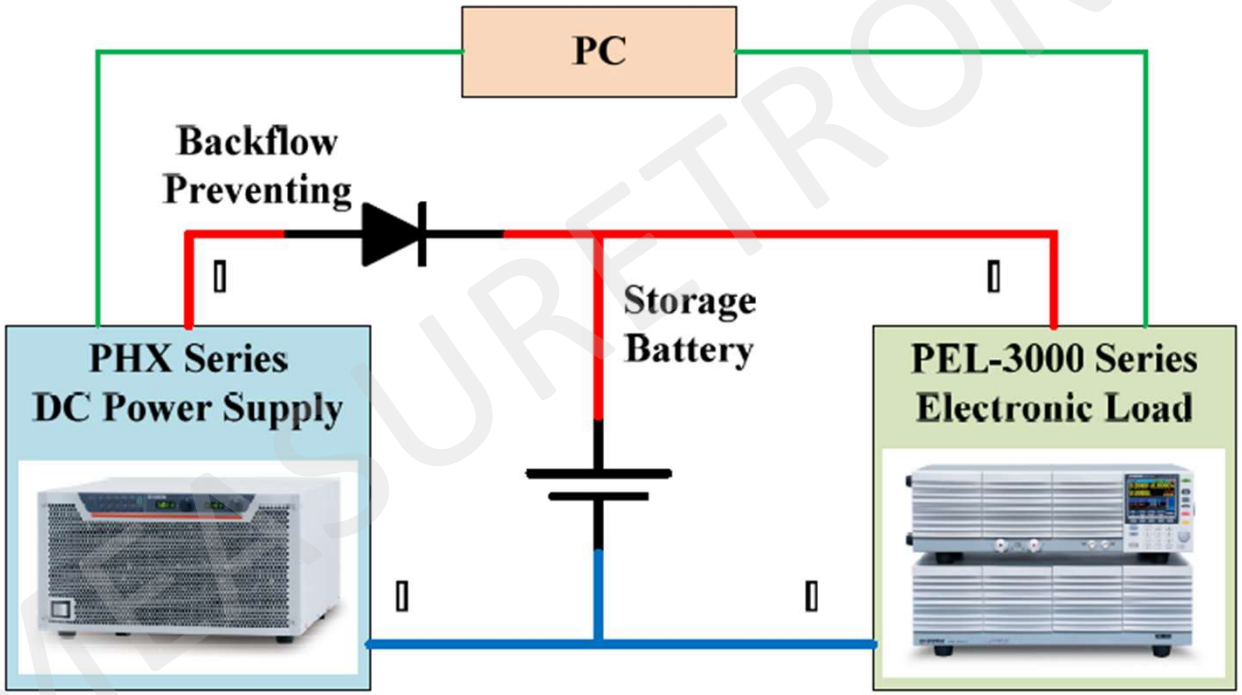
Make a staircase output.

A test example of self-resetting **PTC** verifies its open circuit characteristic by increasing current from 0 to 3A with 16-step resolutions.

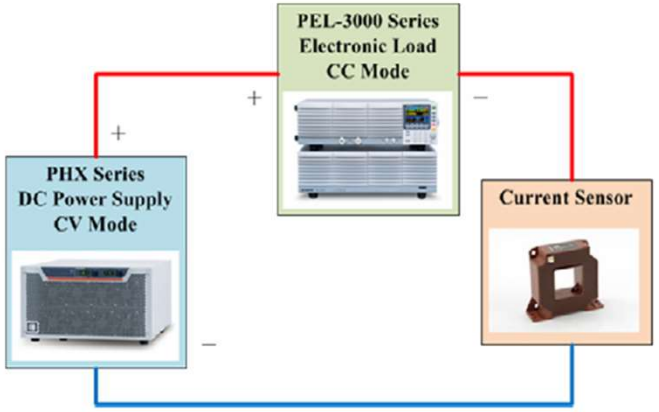
Test Script can easily execute a series of different currents under a constant voltage setting to test the blown and reset characteristic of a self-resetting PTC.



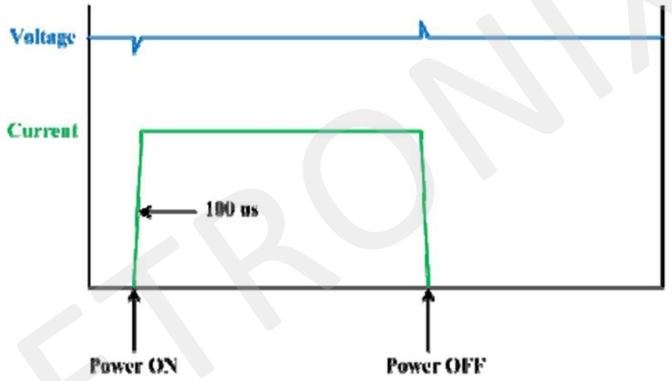
- **Battery Charge / Discharge Test**



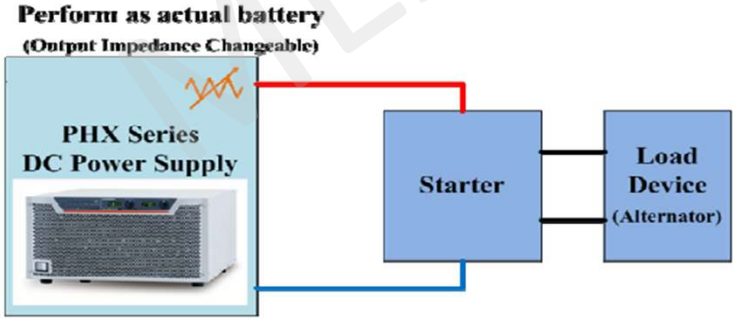
- **High speed pulse power supply for current sensors**



