

# HYDRO ELECTRIC POWER



## DIGITAL LOAD CONTROLLER (DLC)

### Application for Synchronous Generator

By using the Digital Load Control to replace the hydraulic governor of Microhydro Power can overcome the burden of change is very large with a very quick response and the price is cheaper than governor. DLC application is suitable for isolated and grid connected. DLC with digital system has the capability for various types of turbine (Prepeller, Francis, Cross-Flow, Turgo, Pelton). The DLC has been installed more than 250 unit upto now.



#### Digital Load Controller Specification:

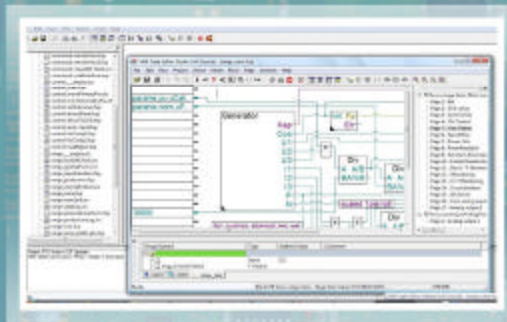
- Fully automatic
- Low distorsion
- Controlling : Frequencys, Synchronizing
- Phase : 3 Phase / 1 Phase
- Voltage : 230 / 400 V / 277 / 480 V
- Nominal Frequency : 50 Hertz / 60 Hertz
- Frequency deviation : 1 s/d 3 Hertz
- Maks time contant : 0.45 second
- Jumlah ballast : 2 step (6 unit)
- Frequencys Droop : 5 %
- Capacity : 1 kW – 500 kW
- Signal analog input [0 .. 10Vdc] - for setting the frequency time synchronization with the grid. + - 1Hz from the nominal frequency. (for auto synchronizer)
- Digital input, shift 2 Hz of reference input (On grid system ).
- Digital input, enable DROOP.



## DIGITAL FLOW CONTROLLER (DFC)



Digital Flow Controller (DFC) is a new generation controller for Mini-hydro Power. DFC works as a controller, synchronizer, protection and monitoring for the power plant. DFC is a system with automation high-level and provide a secure operating system. DFC has a data logger that can be directly connected to the web. With the digital system which has the control capability for various types of turbine (Propeller, Francis, Cross-Flow, Turgo, Pelton). the DFC has been installed more than 10 unit.



### Feature of Digital Flow Control

- Fully Automatic Start/Stop. Automatic startup for on-grid system
- Controlling : Speed Control, Frequency, Power and Water Level.
- Automatic Synchronizing, including Generator and Grid protection
- Generator Control : Voltage Control, Cosphi Control, Reactive Power
- Alarms list, monitoring and protection.
- Metering : Power meter, temperature, water level, etc
- Range capacity: 100Kw – 10MW.
- Alarms Sort Message Send.
- Data Logger
- SCADA
- Application : Isolated and interconnected



