

# Application of the *Reegen* Micro Plug



Just plug it in !



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Micro Plug manages  
motor power

### Save Electricity ! Save Money ! Extends Lifespan of Appliances ! through Motor Power Management

Electricity saving tells not only reducing your electricity bill every month but an essential requirement to reduce CO2 emission and to conserve natural resources.

Electric motors consume about 60% of electricity in industrial fields but their operating efficiency is generally very low, even below 50%, which means considerable portion of electricity is wasted without being used for actual motor operation. Thus, the improvement of electric motors' efficiency is one of the major energy saving means.

**Micro Plug** is the technically proven device which remarkably reduces the electricity consumption of AC induction motor driven households, commercial and industrial appliances, such as refrigerators, air conditioners, washers, freezers, vending machines, pumps, mixers, crushers, escalators, elevators, industrial motors and so on.

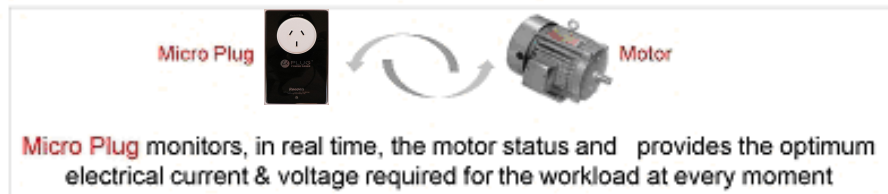
**Micro Plug** intelligently manages the power consumption of an electric motor and optimizes the operating efficiency by eliminating the waste factors of electricity. Its soft-start function protects over-current at starting and sudden increase of voltage. Our test results show at least 15% electricity saving even for newly released high-efficiency-energy-consumption households (Energy Star).

**Micro Plug** will be a new standard for energy management of AC Induction motors because it is available that utilizes the unique properties of electric motors to control and to monitor the true power consumptions by current flow, voltage and phase.

## II. Functions & Applications(1)

### Motor Efficiency & Power saving

- ❖ High efficiency motor means that the most ratio of its consuming power is used for motor operation. Normally, an AC induction motor is considered in good operation with high efficiency when its workload is between 70 to 90% ratio. However, motors operate actually at lower loads, some even at 10 ~20% of full load. It tells the power is excessively consumed and wasted, resulting in very low efficiency. We can **increase the motor efficiency and save electricity by matching the power to the workload with Micro Plug.**



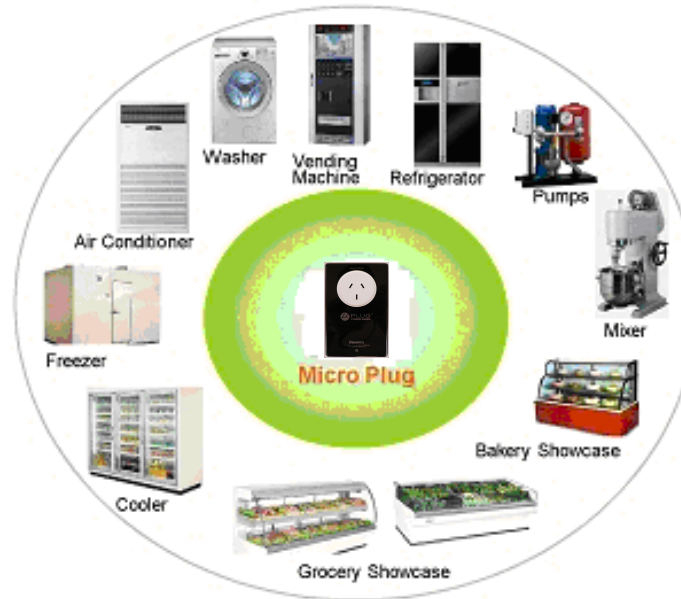
### Key Functions

- ❖ **Software controlled motor management with High Performance Micro Processor**
  - Intelligent Software controlled functions
  - Real-time monitoring and managing for optimum power efficiency
- ❖ **Soft-Start**
  - Reduces the high surge of current at start-up
  - Reduces vibration/noise and mechanical wear
- ❖ **Surge/Sag Protection**
  - Protects sudden increase/drop of voltage
- ❖ **Auto Reset**
  - Auto Reset protection against power overloads and dropout
- ❖ **Plug & Play**
  - Installation technique is not needed. Just plug it in! It operates immediately.
  - Direct wire connection is available by customers' request