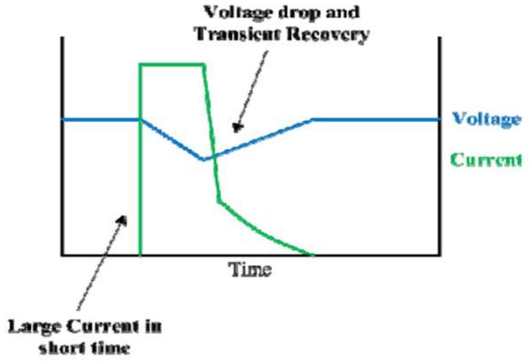
Recommended Model : PHX 30-400



- **Starter Motor Test**

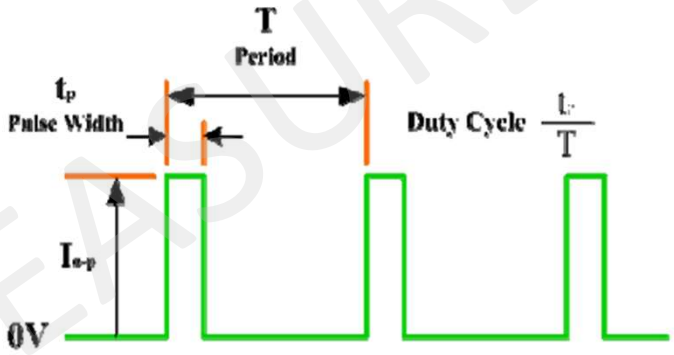


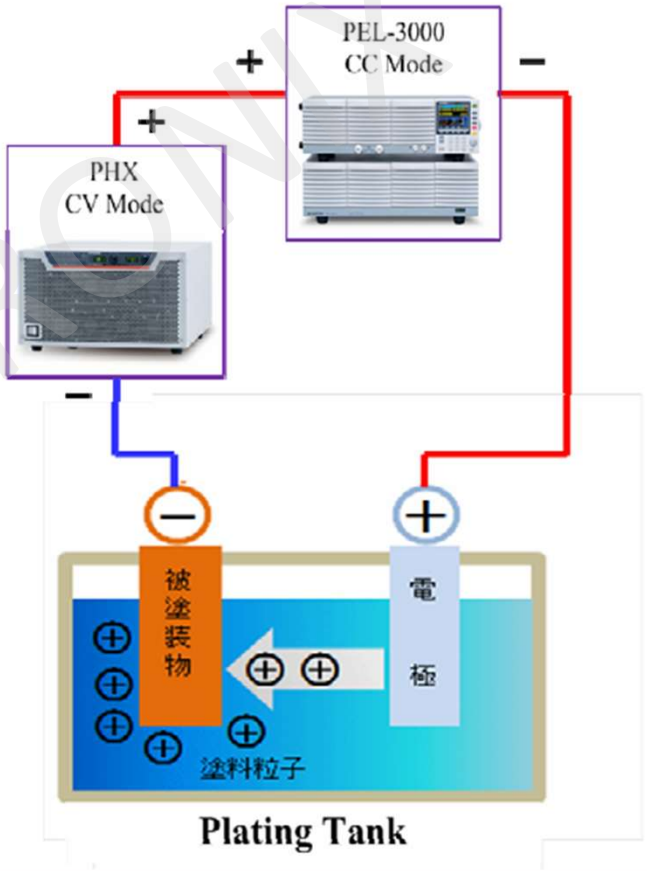
Recommended Model : PHX 30-400



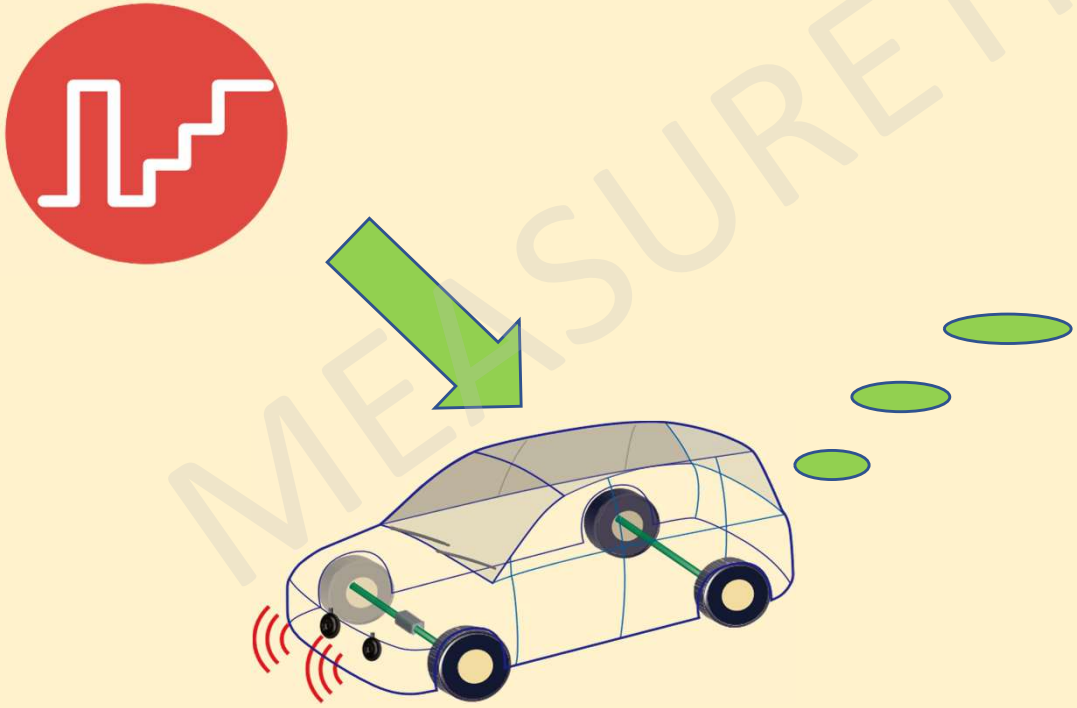
- **Pulse Power Supply for Coating and Plating**