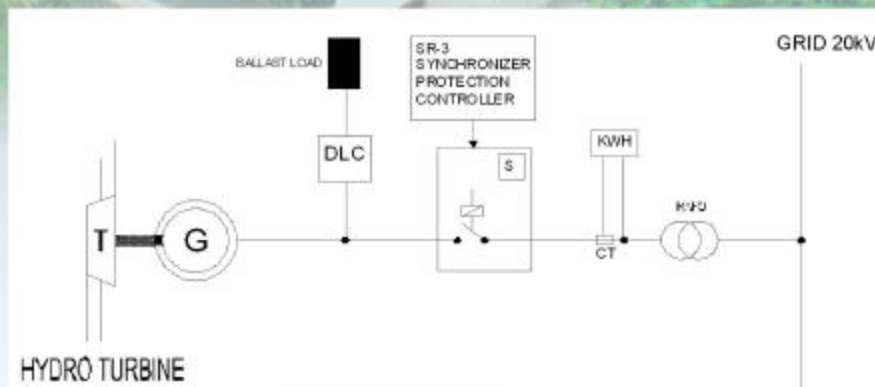
## SYNCHRONIZER SR3



SR-3 is the Interconnection controller, protection and monitoring of mini-hydro power. Where the system of MHP with Load Control (DLC), can be interconnected with the grid, MHP, diesel, other power plan. SR-3 is a combination of Electronics Load Controller (DLC) and SR-3 (synchronizer). SR-3 and is controller protection and digital-based system with a high automation. SR-3 can monitor and control the generator quickly and accurately. Parameters will never change, so no need to re-adjust. SR-3 can be applied for various types of turbine (Prepeller, Francis, Cross-Flow, Turgo, Pelton).

### Spesifikasi Digital Load Controller :

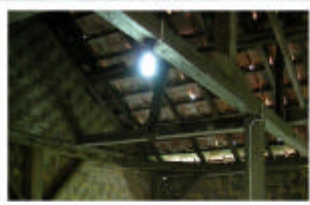
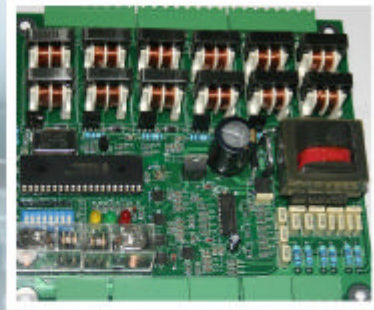
- Fully Automatic Synchronizing
- Controlling : Frequency, Voltage & Synchronizing
- Generator Protection :  
over/under voltage, over/under frequencys, reverse power, over current and short circuit
- Grid/Mains Protection :  
over/under voltage, over/under frequencys, phase shift, rate of change of frequencys.
- Phase : 3 Phase / 1 Phase
- Voltage : 230/400 Volt / 277/480V
- Nominal Frequency : 50 Hertz / 60 Hertz
- Capacity : 1kW – 5MW
- AVR interface for the control voltage and cosphi



## DIGITAL LOAD CONTROLLER

### Application for Asynchronous Generator

Induction Motor As Generator (IMAG) is suitable for the application of micro hydro power because it has a strong construction, maintenance free, runaway speed proof and hold the price relatively cheaper than the synchronous generator. With DLC and Ballast Load system, Voltage and frequency of asynchronous generator will be stable. the DLC for Asynchronous Generator has been installed more than 100 unit.



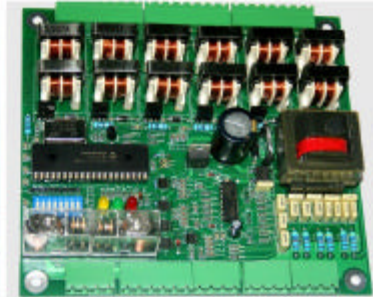
#### Digital Load Controller Specification:

- Fully Automatic
- Low distortion
- Controlling : Voltage, Frequency, Synchronizing
- Phase : 3 Phase / 1 Phase
- Voltage : 230/400 Volt / 277/480V
- Nominal Frequency : 50 Hertz / 60 Hertz
- Frequency deviation : 1 - 3 Hertz
- Max time constant : 0.45 second
- Ballast amount : 2 step (6 unit)
- Frequencys Droop: 5 %
- Capacity : 1kW – 200 kW
- Capacitor life time : 150 hours



**SMART DLC****Application for Synchronous Generator without AVR**

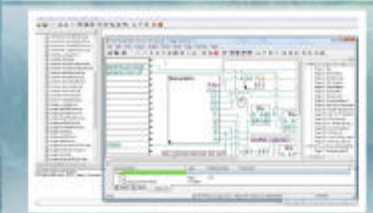
Not all applications of MHP can use generator with AVR due to cost limitations, Digital Load Controller (DLC) can be used to control generator without AVR, so that the generator voltage and frequency stable.

