

## Principles of Measurement

### Conductivity measurement

The water level is detected between the electrode tips and the vessel wall (or reference electrode) and evaluated for control or limitation purposes. In this case it is essential that the medium is electrically conductive.

The high-integrity self-monitoring design of the level alarms ensures constant supervision of the insulating seal and electrode entry, immediately recognizing malfunctions in the system and failure of the electrode or supply cables. In addition, the equipment features periodic self-checking of the electronic control unit and the corresponding output contacts. Self-monitoring equipment with periodic self-checking is required for boilers with temperature/pressure ratings > 1 bar and > 120 °C and a volume > 50 l.

Before installation, the length of the conductivity electrode rods must be cut to the required switching levels.

### Capacitance measurement

Electrode rod and vessel wall (or reference electrode) form a capacitor; air and the fluid to be controlled act as dielectric. Due to the different dielectric constants of air and boiler water the capacitance value between the electrode and the vessel wall changes concurrently with level changes.

The switchpoints can be continuously adjusted during operation and multiplied by connecting in parallel several electronic control units.

## Types of Controls

### Water level limiters

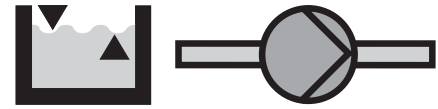
(High-level/low-level alarms)

As soon as the water level exceeds or falls below the adjusted switchpoints the burner protection circuit is interrupted (low level) or the feed pump is switched off (high level).



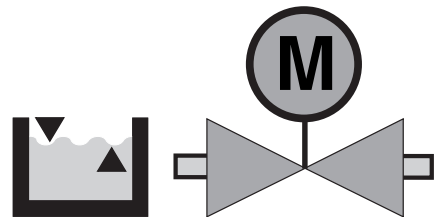
### On-off level control

The water level is controlled between two fixed or adjustable switchpoints. The signals are directly transmitted to the feed pump or valve.



### Modulating level control

The water level is continuously monitored and the actual value is compared with the adjusted set point by the associated controller. If a deviation between the two values is detected, a signal will be sent to the control valve to re-adjust the flowrate accordingly, thereby enabling a more economic and efficient steam plant operation.



## Field Bus System

### Digital Data Exchange

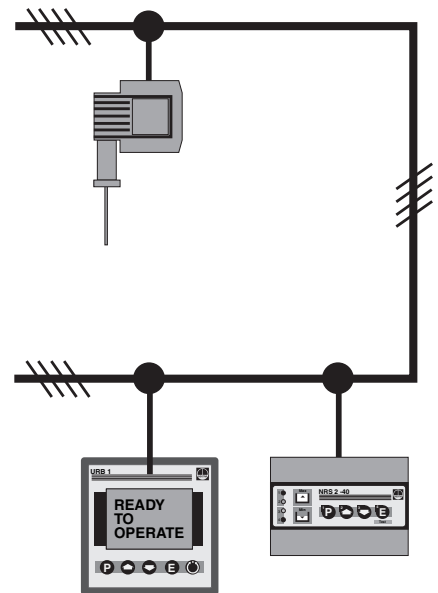


The Spector Bus system transfers the digitized measurement data acquired by the level probe to the electronic control unit located in the control cabinet. The centerpiece of this system is the stable and sophisticated CAN bus (Controller Area Network). Several sensors and switches can be interconnected via one bus line.