Recommended Model : PHX 30-400

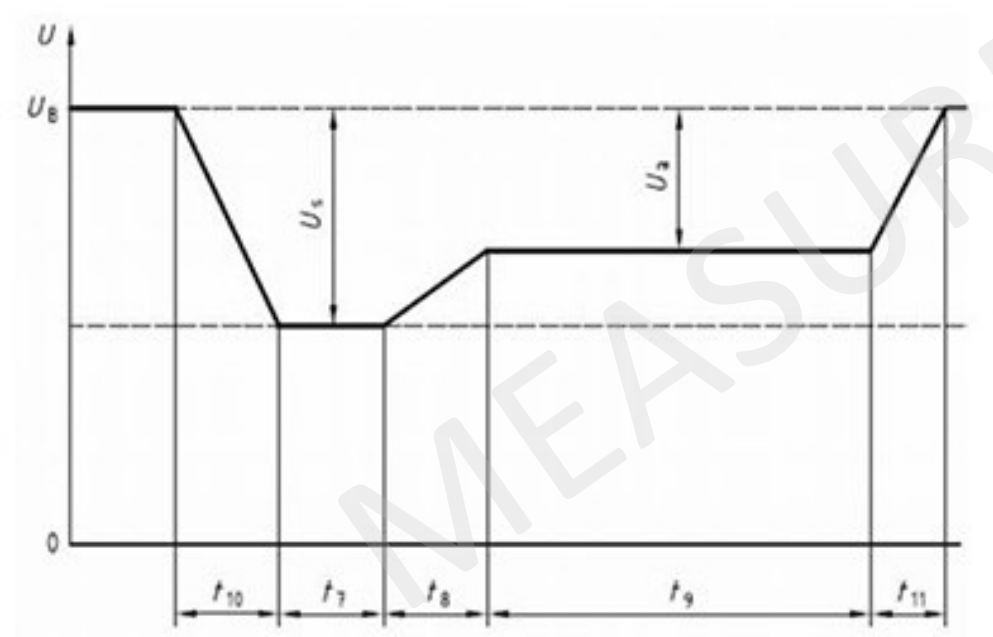




ตัวอย่างการสร้างรูปแบบไฟฟ้า เพื่อการทดสอบระบบอุปกรณ์ในรถยนต์



1. ไฟตกชั่วขณะตาม DIN 40839 เป็นการจำลองว่าในขณะที่อุปกรณ์ที่ถูกทดสอบกำลังใช้งานอยู่ในรถ แล้วมีเหตุการณ์สตาร์ทเครื่องยนต์เกิดขึ้นอุปกรณ์นั้นสามารถทนทานต่อไฟฟ้าตกชั่วขณะโดยไม่ทำงานผิดพลาด โดยมีโปรไฟล์ของแรงดันจ่ายออกและเวลาตามรูป



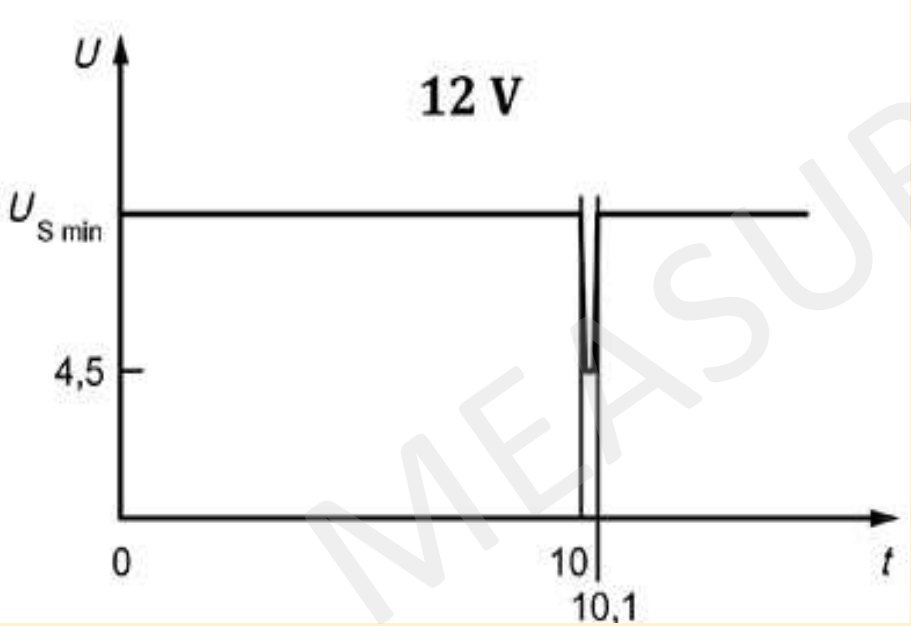
Parameter	12 V system	24 V system
U_s	-6 V to -7 V	-6 V to -7 V
U_a	-2.5 V to - 6 V with $\|U_a\| \le \|U_s\|$	-5 V to - 12 V with $\|U_a\| \le \|U_s\|$
R_i	0 Ω to 0.02 Ω	
t_7	15 ms to 40 ms [a]	50 ms to 100 ms [a]
t_8	≤ 50 ms	
t_9	0.5 s to 20 s [a]	
t_{10}	5 ms	10 ms
t_{11}	5 ms to 100 ms [b]	10 ms to 100 ms [c]