**Digital Load Controller Specification :**

- Fully Automatic
- Low distortion
- Controlling : Voltage, Frequency
- Phase : 3 Phase / 1 Phase
- Voltage : 230/400 Volt / 277/480V
- Nominal Frequency : 50 Hertz / 60 Hertz
- Frequency deviation : 1 -3 Hertz
- Max time constant : 0.45 second
- Ballast amount : 2 step (6 unit)
- Frequencys Droop: 5 %
- Capacity : 1kW – 50 kW



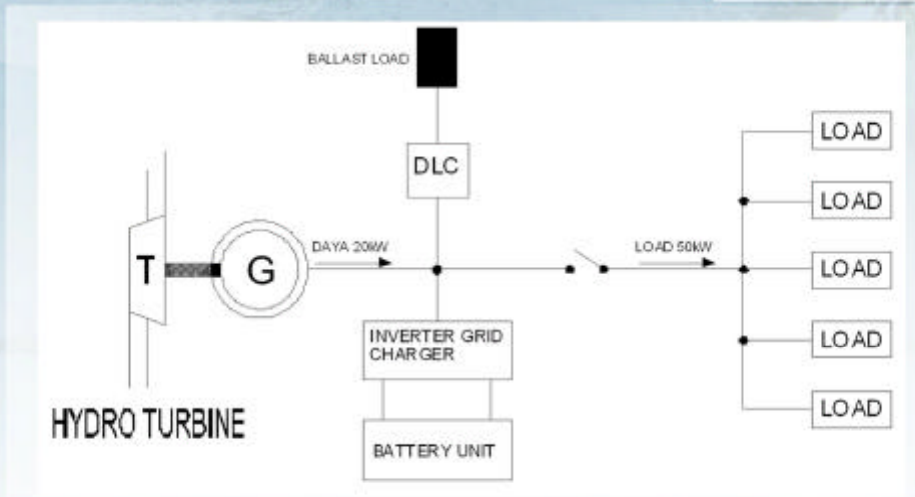
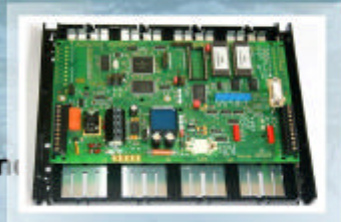
## HYBRID SYSTEM



The increasing needs of electricity and fluctuation load exceeds the capacity is a constraint for the small scale power plan. But with the hybrid system, constraints of the needs of the power and the fluctuation in the peak load can be overcome. Hybrid system consists of charging, battery and inverter grid. Excess power at the time of small load saved on the battery. When the load exceeds the capacity of the inverter will automatically run parallel with MHP. Thus the loads of excess capacity or the peak load can be fulfilled.

### Hybrid System Feature:

- Fully Automatic Start/Stop.
- Controlling : Charging, discharge, voltage, frequency.
- Automatic Synchronizing, including Generator Protection and Control.
- Metering : Power meter, battery voltage, DC current, etc
- Range capacity: 1kW – 200kW.
- Alarms Sort Message Send.
- Data Logger.
- SCADA.
- Application : Isolated and Interconnected.



REFERENSI PROJECT



PLTMH Cikahuripan – Dewata – Ciwidey  
2 x 128 kW, Th 2001

PLTMH Melong – Subang 100 kW, Th 2004



PLTMH Santong Kayangan NTB, 48 kW Th 2006

PLTMH Lantan NTB, 128 kW Th 2006



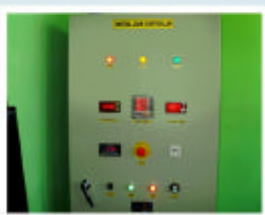
PLTMH Perkebunan Teh Cibuni - Ciwidey  
200kW Th 2006

PLTMH Wangan Aji – Wonosobo  
2 x 70 kW Th 2006



PLTMH Salido Kecil Unit-2 – Pesisir Selatan,  
320 kW Th 2006

PLTMH Banti Wa'a – Tembaga Pura,  
2 x 128 kW Th 2007



PLTMH Sengkaling, Universitas Muhammadiyah  
Malang, 128 kW Th 2007

PLTMH Jamus, Ngawi, PT Candi Loka  
105 kW Th 2008