



HIRSCHMANN

A **BELDEN** BRAND

Case Study

CS 201E

Dashiqiao 220kV Intelligent Substation in Liaoning Province

Dashiqiao 220kV intelligent substation is the first 220kV intelligent substation in Liaoning province, which located in northeast China.



This intelligent digital substation is designed and constructed to support unattended operations.

The network communication in this 220kV substation is based on the IEC61850-9-2 standard. Replay protection is also based on modern satellite synchronization and Ethernet communication was integrated to replace the ordinary signal collection and control method based on the serial point-to-point method. With the implementation of this technology, the Dashiqiao 220kV substation became China's first 220kV substation based on the centralized replay protection principle and IEC61850-9-2 standard.

Optoelectric current transformers and power transformers are being used to provide digital signal for monitoring, protection and measurement in Dashiqiao 220kV intelligent digital substation, digital signals are transmitted through fiber optic links to make this substation a pure digital running basis substation automation.

This substation network adopted a layered, distributed structure; separated by Station bus Layer, Bay Layer and Process bus Layer. 100Mbps Star topology Industrial Ethernet was used in all layers. In station bus layer, all MMS, GOOSE and IEEE1588 data were transmitted in one network. In 220kV and 110kV process bus layers, SV and GOOSE

were separated networked into independent networks. Switches used in 220kV and 110kV process bus layers are configured based on bay configuration principle.

In Station Bus Layer and Bay Layer, protection relays' and measurement devices' communication is based on IEC 61850-8-1 standard. Devices in Bay Layer are communicating with merging units based on IEC61850-9-2 standard.

System Requirements

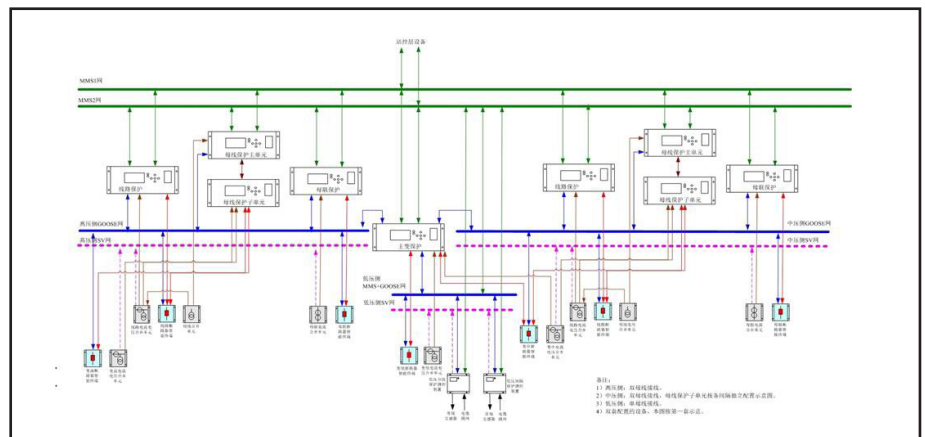
- Fully Comply with IEC61850 & IEEE1613 standard
- Fulfill requirements defined in „Intelligent Substation Design Norm – State Grid of China“
- Support of support high precision time synchronization based on IEEE1588
- Low latency real-time data transmission
- Doubled networks to realize maximum reliability
- Switches must be reliable enough for long-term non-stop running purpose
- Withstand the harsh installation environment (moisture and strong EMI)

**Be certain.
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Belden Solution

- Ultra-Ruggedized MACH1000 switch, Fanless design, capable of 77-300VDC dual power input with redundant power supplies
- Capable of offering two time synchronization methods: SNTP & PTP
- VLAN segmentation along with QoS to ensure real-time transmission of most critical data
- Port speed limiter and broadcast limiter ensure max. operation safety
- Double star topology fiber optic networks are used in process bus layer, GOOSE & SV are separated into two independent networks, IEDs in process bus are interconnected via fiber optic links
- By using SNMP protocol, switch monitoring can be easily integrated into existing substation SCADA system.



Product Details

MACH1000

- Rack-mount ruggedized switch
- Maximum uptime in extreme environmental conditions
- Designed for enhanced requirements in substations
- Extended temperature range: -40°C up to +85°C



Why Belden

- High available and reliable industrial Ethernet reputed products
- Fully comply with IEC61850 , IEEE1613 standard
- KEMA and State Grid A Grade Certificates
- Hardware PTP/IEEE1588 support, precision <30ns
- Many successful installation bases in intelligent substation automation as well as in whole power industry
- Flexible switch configuration, various port counts, port connector types