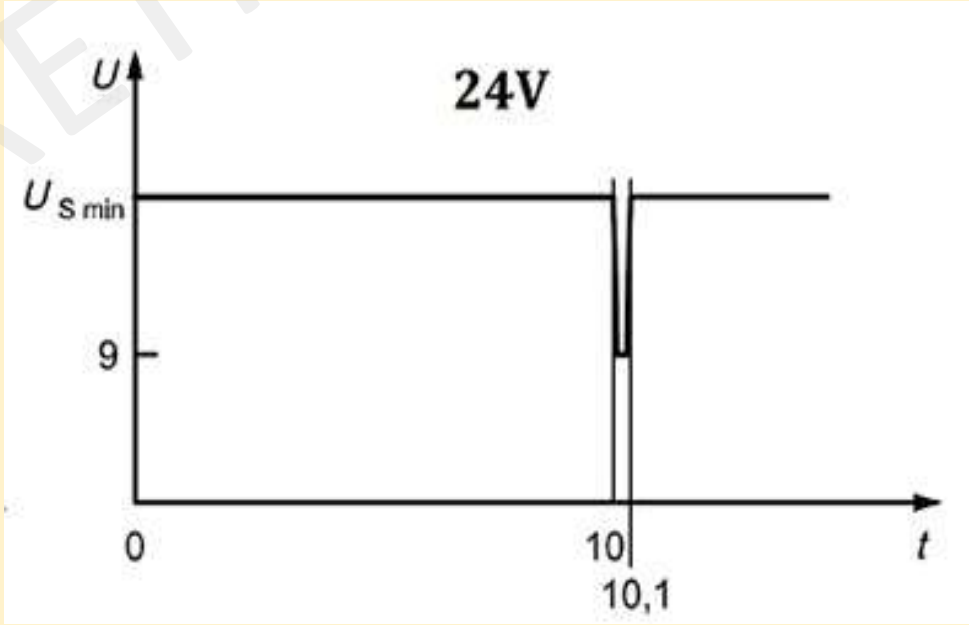
[a] The value used should be agreed between the vehicle manufacturer and the equipment supplier to suit the proposed application

[b] t_{11} = 5 ms is typical of the case when engine starts at the end of the cranking period while t_{11} = 100 ms is typical of the case when the engine does not start.

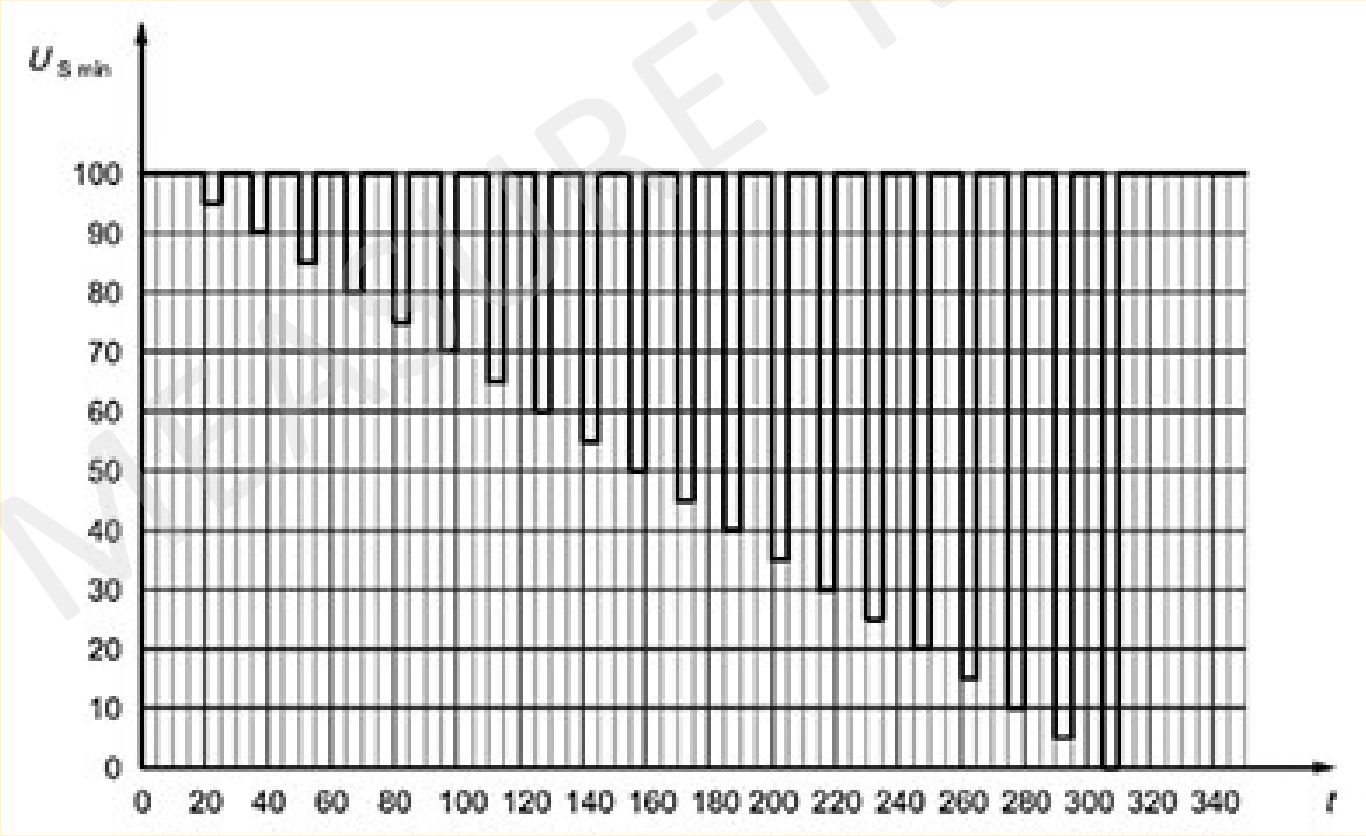
[c] t_{11} = 10 ms is typical of the case when engine starts at the end of the cranking period while t_{11} = 100 ms is typical of the case when the engine does not start.

