

# SHICO. Hydrafit Electronic Gauging Systems

MODEL : HGS Series

## ■ FEATURE

Modern boilers are designed to provide clean dry steam. Too high a level of water in the drum can give wet steam, leading to turbine blade erosion. Too low a level in the drum can lead to overheating of the boiler tubes and the danger of explosion. Optimum performance can be obtained by using Hydrafit to monitor the level.

## ■ APPLICATION

For optimum performance the system requires sloping steam and water legs as shown in the diagram. The slope needs to be a minimum of 1 in 50. The slope minimizes density error and prevents corrosion of the electrodes.

Custom columns are available, ask your representative for the water column design form.

Recommended practice is to fit two suitably classified valves in each of the steam & water pipes.

One valve takes the wear caused during shut-off. The second ensures a secure final shut off.

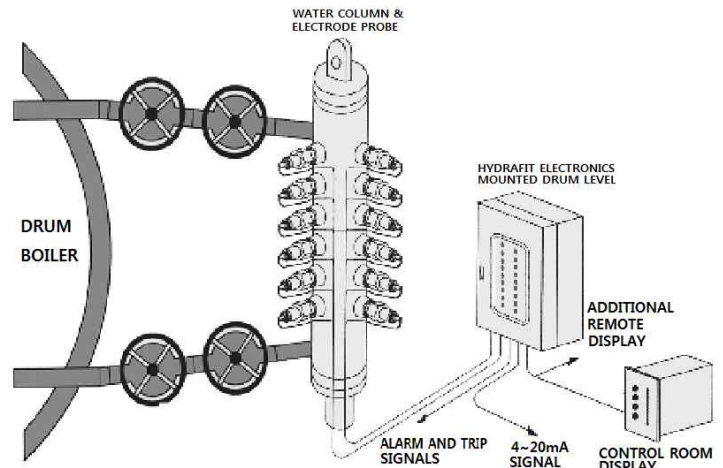
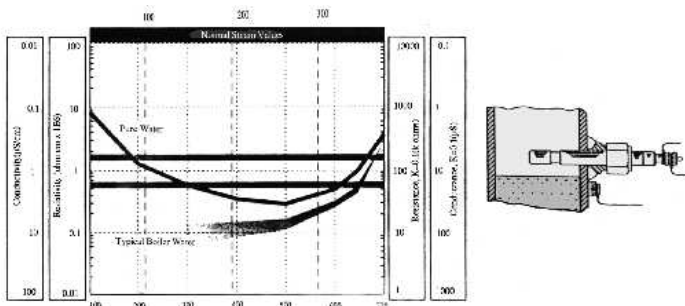
Parallel slide valves are most suited, but other types may be used. Valves should always be mounted with their spindles horizontal - as shown - to ensure a straight through flow when fully open.

## ■ CONDUCTION PROPERTIES

The graph shows the conductivity of water and steam at a range of saturation temperatures. Hydrafit relies on the significant difference in conductivities of water and steam at temperatures up to 593°C to determine the water level.

There are practical difficulties. Boiler feedwater is conditioned to be extremely pure, and contains additives to inhibit corrosion, see table below.

| Material     | Conductivity      |
|--------------|-------------------|
| Glass        | 0.0020 $\mu$ S/cm |
| Pure Water   | 0.0025 $\mu$ S/cm |
| Boiler Water | 1-40 $\mu$ S/cm   |
| Copper Wire  | 450.000S/cm       |



## ■ CONDUCTION PROPERTIES

In addition to the detection of 'water above steam' the HGS will also detect short and open circuit cables between the electrodes and the measuring electronics. Hydrafit HGS measures the return signal and determines 'water', 'steam' or 'cable fault'. This test is carried out on all channels, regardless of the water level. As soon as a non-valid value is detected a system alarm is initiated to warn of possible problems. The normal operation of the system is continued, so that changes in water level can still be viewed in the control room even though one point may be incorrect.

## ■ APPROVAL

In countries where sole gauge approval has been granted, Hydrafit is the only legally accepted control room indication.

The ability to continue plant operation - despite a minor fault with the system, means no plant shut down and loss of generation.

To this end, the whole system is designed to ensure that all components are operated well within their design criteria, with the extended life that this promotes.

