CAPAC® HS

Capacitance Measurement Systems
For Cable Production Lines
IN-LINE CAPACITANCE MEASURING SYSTEMS

The CAPAC® HS high speed capacitance measurement systems from ZUMBACH guarantee accurate and reliable measurements of the coaxial capacitance of telephone cables, coax cables, data and LAN cables (cat. 5, 6, 7, 8) at the high bandwidth and low noise level. The systems offer various advantages and possibilities of in-line capacitance measurement, such as:

- Accurate, continuous measurement and monitoring of the products capacitance
- Communication with higher level systems, including PROFIBUS DP
- FFT analysis and absolute value simultaneously
- SRL prediction up to 6.5 GHz
- Process control as well as statistical monitoring and production logging
- Pinhole function; pinhole and bare patch detection in the production
- High speed analogue output
- Very low noise level
- Digital output for connection to processors and display units
- Separate processor and display for mounting flexibility
- OEM application solutions

SYSTEM OVERVIEW

The MR measuring tube is the measuring sensor. It measures the coaxial capacitance of the cable over a defined length. The CAPAC® HS electronics treats the signals acquired by the measuring tube. It transmits the capacitance over different interfaces to the connected data processing system.

Data processing and display units from ZUMBACH (USYS 20/200/2100, USYS IPC CELLMASTER®) or customer systems, such as PLC’s and Host computers.

MEASURING TUBES

Standard tubes with a measuring length of 50 mm (2 in.)

These measuring tubes are specially designed for the measurement of CAT type communication cables. These tubes feature a very high signal to noise ratio as well as a large bandwidth. This is especially advantageous when capacitance variations must be monitored e.g. for FFT/SRL analysis.

<table>
<thead>
<tr>
<th>Model</th>
<th>Inner diameter</th>
<th>Active measuring length</th>
<th>Measuring frequency</th>
<th>Weight</th>
<th>Max. water temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>MR.12.50HS</td>
<td>12 mm/0.5 in.</td>
<td>50 mm/1.9 in.</td>
<td>20 kHz/2 V</td>
<td>3.3 kg/7.2 lbs</td>
<td>70°C / 158°F</td>
</tr>
<tr>
<td>MR.20.50HS</td>
<td>20 mm/0.8 in.</td>
<td>50 mm/1.9 in.</td>
<td>20 kHz/2 V</td>
<td>4.9 kg/10.8 lbs</td>
<td>70°C / 158°F</td>
</tr>
<tr>
<td>MR.36.50HS</td>
<td>36 mm/1.4 in.</td>
<td>50 mm/1.9 in.</td>
<td>20 kHz/2 V</td>
<td>7.4 kg/16.3 lbs</td>
<td>70°C / 158°F</td>
</tr>
<tr>
<td>MR.68.50HS</td>
<td>68 mm/2.7 in.</td>
<td>50 mm/1.9 in.</td>
<td>20 kHz/2 V</td>
<td>15.4 kg/34 lbs</td>
<td>60°C / 140°F</td>
</tr>
</tbody>
</table>

Ultra short tubes with a measuring length of only 10 mm (0.4 in.)

Drawing from a vast experience with thousands of measuring tubes of a variety of models, ZUMBACH has developed an extremely short but accurate measuring tube with an electrode length of a mere 10 mm (.39in.) for high frequency coaxial cables. These tubes feature a surprisingly low noise level and meet the highest demands for absolute accuracy and bandwidth with the following advantages:

- High length resolution with low noise level
- SRL prediction up to 6.5 GHz
- 600Hz bandwidth of the measuring system
- High absolute accuracy
- Compact and robust design

Model | Inner diameter | Active measuring length | Measuring frequency | Weight              | Max. water temperature |
<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>MR.12.10HS</td>
<td>12 mm/0.5 in.</td>
<td>10 mm/0.4 in.</td>
<td>80 kHz/2 V</td>
<td>3.3 kg/7.2 lbs</td>
<td>70°C / 158°F</td>
</tr>
<tr>
<td>MR.36.10HS</td>
<td>36 mm/1.4 in.</td>
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1) MR.12.50.HSD equipped with pressure chamber to be installed in spray cooling tanks on production lines reaching up to 3000 m/min. (9000 ft/min.).

2) Indicative value only; the max. diameter depends on the largest cable diameter to be expected.
The CAPAC HS electronic unit is connected to the measuring tube via a 2 m length cable. The electronic unit is assembled in a robust aluminium housing meeting IP 65 protection standards. Depending on the model, the unit is equipped with a “J” interface, for the connection of ZUMBACH processors, serial or PROFIBUS DP interfaces for the communication with higher level systems. All models include a fast analogue output with selectable bandwidth for connection to FFT systems as well as a pinhole detection feature with variable sensitivity for the detection of holes and bare patches.

**FFT Analysis – Fast Fourier Transformation**

Particularly during the manufacture of communication cables, periodic fluctuations of capacitance and diameter alter the performance of the data transmission. The on-line FFT analysis of the measured data represents a powerful monitoring tool for the determination of periodically occurring irregularities during the cable extrusion.

**SRL Prediction of the Structural Return Loss**

The most commonly used method for quality control is to measure the return loss over the frequency bandwidth to be transmitted by the cable.
DIMENSIONS

ACCESSORIES

Special capacitors and tube adapters are available for the calibration of the CAPAC® HS systems. They allow a simple yet effective check of the measuring accuracy.

Calibration capacitors CC1-xx

<table>
<thead>
<tr>
<th>Measuring tube adapter</th>
<th>Measuring tube</th>
<th>Capacitance in the range 0...300 pF/m</th>
<th>Capacitance in the range 0...100 pF/ft</th>
<th>Capacitance in the range 0...1800 pF/m</th>
<th>Capacitance in the range 0...600 pF/ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>MR.xx.10HS</td>
<td>CC1-3</td>
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<td>CC1-3</td>
</tr>
<tr>
<td>MR.xx.50HS</td>
<td>CC1-14</td>
<td>CC1-27</td>
<td>CC1-36</td>
<td>CC1-36</td>
<td>CC1-36</td>
</tr>
</tbody>
</table>

Measuring tube adapters MA-MR-xx

- Technical specifications are subject to change without notice

WORLDWIDE CUSTOMER SERVICE AND SALES OFFICES

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