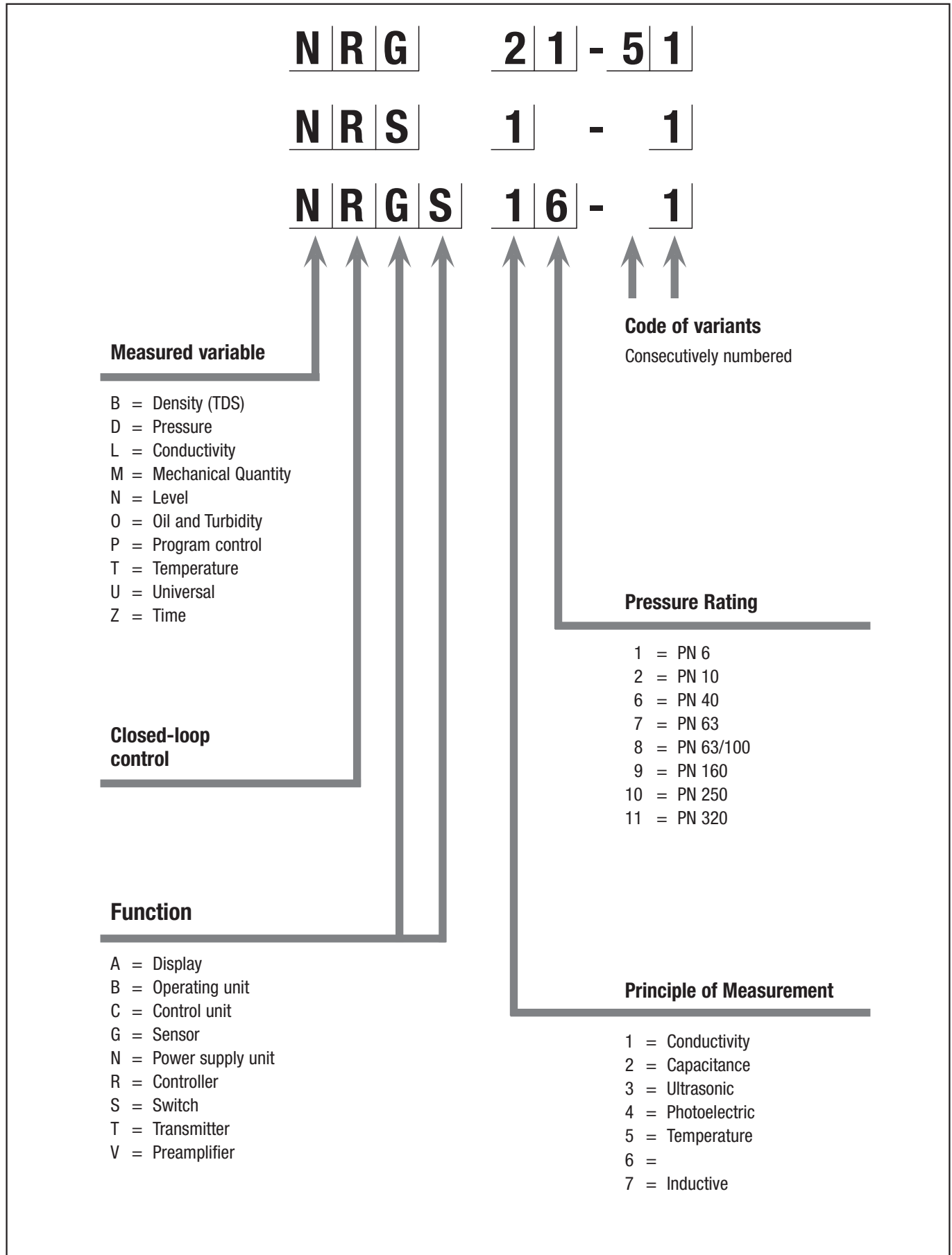
Apart from active cable monitoring a CAN bus system offers a host of benefits, such as increased design flexibility, reduced installation effort, optimized open and closed loop control, centralized operation and remote monitoring.

The standardised network opens up highly flexible possibilities for configuration. The CANopen protocol is used nowadays in medical equipment, electronic devices for marine applications, public means of transport and in burner and boiler controls of power plants.