## ■ CONTROL

The HGSC Hydrafit Level Controller adds the facilities of a 3-Term (PID) controller to the Hydrafit range and is in use around the world increasing the efficiency of feedwater heaters.



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## ■ ELECTRODE PROBE

The performance reliability of the Electro Conductivity system is related directly to the exceptional success of SHICO Probes.

SHICO pioneered Probe technology and now continues to lead in the innovative design and precision manufacture of water detecting Probes.

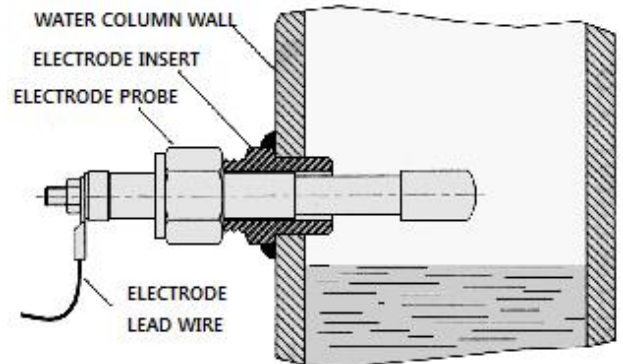
Located in the Water Detector, or acting as individual units in piping, sensing"it Probes complete an electrical circuit when water reaches the Probe tip. The completed circuit signals a relay in the Control Unit which, in turn, can activate an alarm, drain, pump or other equipment.

Probes allow even pure water of ultra-low conductivity (less than 1 micro more) to complete electrical circuits.

SP-03 and SP-04 Probe service life is extended with low cost Probe Repair Kits. Kits allow field replacement of components subject to normal wear factors.


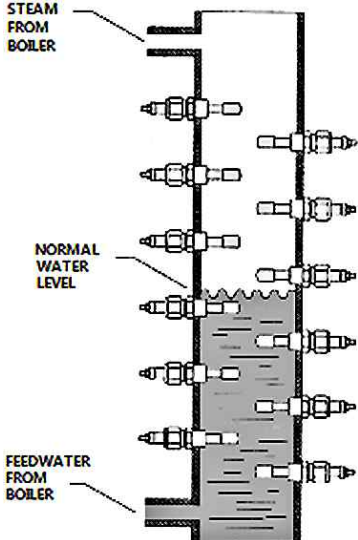



Performing as a small, independent chamber, the Water Detector is attached to steam plant equipment or piping. to facilitate installation, connections may be of the size, type and orientation best suited to each application. The Water Detector is available in various materials to withstand system pressures to 210Kg/cm<sup>2</sup> and temperatures to 593°C.

One or more sensing Probes are located at various chamber levels to signal the arrival or level of water within. Probes may be installed at whatever chamber locations are desired, The Water Detector is where the SHICO system's liquid connections end - and advanced electronic operation begins.



※ Electro system Probes are manufactured from premium materials throughout permitting a standard warranty of 8,760 Hours (One year)

## ■ TYPES OF ELECTROPROBE

| SHAPE   | TYPE  | INSTALLATION  |
|---|---|---|
|  | SP-01 :<br>35Kg/cm <sup>2</sup> , 235°C MAX<br>Teflon Insulated   |  |
|  | SP-02 :<br>75Kg/cm <sup>2</sup> , 285°C MAX<br>Teflon Insulated   |   |
|  | SP-03 :<br>110Kg/cm <sup>2</sup> , 480°C MAX<br>Ceramic Insulated |   |
|  | SP-04 :<br>210Kg/cm <sup>2</sup> , 593°C MAX<br>Ceramic Insulated |   |



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### ■ WATER LEVEL COLUMNS AND ELECTRONICS

Water level columns are available for operational pressure up to 300bar, together with a complementary range of electrodes. Special electrodes are available for both high pH and low temperature operation. All pressure parts are designed to ASME(American Society of Mechanical Engineers) B31.1 Power Piping Code, and pressure tested to 1 ½ times the design pressure. Columns are available with 8 to 32 electrode part. and can be ASME stamped on request.