2. **ไฟตกชั่วขณะตาม ISO 17650-2** เป็นการจำลองไฟตกในเวลาสั้นๆ เพียง 0.1 วินาที โดยมีโปรไฟล์ในกรณีระบบไฟ 12VDC และ 24VDC ตามรูป จุดประสงค์เพื่อดูความทนต่อไฟตกสั้นๆ ว่าอุปกรณ์สามารถทำงานได้ปกติหรือไม่

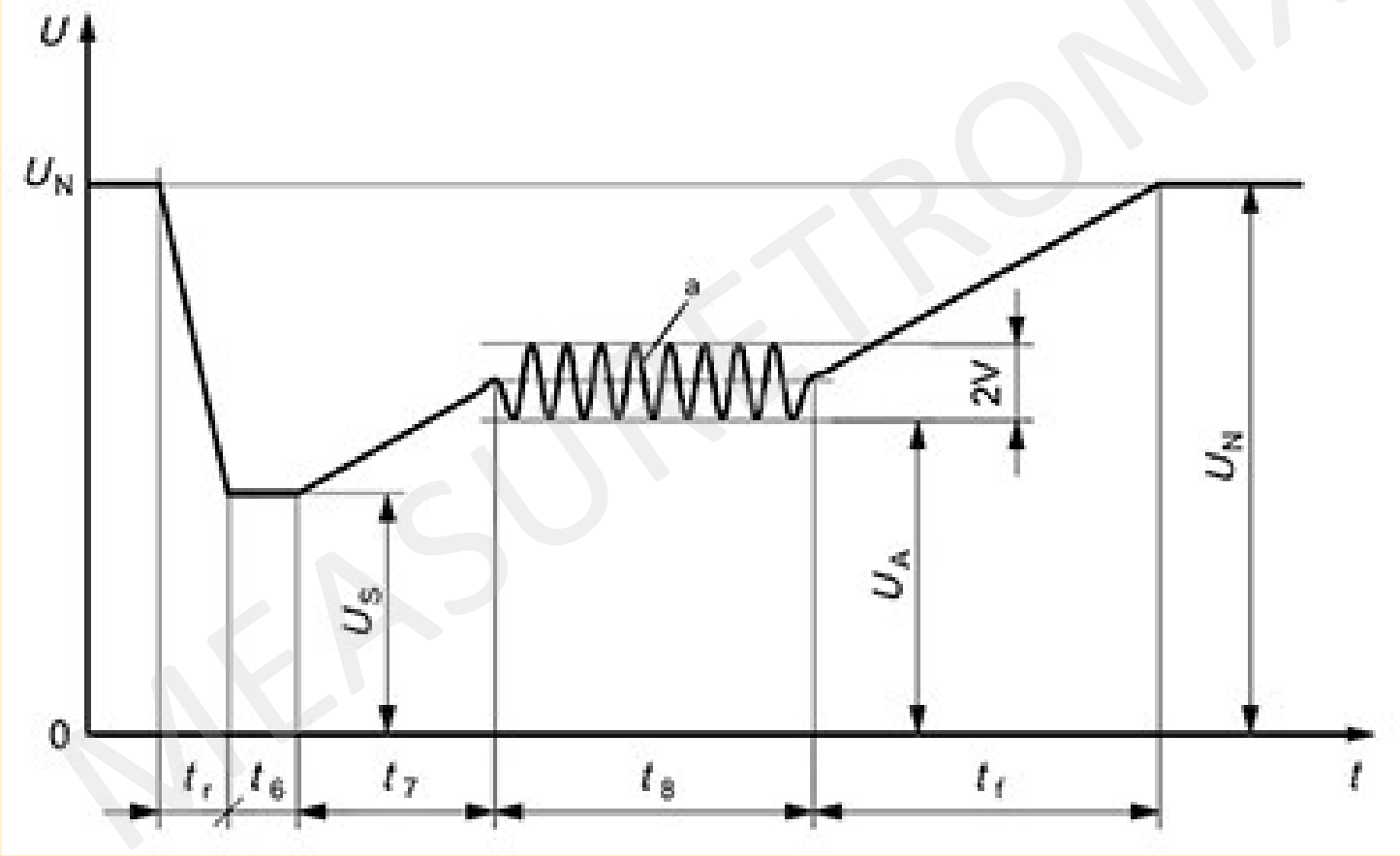




3. การหาแรงดันสุดท้ายที่อุปกรณ์ยังทำงานได้ ก่อนจะเกิดการ reset ตัวเอง ตาม ISO 17650-2 คือการจ่ายแรงดันปกติ 20 วินาที จากนั้นลดแรงดันให้ต่ำกว่าแรงดันปกติทีละ 5% นาน 5 วินาที แล้วกลับสู่แรงดันปกติอีก 10 วินาที วนไปเรื่อยๆ (คาบละ 15 วินาที) จนกว่าแรงดันตกถึง 0 ในวินาทีที่ 305 เป็นอันจบรอบการทำงาน ผู้ทดสอบจะบันทึกค่าแรงดันที่อุปกรณ์เริ่มทำงานผิดปกติหรือไม่ทำงาน ว่าได้ตามสเปกหรือไม่



4. **ไฟตกชั่วขณะตาม ISO17650-2** เป็นการจำลองเหมือนข้อ (1) โดยมีโปรไฟล์ของแรงดันจ่ายออกและเวลาตามรูป



DC Power supply and DC Electronic Load Function

