

Magtech Voltage Booster

Stabilising medium voltage lines



- **Dynamic** – lifts and stabilises frequent voltage changes
- **Robust** – no moving parts, no maintenance
- **Safe** – direct bypass during operation
- **Self adaptive** – no need for calibrations and adjustments
- **Flexible** – prepared for remote control and metering

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Magtech Voltage Booster – MVB

Power Quality

- Regulator lifts and stabilises medium voltage lines
- Lifts and stabilizes voltages for each phase individually
- Corrects unbalanced voltages (symmetrical)
- High dynamic, voltage correction 1000V/s
- Fast regulation; 500ms for a typical load change
- Continuous control – no steps

Robust

- 25 years designed lifetime - No moving parts or semiconductors in the power circuit
- The patented MCI, Magtech Controllable Inductor – a design with mainly copper and iron in power circuit
- Oil cooled, standard transformer oil, optional with organic decomposable oil
- System tested before shipment
- Lifts and stabilises frequent voltage changes – unlimited number of voltage corrections

Safe

- Bypass function ensures fail safe (no power interruptions) at overload or faults
- Returns automatically to operation when fault is not present (e.g. high temperature, overload)
- Secures no reduction of short circuit capacity
- Safe bypass – direct bypass during operation



Proven

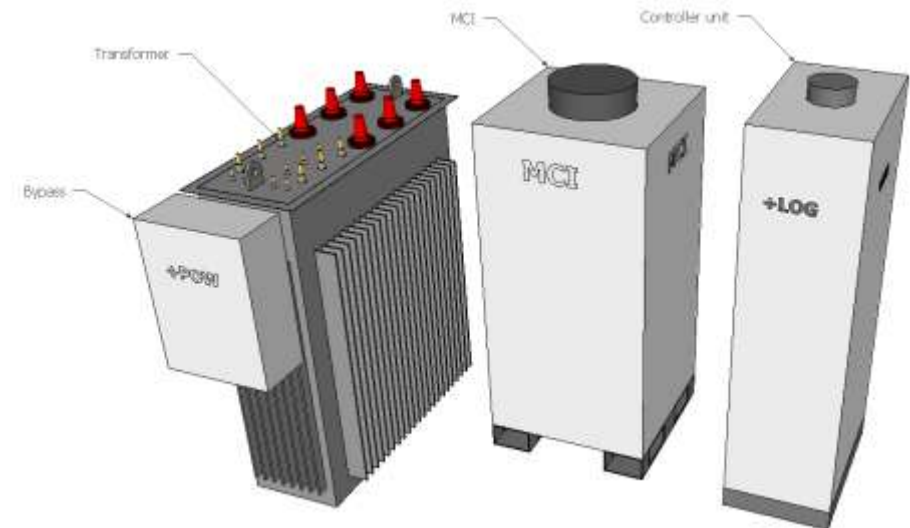
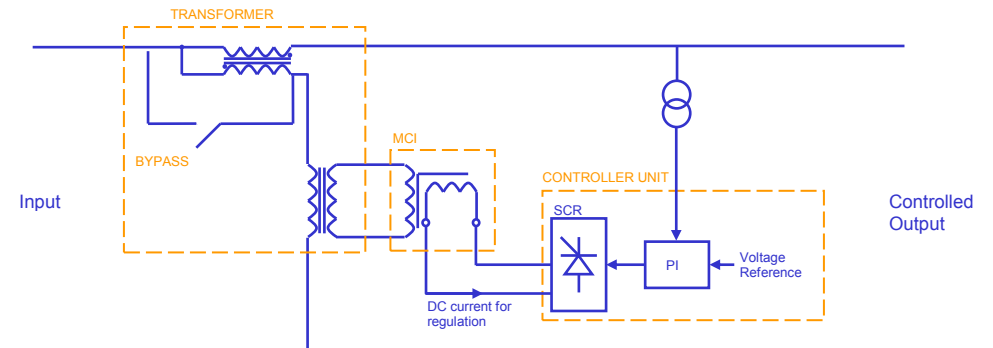
- Developed in close cooperation with several Norwegian electric utilities
- In compliance with EN50160 and CE-marking for industrial EMC environment
- First pilot installed 2009
- Regulator uses same system solution as the low voltage version of Magtech Voltage Booster that has been delivered in large numbers all over Europe

Quick installation

- Easy to install – prefixed pluggable cables between units
- All units in one kiosk
- Only two power cables to be connected externally, for over head lines or ground cables
- Ground mounted
- Free planning tool (Excel) available on www.magtech.no

Areas of application

- Stabilizing voltage for long medium voltage (MV) lines or sea cables. e.g 5kV, 10kV, 22kV etc
- Supporting areas with vacation homes, weekend cottages, rural homes and stores, farms, fish farms, production plants etc.
- Provisional power supply for construction areas, tunnels etc.
- Stabilizing voltage in the grid when voltage fluctuation is caused by distributed generation like solar cells, hydropower or wind-power-plants.
- Stabilizing and lifting voltage on the medium voltage side, when voltage drop is caused on the HV side.



