ADIs expertise in integrated energy measurement—300 million ADI metrology-based meters deployed.

Precision measurement of current and voltage through highly accurate converters and amplifiers.

Enable robust and reliable power networks using high performance processing technology.

Main Challenges and System Considerations

Higher reliability and lower assembly/manufacturing costs.

High signal dynamic range (up to 4000:1) and resolution (≥ 12 bits system ENOB) in some applications.

Various requirements of system accuracy (protection up to 0.5%, measurement up to 0.1%).

Multichannel (simultaneously as optional).

Real-time processing (10 ms, 20 ms for all channels).

System level connectivity: RS-232, RS-485, Ethernet, CAN, USB. In most cases, the communication interfaces also require isolation (≥ 500 V).

Robustness requirements such as overvoltage protection, EMC/EMI, industry operation temperature range, long lifetime.

To develop a low voltage device, the designer usually needs to consider different system requirements, including dynamic range, accuracy, bandwidth, channels, isolation, real-time processing, cost, and robustness.

Typical Distribution System Categories

Low voltage system: < 35 kV, including 10 kV, 6 kV, 3 kV.

Ultralow voltage system: 1 kV, 380 V, 220 V.

Typical Power Distribution Device Signal Chain

External ADC solution

Integrated ADC solution

The signal chain above is representative of a typical power distribution device. The technical requirements of the blocks vary, but the products listed in the table below representative ADI’s key promotion parts for the power distribution application.
AD8604

Vos = 500 μV (max), Vref = 2.7 V to 5.5 V, wide bandwidth; 8 MHz

AD7490

16-channel, 12-bit non-simultaneous ADC

AD7689/AD7699

8-channel, 16-bit non-simultaneous ADC

AD7606/AD7607

8-channel, 16-bit/14-bit simultaneous ADC

Reference Design for Low Voltage Energy Distribution System

Reference circuits are subsystem-level building blocks that have been engineered and tested for quick and easy system integration.

More reference circuits are available at:

- www.analog.com/CN0031
- www.analog.com/CN0148
- www.analog.com/CN0157

Circuits from the Lab™ Reference Circuits for Energy Management

Reference circuits are subsystem-level building blocks that have been engineered and tested for quick and easy system integration.

- Layout Considerations for an Expandable Multichannel Simultaneous Sampling Data Acquisition System (DAS) Based on the AD7606 16-Bit, 8-Channel DAS (CN0148) — www.analog.com/CN0148
- A Low Cost, 8-Channel, Simultaneously Sampled, Data Acquisition System with 84 dB SNR and Excellent Channel-to-Channel Matching (CN0175) — www.analog.com/CN0175
- 24-Bit, 4-Channel, High Dynamic Range, 156 KSPS per Channel Simultaneous Sampling Data Acquisition System (CN0157) — www.analog.com/CN0157
- Half-Duplex, Isolated RS-485 Interface (CN0031) — www.analog.com/CN0031
- More reference circuits are available at: www.analog.com/circuits

Reference Design for Low Voltage Energy Distribution System

Main Features
- 2 × AD7606 as analog front, with no amplifier
- ADSP-BF51x can run RTOS, protection algorithm, and communication stack in the same time
- ADSP-BF518 has IEEE 1588, which is required by digital substation applications
- Free schematics, PCB, software (OS, drivers, etc), and documents are provided

If you need more information about ADI energy applications and products, please visit: energy.analog.com

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