## II. Functions & Applications(2)

### Application of Micro Plug

**Micro Plug** is widely applicable to all the AC induction motor driven appliances, most of electrical equipments operated at our life in houses, commercial places, offices and factories. Customers can choose a suitable model of **Micro Plug** matching to the rated current of the appliance.



- **Commercial Places :**
  - Convenience Stores
  - Super Markets
  - Bakeries
  - Restaurants,
- **Telecom Service Companies :**
  - Service Stations
  - Remote Sites
  - IDC
  - for cooling & ventilation
- **Residences and Offices ;**
  - Swimming Pool Pumps
  - Appliances for cooling and refrigeration

Patent Pending  
Technology

“MPMT”

applied to  
Micro Plug

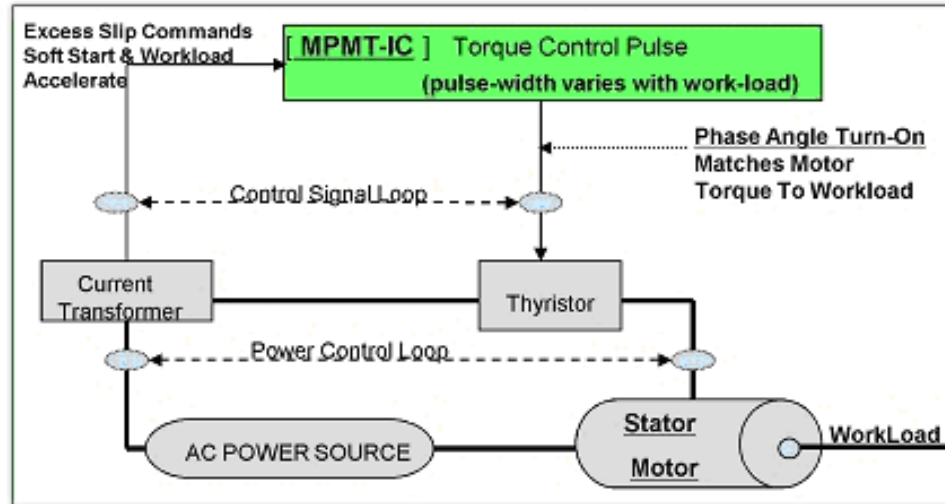
#### about **MPMT**(Motor Power Management Technology)

**MPMT** does not use “Artificial” references such as a preferred “phase lag” or other “error” comparisons.

Instead, **MPMT** develops control signal from “natural” Rotor-Slip changes in stator current caused by well-known properties common to all induction motors and uses them in a novel way that enables a motor to self-limit torque to work-of-a-moment requirements.

Motor, workload and power source are arranged in a control loop wherein the stator current resistive component commands optimum motor efficiency and power factor down to zero load plus protects the motor from over-current with power line or mechanical faults.

Thus the motor itself controls stator power during soft start, as needed for sudden-load increases or routine work-of-a-moment and turn off power line current in the event of “excess” rotor slip.



## IV. Product Range



PS2B

### PS2B : 7 Amps    MPC 15A : 15 Amps

- Easy Plug-In for Plug & Play (Adaptable for plug types)
- Compact size(NEMA 5-15)
- Application
  - Household : Refrigerator, Freezer, Wall Mount Air-Conditioner
  - Residence : Window type Air-Conditioner / up to 6,000 BTU
  - Mini-Market : Small glass door refrigerator

### MPC 15A



- Easy Plug-In for Plug & Play (Adaptable for plug types)
- Application : Refrigerator, Freezer, Mid-size Air-Conditioner, Etc,
  - Restaurant : Cooler, Merchandiser, Prep-Table
  - Air-Conditioner up to 15,000 BTU
  - Warehouse & Manufacture : Conveyor motor, Fan motor
  - Coin Laundromat : Gas Dryer

### MPC 20A/30A/40A/50A



- Both for Indoor and Outdoor use
- Wire connection Installation
- Application
  - House : Roof mount Air-Conditioner up to 5 Ton, swimming pool pump
  - Market : Milk cooler, Deli case, Beer dispenser
  - Office : Air-Conditioner
  - Farm : Down-hole-pump

## V. Benefits

### Benefits



Just plug it in !