### ■ SPECIFICATIONS

#### ■ Low Pressure Columns

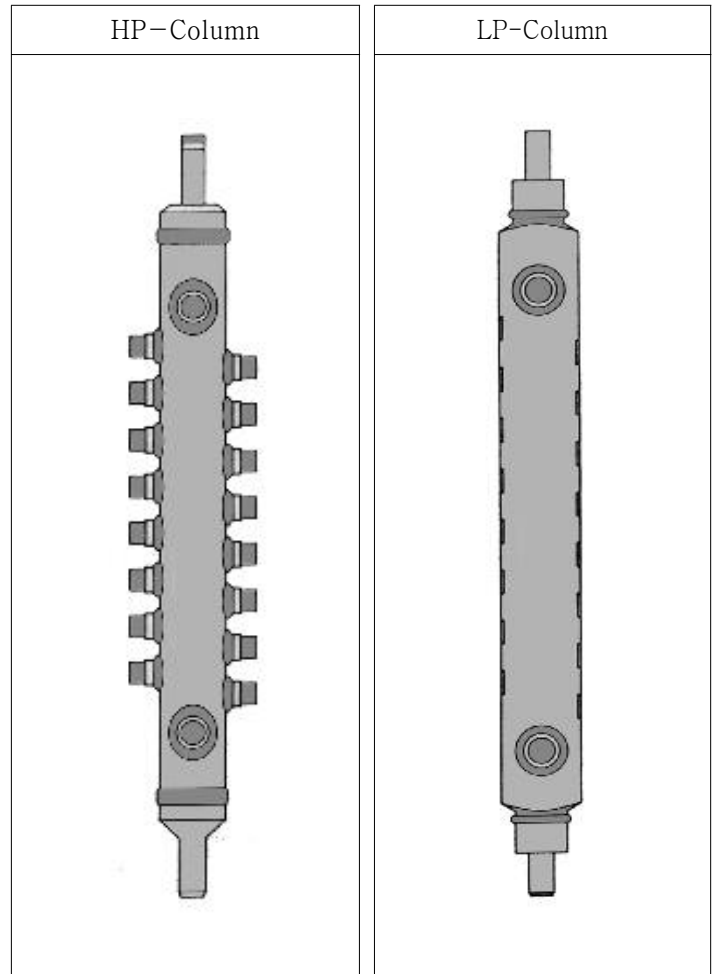
|                      |   |
|----------------------|---|
| Design pressure      | 120bar  |
| Design temperature   | 327℃  |
| Electrode Probe type | SP-02 for 7-11 pH operation<br>SP-03 for high pH or low temperature |

#### ■ High Pressure Columns

|                      |                             |
|----------------------|-----------------------------|
| Design pressure      | 207bar                      |
| Design temperature   | 368℃                        |
| Electrode Probe type | SP-04 for 7-11 pH operation |

#### ■ Supercritical Pressure Columns

|                      |                             |
|----------------------|-----------------------------|
| Design pressure      | 300bar                      |
| Design temperature   | 560℃                        |
| Electrode Probe type | SP-04 for 7-11 pH operation |



### ■ ORDERING INFORMATION

※ For full specification of electrodes see "Ordering Information"

**Maker Model Information ( HCM- <sup>①</sup>HP - <sup>②</sup>20 - <sup>③</sup>1170 - <sup>④</sup>SUS304 - <sup>⑤</sup>1 )**

MODLE HCM -

- ① : Drum Line (HP, LP, IP)
- ② : Electrode Probe Coupling Quantity
- ③ : C to C Length
- ④ : Column Body Material
- ⑤ : Connection Size (Alternate S.W Con'n 1"Pipe projection  
Female Socket Weld or Flange Information)



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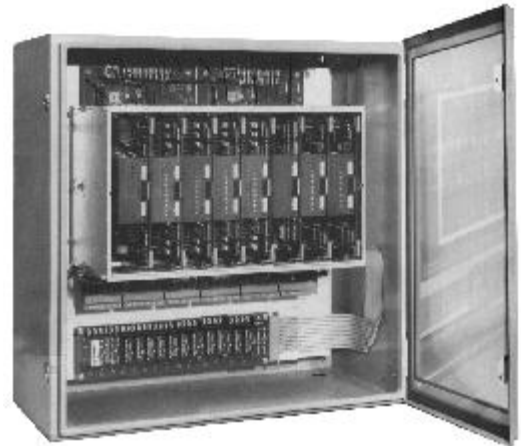
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## ■ INTRODUCTION OF ELECTRONIC UNIT