GW INSTEK
Simply Reliable

รุ่น GPP Series Multi-Channel Programmable DC Power Supply with DC Electronic Load

Load Mode	
CV Mode	
CH1/CH2	1.500V - 33.00V
CC Mode	
CH1/CH2	0 - 3.200A / 0 - 6.200A(GPP-1326)
CR Mode	
CH1/CH2	1Ω - 1kΩ

Display
Voltage: 1-33.00V
Current: 0-3.200A (GPP-1326: 0-6.200A)
Power: 0-50.00 (GPP-1326:0-100.00W)

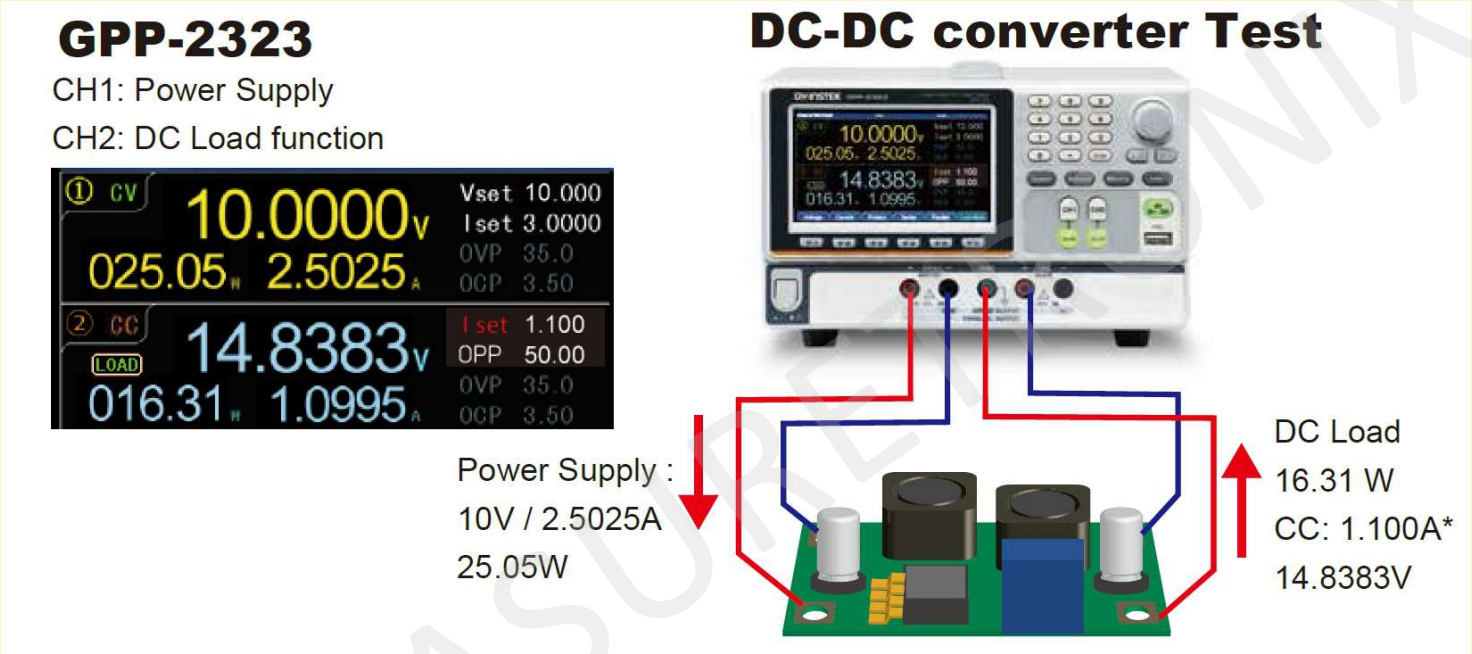
Model	GPP-4323				GPP-3323			GPP-2323		GPP-1326
Channel	CH1	CH2	CH3	CH4	CH1	CH2	CH3	CH1	CH2	CH1
Voltage	0~32V	0~32V	0~5V	0~15V	0~32V	0~32V	1.8/2.5/3.3/5.0V	0~32V	0~32V	0~32V
Current	0~3A	0~3A	0~1A	0~1A	0~3A	0~3A	5A max.	0~3A	0~3A	0~6A
Series	0~64V / 0~3A		----		0~64V / 0~3A		----	0~64V / 0~3A		----
Parallel	0~32V / 0~6A				0~32V / 0~6A			0~32V / 0~6A		

MEASURETRONIX LTD.