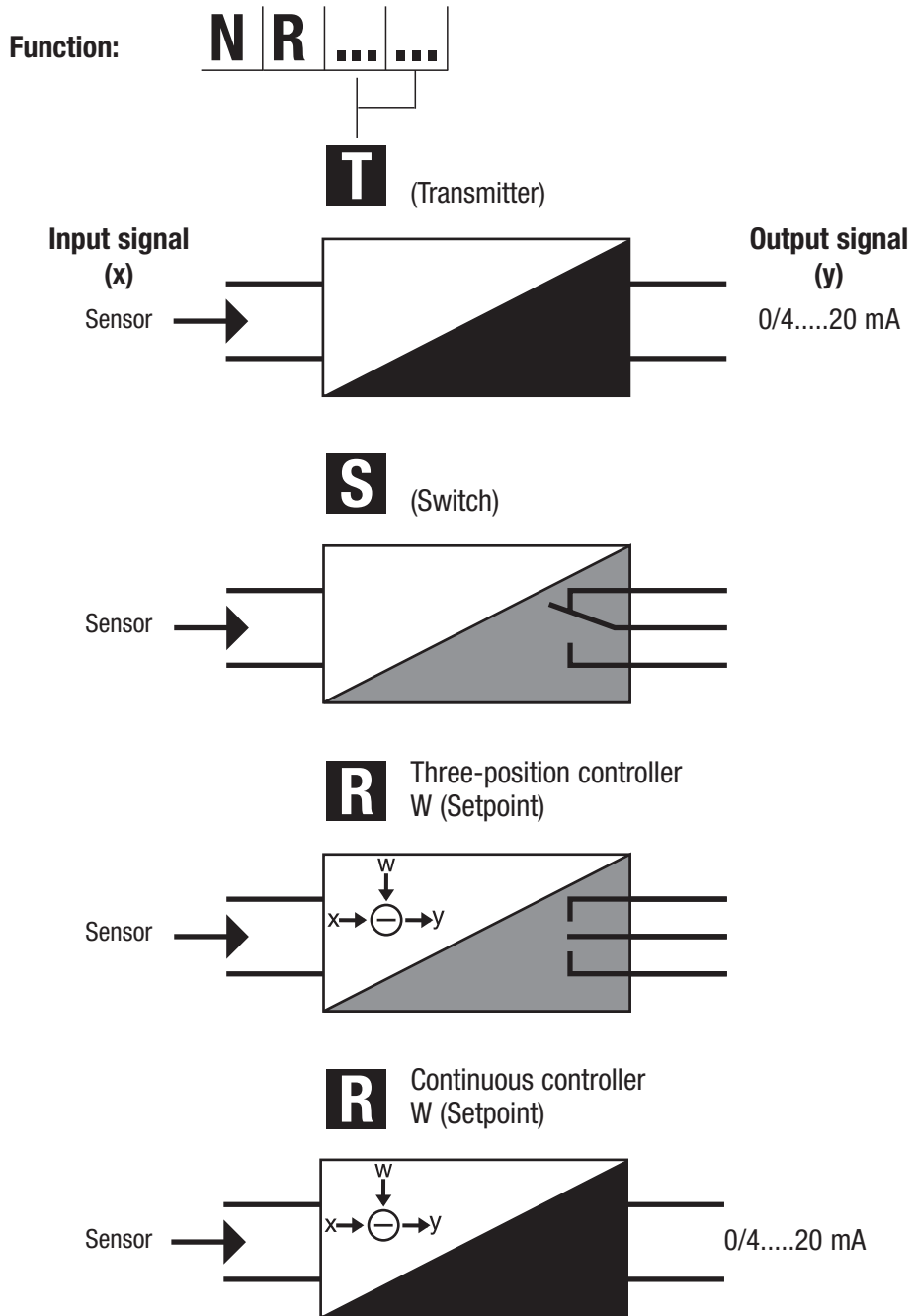
Thanks to the many CANbus applications a great number of equipment and interface components are widely available, providing an ideal addition to our product range.



