Presentation 2004

Medium voltage
Instrument transformers
and Sensors

2003
ABB s.r.o – org. unit EJF
was appointed by BA PTMV
GFFF for MV CTs, VTs and
Sensors
Instrument transformers history

- 1887  Foundation of factory (Bartelmus & Donát)
- 1919  Production of instrument transformers with oil insulation
- 1927  Take over by Škoda Plzeň
- 1952  Production of instrument transformers with epoxy insulation
- 1959  Incorporated into ZSE Praha Group
- 1983  Technology of automatic pressured gelation (APG) implemented
- 1993  100% of shares was purchased by Asea Brown Boveri Ltd.
- 1993  Foundation of Instrument transformers division in CZ, BU 3440
- 1997  New production plant erected, new production technology and testing equipment

- 2002  CZELS was appointed as Global focused feeder factory (GFFF) for both indoor and outdoor MV Instrument transformers up to 40,5 kV – responsibility worldwide
- 2003  CZELS was appointed as Global focused feeder factory (GFFF) for both MV Instrument transformers and sensors – responsibility worldwide
Indoor Current Instrument Transformers

**Support (post) CTs**
- TPU 4x.xx......up to 12 kV
- TPU 5x.xx......up to 17,5 kV
- TPU 6x.xx......up to 24 kV
- TPU 7x.xx........up to 36 kV - 40,5 kV

**Bar primary bushing CTs**
- TTR.... up to 12 kV, up to 24kV

**Bushing CTs**
- BB.....up to 24 kV

**Bus CTs**
- KOKS.....up to 12 kV, up to 17,5 kV,
- KOKS ....up to 24 kV

Casting equipment (vacuum or APG)
Indoor Voltage Instrument Transformers

Single pole insulated VTs
- TJC 4 .... up to 12 kV
- TJC 5 .... up to 17,5 kV
- TJC 6 .... up to 24 kV

- TJC 7 or 7.1..up to 36 kV - 40,5 kV

- KGUGI....up to 36 kV (up to 2000 VA)

Single pole insulated VTs with fuses
- TJP 4.x .... up to 12 kV
- TJP 5.x .... up to 17,5 kV
- TJP 6.x .... up to 24 kV

- TJP 7.1 or 7.2..up to 36 kV - 40,5 kV

Double pole insulated VTs
- TDC 4 .... up to 12 kV
- TDC 5 .... up to 17,5 kV
- TDC 6 .... up to 24 kV

- KGUG....up to 36 kV(up to 2000 VA)

Testing equipment
Outdoor Voltage and Current Instrument Transformers

Current transformers

TPO 6x.xx......up to 24 kV,
TPO 7x.xx… up to 40,5 kV

Voltage transformers

single pole VTs

TJO 6……up to 24 kV
TJO 7…up to 40,5 kV

double pole VTs

TDO 6…up to 24 kV
Electronic Instrument transformers (sensors) - IEC standard

- **Voltage sensors**
- **Current sensors**
- **Electronic instrument transformers**
- **Combi sensors**

**Voltage sensors**
- Resistive or Capacitive divider

**Current sensors**
- Rogowski coil
Current Sensor - Rogowski coil, KECA __ A1 (AIS)

- First published in 1912 by Rogowski and Steinhous
- Uniformly wound coil with non-magnetic core
- Output signal is proportional to the derivate of primary current
- IEC 60044-8
- Nominal primary current 80, 300 or 800 A
- Current sensor cl. 1.0

\[ u_{out} = M \frac{di_p}{dt} \]
Voltage Sensor - Voltage Divider

Resistive divider
- Matched resistor pair
- 1:10 000 divider ratio
- Accuracy up to class 0.5

Capacitive divider
- $Z_c = 1/\omega C$
- 1:10 000 divider ratio
- Accuracy up to class 3
- Small size ideal for bushings
Combi Sensor, type KEVCD_

- Current and voltage sensors in the same block
- Measurement and protection by one sensor
- Dimensions and primary connections same as DIN-type CTs (DIN 42600)
- 12, 17.5, 24 kV, two types:
  - A. \( \leq 1250 \) A
  - B. > 1250 A (max. 3200 A)
- Including coupling electrode for voltage indication
## Selection Guide for KEVCD Sensors

<table>
<thead>
<tr>
<th>Nominal voltage</th>
<th>Rated current range (first row)</th>
<th>Functions included (second row)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 1250 A</td>
<td></td>
</tr>
<tr>
<td>Upto 12 kV</td>
<td>$I + U + U_{ind}$</td>
<td>$I + U_{ind}$</td>
</tr>
<tr>
<td>KEVCD 12 AE3</td>
<td>KEVCD 12 AG3</td>
<td>KEVCD 12 BE2</td>
</tr>
<tr>
<td>KEVCD 12 BG2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1600...3200 A</td>
<td></td>
</tr>
<tr>
<td>Upto 12 kV *)</td>
<td>$I + U + U_{ind}$</td>
<td>$I + U_{ind}$</td>
</tr>
<tr>
<td>KEVCD 12 AE3C</td>
<td>KEVCD 12 AG3C</td>
<td>KEVCD 12 BE2C</td>
</tr>
<tr>
<td>KEVCD 12 BG2C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upto 17.5 kV</td>
<td>KEVCD 17.5 AE3</td>
<td>KEVCD 17.5 AG3</td>
</tr>
<tr>
<td>KEVCD 17.5 BE2</td>
<td>KEVCD 17.5 BG2</td>
<td></td>
</tr>
<tr>
<td>Upto 24 kV</td>
<td>KEVCD 24 AE3</td>
<td>KEVCD 24 AG3</td>
</tr>
<tr>
<td>KEVCD 24 BE2</td>
<td>KEVCD 24 BG2</td>
<td></td>
</tr>
</tbody>
</table>

*) Insulation level according to Chinese standard
CVT+ program for Instrument transformers

Successful industrial application of on-line engineering tool for engineer-to-order products.

GFFF in Europe:
ABB CZELS – Brno – Czech Republic

CVT+ allows ABB to become the fastest supplier

- Vision for conventional instrument transformers:
  - customer places order within 15min
  - production starts within 2 hours
  - manufacturing time < 6 working days
- Guarantee cost efficiency by a common range of main ITs and common processes
- Advanced system for engineering wide range of Instrument Transformers to speed up product design and manufacturing
- Internet Sales System brings the set of products with fully customisable solutions
Instrument transformers – external R 2003

WE 47%

SEA 7%

MENA 7%

LAM 2%

CEE 37%