ตัวอย่าง 1 GPP-2323 ทำการทดสอบ DC-DC CONVERTER

CH1 : ทำงานในโหมดแหล่งจ่ายไฟ

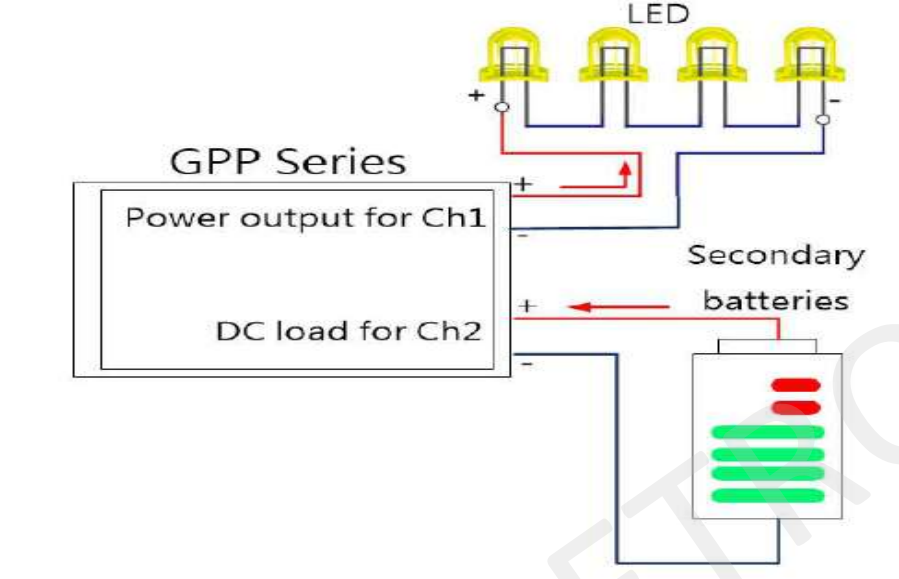
CH2 : ทำงานในโหมดอิเล็กทรอนิกส์



จะเห็นว่า GPP-Series สามารถทำงานโดยป้อนไฟดีซีซัพพลาย CH1 ให้กับวงจร DC-DC CONVERTER และภาคเอ้าท์พุทต่อไปยัง CH2 เพื่อทำหน้าที่เป็นโหลดดึงกระแสไฟ DC ในโหมด CC เราสามารถป้อนค่ากระแสตามต้องการ เพื่อดูประสิทธิภาพของชิ้นงานอิเล็กทรอนิกส์

นอกจากนั้น GPP-Series ยังเป็น DC Power Supply แบบ Linear ซึ่งมีข้อดีในการจ่ายไฟที่มีค่า Noise และ Ripple ต่ำมาก : < 350μVrms / ≤ 2mArms และ Transient Response Time ≤ 50μs

ตัวอย่างที่ 2 การทดสอบ LED และการทดสอบคายประจุแบตเตอรี่



- เราสามารถป้อนแหล่งจ่ายหรือทดสอบอุปกรณ์ LED และ ภาคโหลดอิเล็กทรอนิกส์ สามารถนำไปทดสอบการดึงกระแสไฟของแหล่งจ่ายไฟหรือ Charger และแม้กระทั่งการทดสอบการคายประจุแบตเตอรี่ เพื่อวิเคราะห์อายุการใช้งานได้

ASTERION DC ASM SERIES

3 CHANNELS – 1,700 W/CHANNEL – 1U HIGH

High End Programmable DC Power Source

ASTERION DC ASM SERIES

Channel Options

8 Full Power Output Options

Option No.	Voltage (V)	Current (A)	Power (W)
040	40	42	1680
060	60	28	1680
080	80	22	1700
100	100	17	1700
150	150	12	1700
200	200	9	1700
300	300	6	1700
400	400	4.3	1700
000	0	Blank (Channel 3 only)	