**GESTRA Type Designations for Boiler Controls**



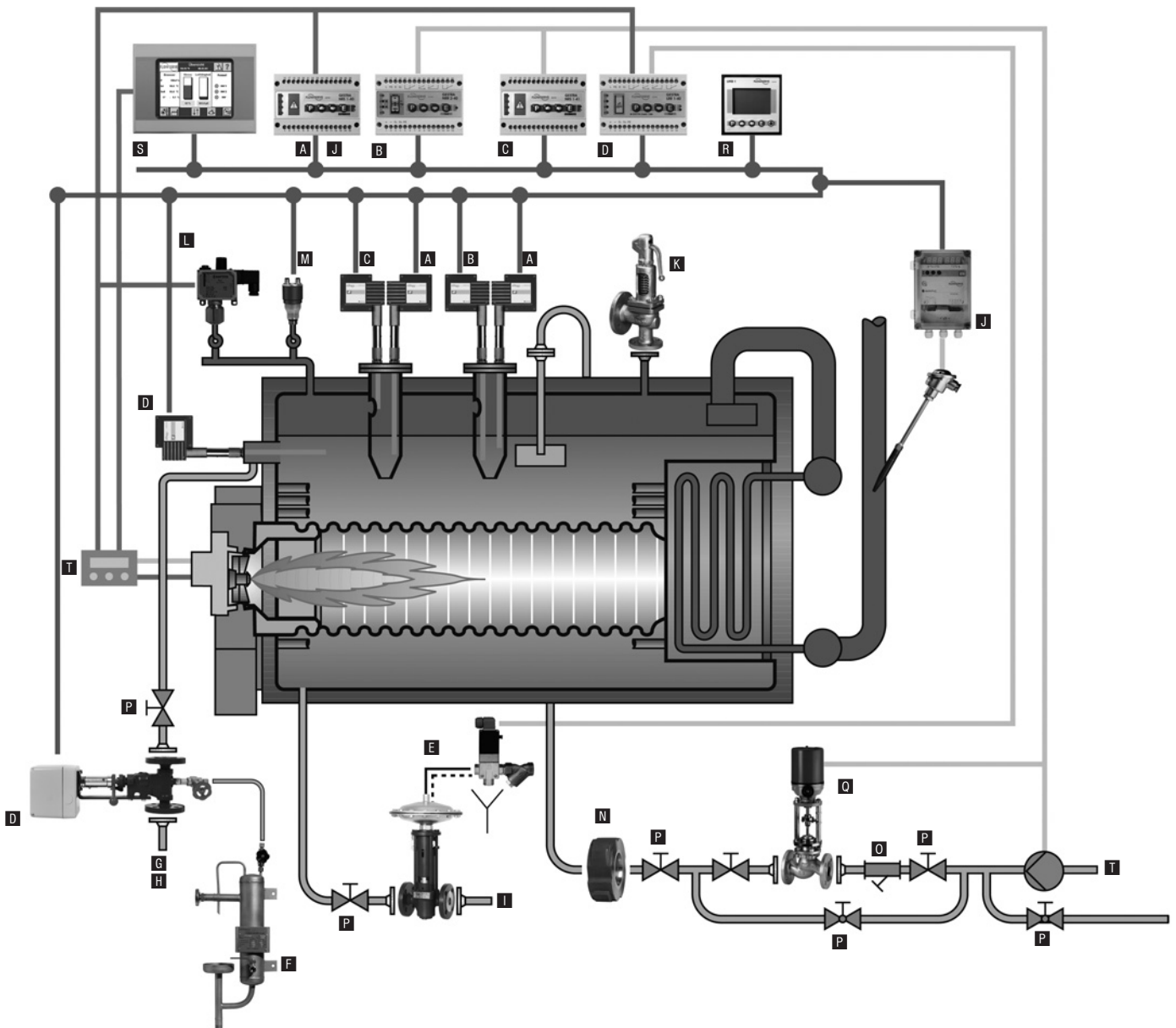
**GESTRA Type Designations for Boiler Controls**



**Level Switch Type NRS 1-1** ..

- a# Enclosure for wall mounting
- b Enclosure for installation in control cabinet
- c\* 19" slide-in unit
- d Spare plug-in card for 19" slide-in unit
- e Case for panel mounting
- f Integrated solenoid valve plug

# Often design b with additional enclosure for wall mounting  
 \* Installation in 19" mounting panel provided on site or separately supplied 19" mounting panel



**Boiler equipment acc. to TRD 604 (continuous operation without constant supervision for 24/72 hrs)  
or in accordance with other European guidelines, e. g. EN 12953 part 6**

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| <p><b>A</b> Self-monitoring<br/>low-level electrode NRG 16-40</p> <hr/> <p><b>A J</b> Low-level alarm NRS 1-40/NRS 1-40.1</p> <hr/> <p><b>B R</b> Modulating level control with fully integrated second<br/>level and conductivity (TDS) indicator:<br/>level electrode NRG 26-40, level controller NRR 2-40,<br/>control terminal and display unit URB 1/URB 2</p> <hr/> <p><b>C</b> Self-monitoring high-level alarm:<br/>level electrode NRG 16-41, level switch NRS 1-41</p> <hr/> <p><b>D E</b> TDS control / Continuous and intermittent boiler blowdown:<br/>Conductivity electrode LRG 16-40, continuous blowdown<br/>controller LRR 1-40, continuous blowdown valve BAE,<br/>intermittent blowdown valve MPA, 3/2 way pilot valve, strainer</p> <hr/> <p><b>F</b> Sample cooler</p> | <p><b>G</b> Flash vessel</p> <hr/> <p><b>H</b> Residual blowdown heat exchanger</p> <hr/> <p><b>I</b> Blowdown receiver (mixing cooler)</p> <hr/> <p><b>J</b> Self-monitoring temperature limiter:<br/>resistance thermometer TRG 5-65,<br/>temperature switch TRV 5-40,<br/>NRS 1-40.1 (only with existing<br/>superheater)</p> <hr/> <p><b>K</b> Safety valve GSV</p> <hr/> <p><b>L</b> Pressure limiter DSH</p> <hr/> <p><b>M</b> Pressure controller/transmitter</p> <hr/> <p><b>N</b> DISCO Non-return valve RK 86 A</p> |
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