- Install Easily At Distances To 10m From Electro System
- Modular Design of Major Components Allows Instant, On-Site Servicing
- Display 12 to 34 Water levels At Control Unit And Remote Indicators
- Auxiliary Functions Control Alarms, Trips, Fault Advisories
- Self-Diagnostic Capability Covers Power Supply, Probes, Transmitting Circuitry



## ■ GENERAL OPERATIONAL PROCEDURES

The Primary function of the HGS Control Unit is to display water levels at both the unit itself and at remote indicators.

Employing sophisticated, solid-state technology, water levels are accurately presented using LED status indication. On control unit Probe Panels, water levels are shown with yellow LED. On these same panels, additional LED indicate panel circuitry status; green LED mean normal operation while red LED will illuminate if fault occurs. Level indications on the Probe Panel are transmitted to additional plant locations via the control unit's Remote Indicator Panels. Under normal operations, the level indications on the Probe Panels will be identical to the indications on the Remote Indicator Panels.

## ■ AUXILIARY OUTPUTS

Five standard auxiliary outputs provide for high alarm, high trip, low alarm, low trip, and system fault functions. All auxiliary outputs (and inputs) are optically isolated to prevent electrical interference.

Configurations are available to allow alarms and trips to be activated by any logical combination of levels.

## ■ GENERAL OPERATIONAL PROCEDURES

In abnormal situations, such as when the control unit might detect a false water level (possibly caused by a shorted Electrode probe above actual water level), the following displays will occur (1) the Probe Panel's yellow LED will indicate the false water level (2) the MDU (Micro Diagnostic Unit) Panel will illuminate its red LED fault signal, (3) the Remote Indicator Panel will flash only one LED - at the false level - and illuminate its red fault LED and (4) remote indicator lights will flash at the false level.

Control Unit reliability is further on-handed by integral self-diagnostics, performed at the MDU Panel. Many times per second, the MDU checks the proper functioning of probes, power supply and all transmitting circuitry.

Upon fault detection: (1) the MDU Panel will illuminate its red LED, (2) the red LED on panel (5) at fault will light (independent of the MDU) serving to locate the fault source, and (3) the Control Unit will allow other normal circuits to continue operating during the fault signal. Simply speaking, the MDU signals that something is wrong and locates the problem area while allowing the system to operate.



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### ■ DESIGN & OPERATION FEATURE

- **Dual Power Supply** The HGS unit can accept power from two independent AC mains'110/220 VAC,50/60 Hz. Power takeovers are automatic upon failures. However, a single supply can be used to power the entire system, if preferred.
- **Lamp Test** The Control Unit provides a Lamp Testing Circuit designed to flash all remote indication lamps, while continuing to illuminate actual water level.
- **Probes** Probe circuits require less than 3 VAC. Probe sensitivity ranges are field-selectable to accommodate water of various conductivities (to less than 0.1 micromho).
- **Interfacing** 4 to 20 mA output is available to link the HGS Control Unit with other plant equipment (optionally adaptable as voltage output).

### ■ PERFORMANCE RELIABILITY

Each SHICO HGS Control Unit is engineered, manufactured and tested with strict compliance to applicable domestic and international standards. All solid state components have earned their inclusion through field demonstrated performance. Control Units are available as standard models, or with optional deletions or additions of operating features. See the HGS Control Unit model numbering code shown. For additional information, contact your nearest SHICO representative.

### ■ REMOTE DISPLAY INFORMATION

|  |                        |              |
|--|------------------------|--------------|
| Upgrade for HGS-A to HGS-B<br>Part no. : HGS0610RD | Add display capability | 6-10 levels  |
| Upgrade for HGS-B to HGS-C<br>Part no. : HGS1120RD | Add display capability | 11-20 levels |
| Upgrade for HGS-C to HGS-D<br>Part no. : HGS2130RD | Add display capability | 21-30 levels |