- **Reduces the electricity consumption and monthly bill**
  - Households and commercial equipments : save up to 30% of electricity
  - Industrial Motor : save up to 60% of electricity
- **Reduces the downtime of appliances**
- **Reduces the mechanical defects and increases mechanical durability**
- **Reduces the repair cost of appliances**
- **Extends the life-span of appliances**
- **Increase the productivity in factories**
- **Reduces CO2 Emission**
- **Contributes to the preservation of natural resources**

### Proven Advantages of Micro Plug

- **Proven energy saving device**
  - Up to 28% power savings reported by 3 independent test labs
  - 16% on 2006 Energy Star rated refrigerator, but 28% on 2004 model
  - Expects even more energy savings with older models
  - 22% on 4 ton BTU air conditioner
- **Cost effective device** : Uses only a few solid state components and firmware
- **Fast ROI** : Low cost enables fast ROI (6 to 12 months)
- **Easy installation** : Simply plugs into wall outlet and a cord is inserted in the unit
- **Small size** : enough to fit behind refrigerators or any appliances

## VI. Test & References(1)



### Test Data in Korea

Test Data by KETI(Korea Electronics Technology Institute) On March 31 ~ April 02, 2008

- Model : Micro Plug PS2B - Applied Product : Single Phase AC Induction Motor

Load	250 W	300 W	400 W	500 W
Clamp input voltage	0 V	3.2 V	6.6 V	9.2 V
Power consumption (without power saver)	250 W	300 W	400 W	500 W
Power consumption (with power saver)	139 W	196 W	327 W	458 W
Power reduction	44.4 %	34.7 %	18.3 %	8.4 %

### Test Data in USA for UL Approval

		Test 1	Test 2	Test 3
1	Test Equipment	Roof Mount Air Conditioner and Heater	Refrigerator <ul style="list-style-type: none"> <li>▪ Logo: Profile Arctica(GE)</li> <li>▪ Model : PSC25STA</li> <li>▪ Made in July 2007</li> <li>▪ "Energy Star" product</li> </ul>	Refrigerator <ul style="list-style-type: none"> <li>▪ Logo: LG</li> <li>▪ Model : LRSC26910SW</li> <li>▪ Made in 2007</li> <li>▪ "Energy Star" product</li> </ul>
2	Manufacturer	COLMAN(USA)	GE(USA)	LG(USA)
3	Power Source	AC240V/60Hz	AC120V/60Hz	AC120V/60Hz
4	Equipment Capacity	4,000BTU	710 Liter	730 Liter
5	Applied Model	MPC-30A	PS-1B	PS-1B
6	Test Period	2007.8. 29~8. 30.	2007. 8. 18.~8. 22.	2007. 10.9. ~ 10.12.
7	Watt w/o. Micro Plug	5,009.4 Watts	94 Watts per hour	88 watt per hour
8	Watt with Micro Plug	3,888 Watts	79 watts per hour	72 watts per hour
9	Saved Watt(%)	1,121 Watts(22.3%)	15 Watt per hour(16%)	16 Watts per hour(18.1%)

# VI. Test & References(2)



1. Installed Place  
Fried Chicken Restaurant "Rich Rich"
2. Installed Equipment : 6 refrigerators
3. Model applied : Micro Plug PS-2B
4. Reference Period : March 2009 ~ May 2009

5. Results(see the bill ->)
- 1) **Watts saving rate : 24.9%(830KWh)**  
before installation(March) : 3,335KW/h  
After installation(May) : 2,505KW/h
  - 2) **Charge saving rate : 19%(60,330 won)**  
before installation(March) : 324,270 won  
After installation(May) : 263,940 won

- Remarks ;  
In Summer season, more savings will be achieved by applying to air conditioners

**집합용 고객납계**

[ 경기도 수원시 팔달구 인계동 365 리치리치리치리 ]  
 ○ 여기서서는 전기요금 환불을 이유로 고객님의 회계카드 및 주민등록번호를 요구하지 않으며, 해당요금의 개인제외 입금 필요 요점이 없으니 전화납부시기 (보이스피싱) 피해를 입지 않도록 주의하시기 바랍니다.

