

# HYDRO508

## Digital Control for Francis & Kaplan Hydro Turbines



- **32-Bit  $\mu$ processor Based Digital Control**
- **Field-Configurable**
- **User-Friendly Menu Format**
- **View Program and Change Dynamics While Running**
- **LED Display of all Governor/Turbine Parameters**
- **ModBus® Communications**
- **Level Control Capability (pond or tail)**
- **Creep Detection**
- **Integral Overspeed Protection**
- **Blade Lock / Tilting**
- **Gate Limit Functionality**
- **Bumpless isoch/droop transfer**

## APPLICATION

The programmable Hydro508 controls Hydro turbines driving electrical generators. Its configurable program provides control of both Francis turbines (one actuator applications) and Kaplan turbines (two actuator applications). The Hydro508 provides the electronic brains to control the turbine's hydraulic control system and auxiliary functions, and operates as either a stand-alone unit governor or in conjunction with a plant's Distributed Control System (DCS).

The Hydro508 is a fully digital electronic control, and uses a 32-bit microprocessor to perform all of its control functions. The microprocessor control package consists of printed circuit boards in an enclosure designed to be mounted within a system control panel. Removable terminal blocks allow for easy wiring and installation.

## DESCRIPTION

The Hydro508 contains a fixed number of inputs and outputs. The inputs and outputs can be programmed to meet specific customer's requirements. It also provides several user selectable features including: starting, stopping, gate/blade positioning, speed control, load control, pond level control, and automatic-manual/local remote operation. A first-out indication feature for system shutdowns reduces troubleshooting time. The menu driven software allows program configuration of the control for a specific application.

## COMMUNICATIONS

The Operator Control Panel (OCP), mounted on the front of the Hydro508, consists of a two-line (24 characters each) highly reliable LED display and 30 functional keys. It provides field configuration, on-line adjustments, monitoring, and operational information. The display presents easy-to-follow instructions in plain English expressed in engineering units. Discrete and analog input and output signals can be wired directly to the Hydro508 to control the unit externally. All unit control functions available at the OCP on the front of the Hydro508 are also available through hard-wired connections to other devices.

The Hydro508 can communicate directly with HMI based operator control panels and/or the plant's DCS through two ModBus® communications ports. These ports support RS-232, RS-422, and RS-485 communications using ASCII or RTU ModBus transmission protocols. The two ModBus ports provide control and monitoring of the unit in the same manner as from the Hydro508's integral OCP. The discrete and analog input and output signals can also be hard-wired directly to a DCS if required by the application. A separate PC port facilitates program changes on an offline PC which can then be down-loaded to the Hydro508 when the turbine is stopped. This feature frees the operator from having to make all program changes at the OCP.

## FLEXIBILITY

The Hydro508 is field configurable, allowing site engineers to configure the control to their specific application, and to make future control configuration changes. On-line tunables are available to allow set point adjustments while a unit is running. Inputs and Outputs are programmable as required by the application or interface.

## FEATURES

- Feed forward control
- Remote analog setpoints for Speed, Gate, Level, Power, and Manual Control
- Isochronous loadsharing via Woodward DSLC-2
- Gate limit
- Selectable start mode (auto/manual)
- Selectable actuator outputs (4-20mA/20-160mA)
- Dual speed inputs
- Creep detection option (available with proximity probes)
- Local/remote control (505H front panel versus external contacts or ModBus)
- Wide speed setting range option (20% - 180%)
- Generator breaker logic
- Bumpless isoch/droop transfer
- Level switches for: Speed, Gate Position, Gate Limit, and Power
- Selectable brake operation
- Security (password protected)
- Dual speed/load dynamics
- First-out indication of shutdowns
- Two independent ModBus communications ports
- Program upload/download capability via P.C.