### ■ INSTALLATION & MAINTANANCE

To install the HGS Control Unit, simply mount the enclosure, wire external system components, and supply power. Installations may be indoors or outdoors, nearby or hundreds of feet distant from the Electrode and remote indicators. All Control Units are designed and performance tested to meet individual specifications. No onsite adjustments are required, Routine or scheduled maintenance is minimal. In the unlikely event of component failure, standard spare panels enable immediate, easy plug-in replacement. Control Units arrive with a complete System Configuration Document, which identifies unit components, their functions, and information on replacement parts,

### ■ ORDERING INFORMATION

#### THE SHICO HGS Control Unit Model Numbering Code

**HGS - B - 1 - 1 - 0 - F - 1 - 1**  

①
②
③
④
⑤
⑥
⑦

- ① Local display
  - A : 1-5 Level display
  - B : 1-10 Level display
  - C : 1-20 Level display
  - D : 1-30 Level display
- ② Interfacing output signal
  - 0 : Without
  - 1 : 4~20mA
  - 2 : 0~20mA
  - 3 : 1~5V
  - 4 : RS 232 or 432 computer signal
  - 5 : Other
- ③ Number of control unit relays
  - 0 : Without
  - 1 : Five standard relay (high alarm, high trip, low alarm, low trip and system fault functions)
- ④ Self-Diagnostics
  - 0 : Without
  - 1 : Within
- ⑤ Power Supply
  - F : Free Voltage(90 ~ 240VAC 50/60Hz)
  - S : Special Voltage
- ⑥ Remote Display Panel
  - 0 : Without
  - 1 : Within
- ⑦ Panel Installations
  - 1 : Indoor
  - 2 : Outdoor



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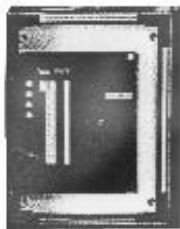
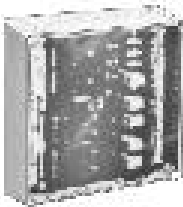
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# SHICO.

MODEL : HGS Series

## Hydrafit Electronic Gauging Systems (Control Unit)

### ■ STANDARD ELECTRONIC UNIT

| SHAPE   | MODEL NAME   | PARAMETERS   | SPECIFICATION   |
|---|--|--|---|
|    | SHICO<br>HGS Electronic<br>Gauging System<br>Standard features | Water switching point<br>Electrodes to electronics<br>cable length<br>Power input<br>Electronics enclosure<br>Operating temperature<br>Analog output | 0.6 or 1.6μ Siemen/cm<br>100 meters max. 1/10/18/30m<br>standard<br>(100m max. 2/10/20/30m<br>Standard)<br>110/220V 60Hz<br>IP65/NEMA 4X<br>-20 to +70°C<br>0-20mA/4-20mA into 600Ω   |
| <b>■ Additional features</b>  |  |  |   |
|    | SHICO<br>HGS-A Electronic                                      | Inputs<br>Front panel  | 1-6 electrodes<br>Power and system alarm status<br>LED  |
|  | SHICO<br>HGS-B Electronic                                      | Inputs<br>Front panel  | 1-12 electrodes<br>Local display of level and alarms  |
|   | SHICO<br>HGS-C Electronic                                      | Inputs<br>Front panel  | 1-24 electrodes<br>Local display of level and alarms  |
|   | SHICO<br>HGS-D Electronic                                      | Inputs<br>Front panel  | 1-32 electrodes<br>Local display of level and alarms  |
|  | SHICO<br>HGSC Electronic<br>Hydrafit<br>Level Controller       | Inputs<br>Power supply<br>Control<br>Output  | 1-32 electrodes<br>Two 4-20mA, 100Ω analog inputs<br>110/220V 60Hz.<br>Full 3-Tem PID<br>10 calculations per second.<br>Two 4-20mA analog into 600Ω<br>Four change-over relays 100V;<br>0.5A;10W  |
|  | SHICO<br>HGSL Electronic<br>Hydrafit<br>Level Switch           | Inputs<br>Power supply<br>Relay outputs  | 1-4 electrodes, powered entirely<br>independently,<br>cross-validation between 2,3 or<br>all 4 channels,<br>for both horizontal and vertical<br>co-incident<br>110/220Vac 60Hz, 20mA max<br>Five two pole change-over relays,<br>220V 12A:40W;80A |



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