청구내역		고객사항	
기본요금(월)	77,400	계정종별	일반용 (갑) 차입
신기요금(월)	205,600	입금기간	26
전기요금(계)	283,000	계정가용수	PS340218071
부가가치세	28,300	계정가용수	1
관리기금	10,470	계정잔액	15
당월요금계	321,770	TV	대수 1
TV수납료	2,500		

년 월 일 미납내역

미납월	금액
	미납금액없음

청구요금 **324,270** 원

**2009년 03월분 전기요금 청구 및 영수증 (내역)**

고객번호 : 02 1439 0265

청구금액 : 324,270원 납기일 2009년 04월 20일까지

사용기간 : 2009년 02월 26일 ~ 2009년 03월 25일까지

고객번호 : 우리005-059301-18-919신원 313-90105-939910  
 국민232790-12-042928 하나471-911676-35337

계량기 지원비고 : \* 지정계로 납부하실 경우에는 청구금액과 동일하게 입금하셔야 합니다.  
 \* 신청계로 납부하시려면 고객센터(02)230-1000에 연락하여 타계로 수수료 부담할 수 있습니다.

계량기 지원비고 : 당월지침 40893 전월지침 37558

세금계산서 : 공급자등록번호 124-82-30581  
 공급인증번호 \*\*\*\*\*  
 공급금액 283,000  
 세액 28,300  
 작성일자 2009.04.09

사용량비고 : 당월 5555 kWh 전월 4300 kWh 전년동월 837 kWh 고객센터 : (국번없이)123

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**집합용 고객납계**

[ 경기도 수원시 팔달구 인계동 365 리치리치리치리 ]  
 ○ 여기서서는 전기요금 환불을 이유로 고객님의 회계카드 및 주민등록번호를 요구하지 않으며, 해당요금의 개인제외 입금 필요 요점이 없으니 전화납부시기 (보이스피싱) 피해를 입지 않도록 주의하시기 바랍니다.

청구내역		고객사항	
기본요금(월)	77,400	계정종별	일반용 (갑) 차입
신기요금(월)	152,654	입금기간	26
전기요금(계)	229,954	계정가용수	PS340218071
부가가치세	22,995	계정가용수	1
관리기금	8,500	계정잔액	15
당월요금계	261,440	TV	대수 1
TV수납료	2,500		

년 월 일 미납내역

미납월	금액
	미납금액없음

청구요금 **263,940** 원

**2009년 05월분 전기요금 청구 및 영수증 (내역)**

고객번호 : 02 1439 0265

청구금액 : 263,940원 납기일 2009년 06월 20일까지

사용기간 : 2009년 04월 26일 ~ 2009년 05월 25일까지

고객번호 : 우리005-059301-18-919신원 313-90105-939910  
 국민232790-12-042928 농협108623-64-034348  
 하나471-911676-35337

계량기 지원비고 : \* 지정계로 납부하시려면 고객센터(02)230-1000에 연락하여 타계로 수수료 부담할 수 있습니다.  
 \* 신청계로 납부하시려면 고객센터(02)230-1000에 연락하여 타계로 수수료 부담할 수 있습니다.

계량기 지원비고 : 당월지침 44456 전월지침 43951

세금계산서 : 공급자등록번호 124-82-30581  
 공급인증번호 \*\*\*\*\*  
 공급금액 229,954  
 세액 22,995  
 작성일자 2009.06.09

사용량비고 : 당월 2505 kWh 전월 3058 kWh 전년동월 2330 kWh 고객센터 : (국번없이)123