## SYSTEM PROTECTION

- Integral Overspeed Protection Logic
- First-out Indication (3 individual Shutdown inputs)
- Bumpless transfer between control modes
- Local/Remote Control priority and selection
- Fail-safe Shutdown Logic

## CONTROL

- Speed for Droop and Isochronous
- Position (with Speed Droop) for Gate Set Point, Power (KW Droop), and Pond Level (Tailrace or Forebay)
- Manual
- Gate Limit

## FUNCTIONALITY

- Speed/Frequency control including Isochronous and Droop Modes
- Auxiliary control modes for Power, Level, Gate Position
- 3-D cam for Kaplan units
- Integrated manual control

## CONTROL SPECIFICATIONS

---

### INPUTS

#### Power

18-32Vdc, or 90-150Vdc, 88-132Vac (47-63Hz), or 180-264Vac (47-63Hz), 60W max.

#### Speed

2 separately configurable from Proximity Probes, MPUs (1-30Vrms), or generator PTs

#### Discrete Inputs

16 Contact Inputs (4 dedicated, 12 programmable)

#### Analog Inputs

6 (4-20mA) Programmable

### OUTPUTS

#### Actuator Drivers

2 Actuator Outputs (4-20mA or 20-160mA)

#### Discrete Outputs

8 Relay Outputs, 5A at 28Vdc, resistive/0.5A at 115Vac, resistive, (2 dedicated, 6 Programmable)

#### Analog Outputs

6 (4-20mA) Programmable

### COMMUNICATION

#### Serial

2 ModBus (ASCII or RTU) Comm Ports (RS232, RS422 or RS485 compatible)

### DIMENSIONS

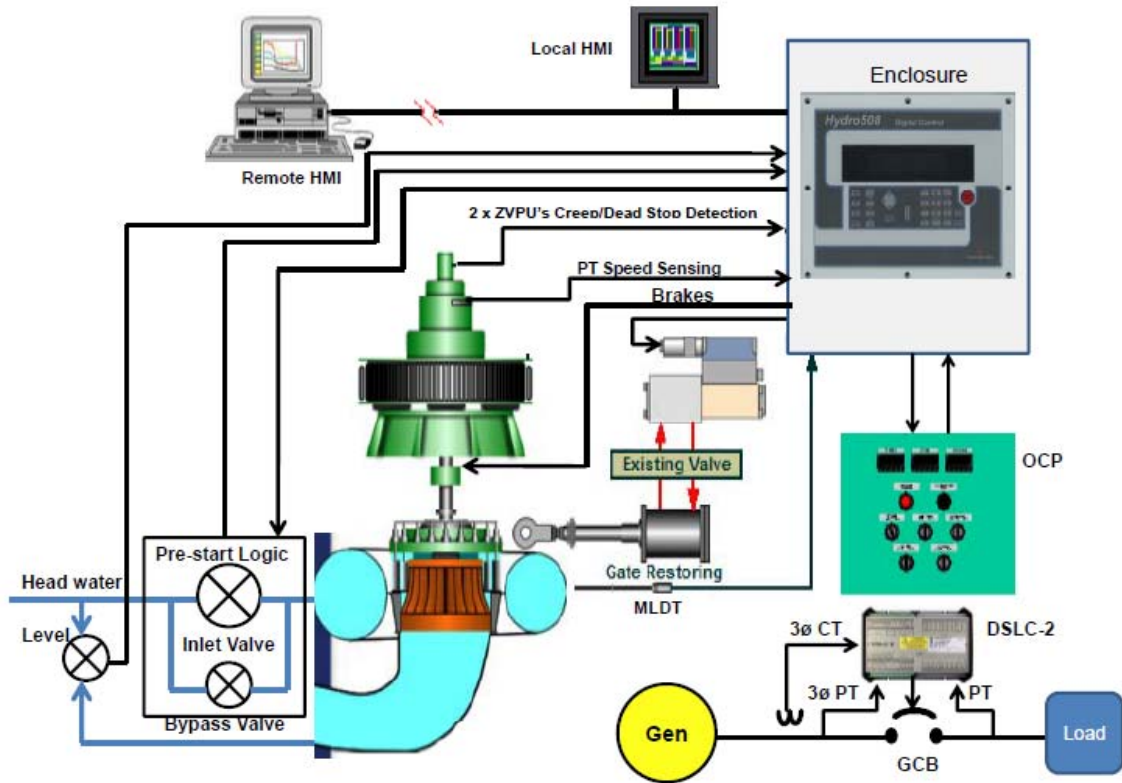
14L x 11H x 4D inches (356 x 279 x 102 mm)