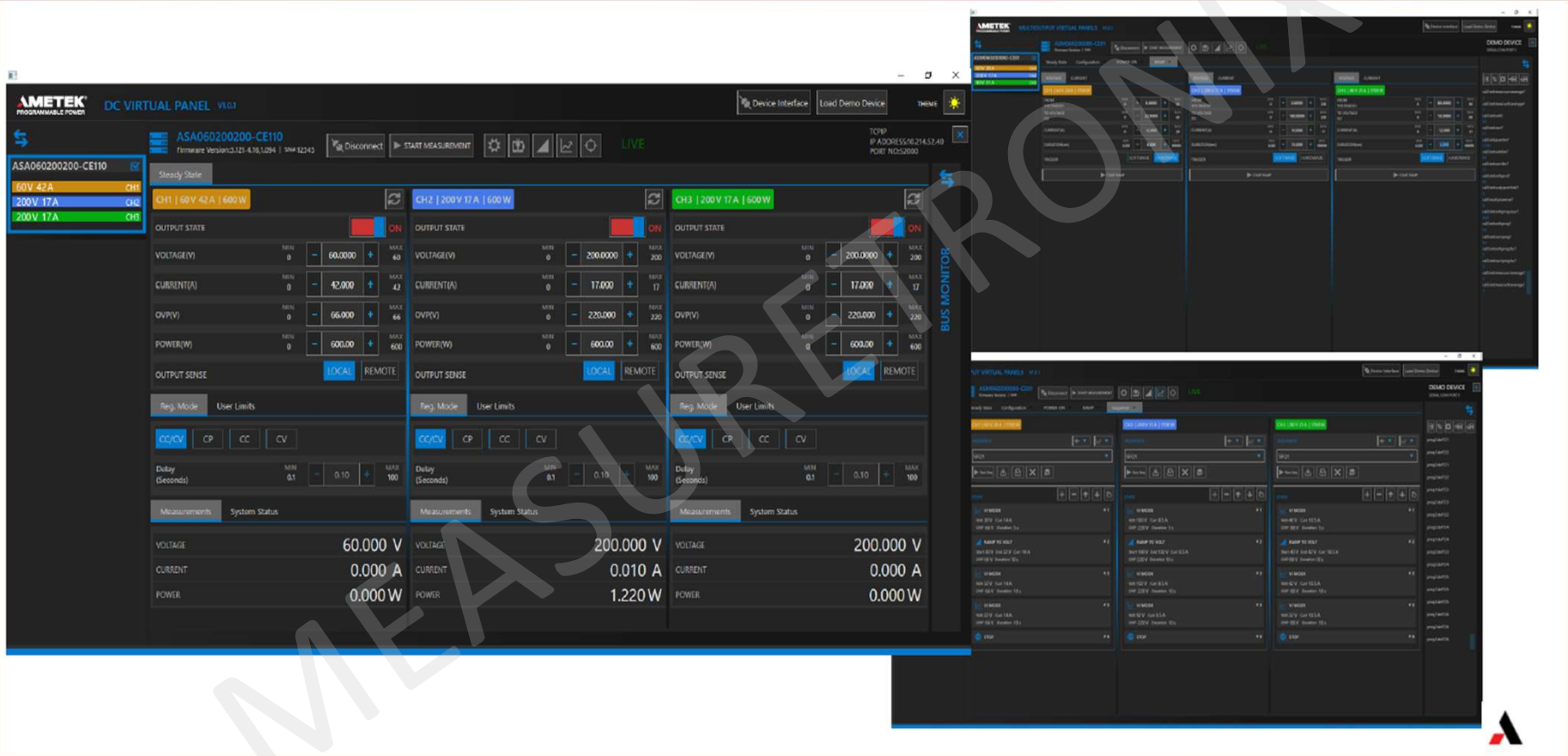
1U
1.75 inch
44.45 mm

Select any 3 Channel Options to Create your Custom 2 or 3 Channel Solution

Asterion DC ASM Series outputs are configured at the factory and are not field replaceable.

ASTERION DC ASM SERIES

Multi-channel
Virtual Panels™ GUI



ASTERION DC ASM SERIES

Multi-channel programmable sequencing, ramps and delays

Sequencing [1]

- Store 50 sequences of 20 individual steps
- Sequences may be tied together
- Extensive list of step functions, ramping, looping, Go-To and subroutine calls

Voltage/Current Ramps

- Programmable dwell 1mS min. to 9999 S max.

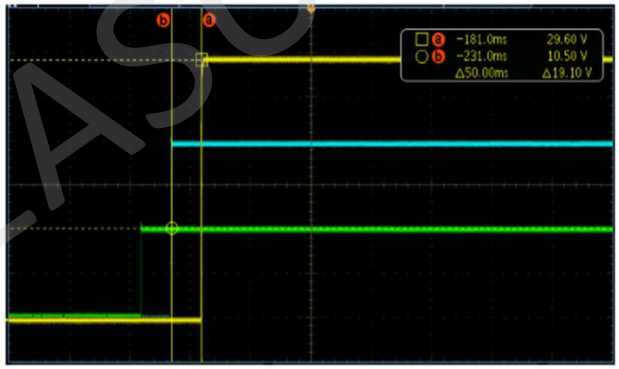
On/Off Delays

- Programmable 0.1 S min. to 100 S max.

[1] Sequencing is only available through remote interfaces, not available on the front panel.

Sequencing

Ramps



Turn-On Delays

Turn-Off Delays

ASTERION DC ASM SERIES

Specifications

DC Output Specifications – 1700W Fixed-Range Channel Options									
MODEL		**ASM40-42**	**ASM60-28**	**ASM80-22**	**ASM100-17**	**ASM150-12**	**ASM200-9**	**ASM300-6**	**ASM400-4.3**
Rated Output Voltage	V	40	60	80	100	150	200	300	400
Rated Output Current	A	42	28	22	17	12	9	6	4.3
Rated Output Power	W	1680	1680	1700	1700	1700	1700	1700	1700
Line Regulation	V	+/- 0.01% of rated voltage							
	A	+/- 0.05% of rated current							
Load Regulation	V	+/- 0.02% of rated voltage							
	A	+/- 0.15% of rated current							
Ripple RMS [1] (20Hz-300kHz) c.v	mV	12	12	15	15	20	40	60	80
Output noise p-p [2] (20Hz-20MHz) c.v	mV	75	75	90	90	120	150	200	300
Remote sense compensation	V	2	3	5	5	5	5	5	5
Temperature drift	PPM/°C	± 100							
Stability		± 0.05% of output rating							

[1] RMS ripple/noise, over 20 Hz to 300 kHz bandwidth, is measured directly across the output terminals with the supply operating into 90% of rated resistive load in all channels and nominal AC input line voltage.

[2] PK-PK ripple/noise, over 20 Hz to 20 MHz bandwidth with the supply operating into 90% of rated resistive load in all channels and nominal AC input line voltage.