### ENVIRONMENTAL SPECIFICATIONS

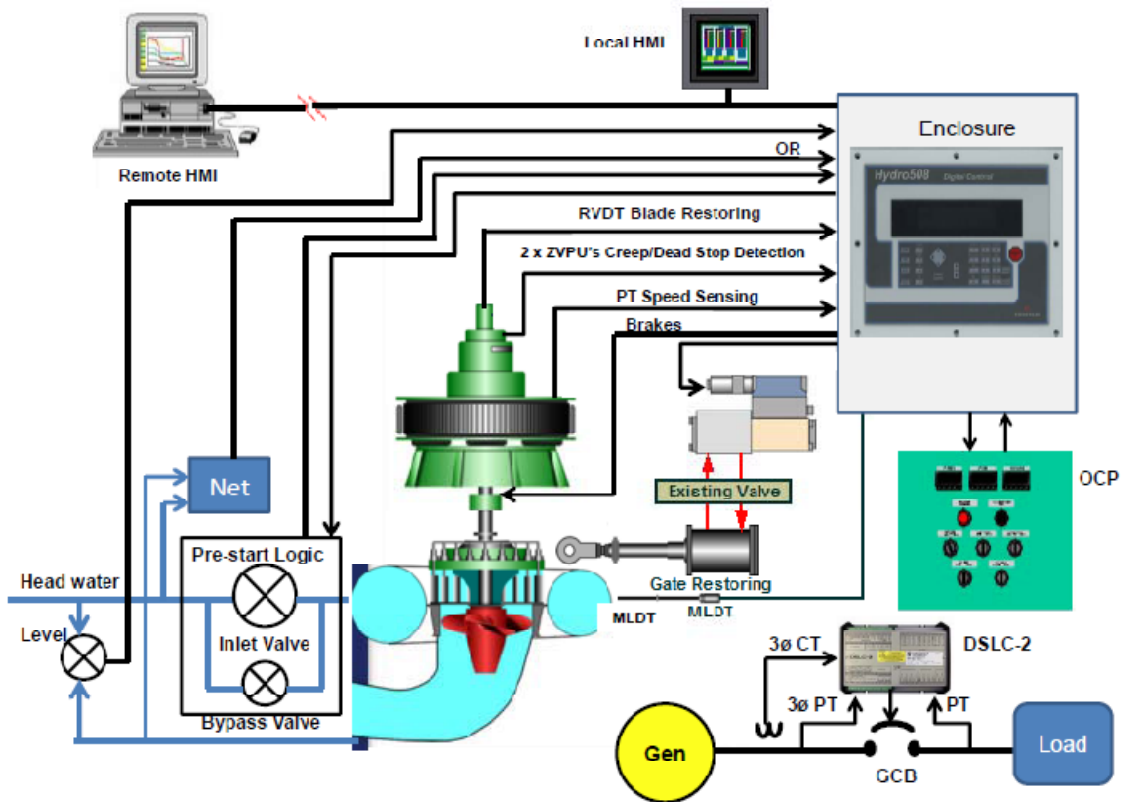
---

#### Certifications

UL, CUL, and CE



**FRANCIS TURBINE APPLICATION**



**KAPLAN TURBINE APPLICATION**

**Temperature range**

-25°C to +65°C ambient air temperature range

**Humidity**

Lloyd.s ENV2 test #1

**Dry heat**

Lloyd.s ENV3

**Salt fog**

MIL-STD-810 method 509.2 proceed. 1

**Shock**

Meets MIL-STD-810C, method 516.2-1,  
procedure 1B

**Vibration**

Lloyd.s ENV2 test #1

**Surge immunity**

IEC 801-5

**ESD immunity**

IEC 801-2

**Emissions**

EN55011, Class A, Gr 1

**Radiated RF immunity**

IEC 801-3

**Fast transient immunity**

IEC 801-4

**Conducted RF immunity**

IEC 801-6

For more information contact:

PM Control Systems Pte Ltd

Tel: (65) 6779 2822

Fax: (65) 6777 6301

Email: [sales@pmcontrol.com.sg](mailto:sales@pmcontrol.com.sg)