Modules with prefixed cables

Technology

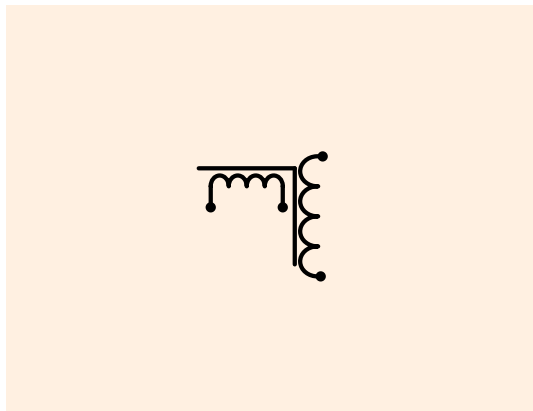


MCI - Magtech Controllable Inductor

Magtech has developed a patented magnetically adjustable inductor with an exceptional efficiency and large control range.

The MCI is produced with copper and iron.

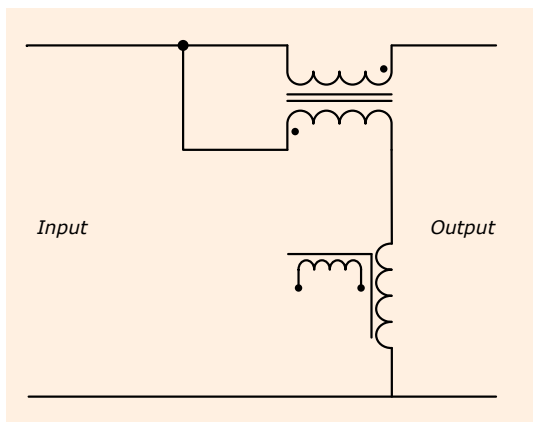
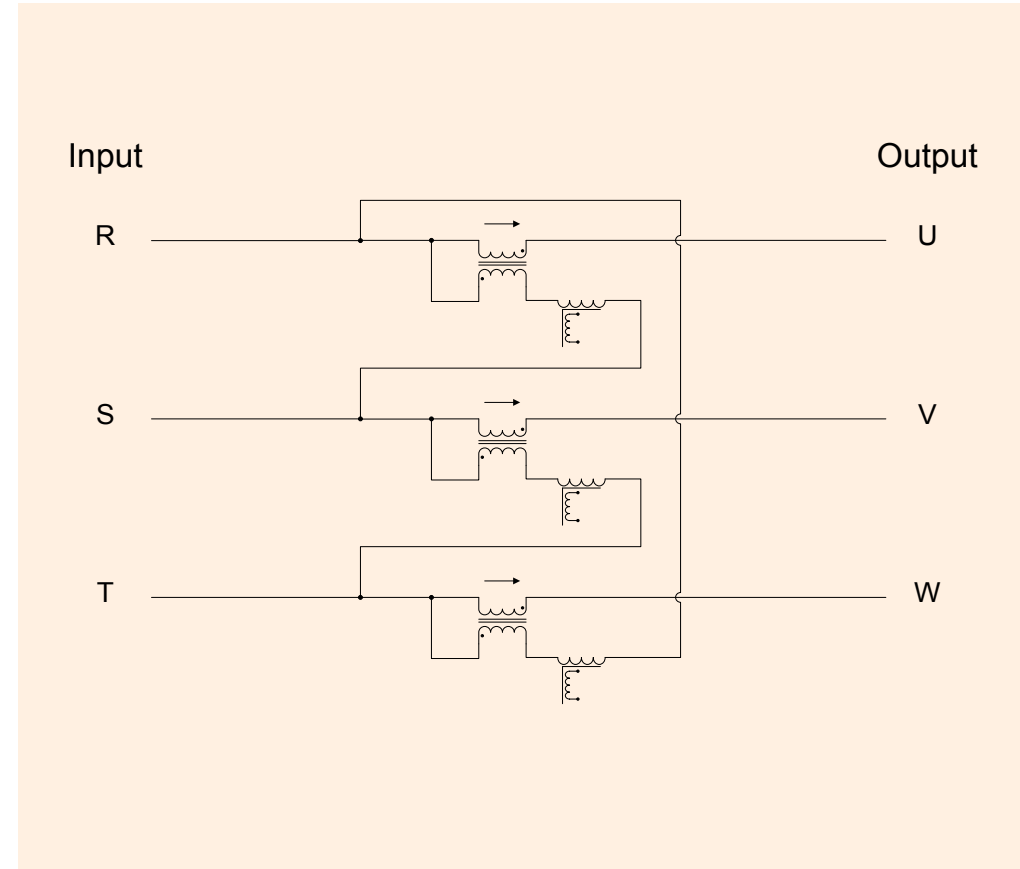
The main copper winding on the outside produce AC flux lines in the core. A hidden control winding on the inside produces DC flux lines 90° on the main flux lines. The amount of DC flux sets the inductance value in the main winding.



MCI - new symbol

Magtech has drawn a new symbol for this new component.

Because of its special construction, two inductors are indicated with a common iron core, 90° angle between them.



Booster topology

The MCI is connected to an auto transformer. This picture shows one phase.

By adjusting the inductance value in the MCI, the voltage over the autotransformer automatically changes accordingly.

By controlling the voltage over the auto-transformer, an extra voltage vector is added to the output and enables active lifting of the output voltage.

Three phase MVB

Three regulators. The booster topology is repeated for all three phases. Electronic regulator cards measures phase-to-neutral voltage, and controls each MCI and lifts all phase voltages to a correct value individually.

Bypass. If the voltage output of the MVB is detected to be less than -10%, a 3-pole contactor (sectos) bypasses the winding of the autotransformers. This also happens if the booster has been overloaded and high temperature is detected. The MVB automatically restarts when the situation is over.

Technical data

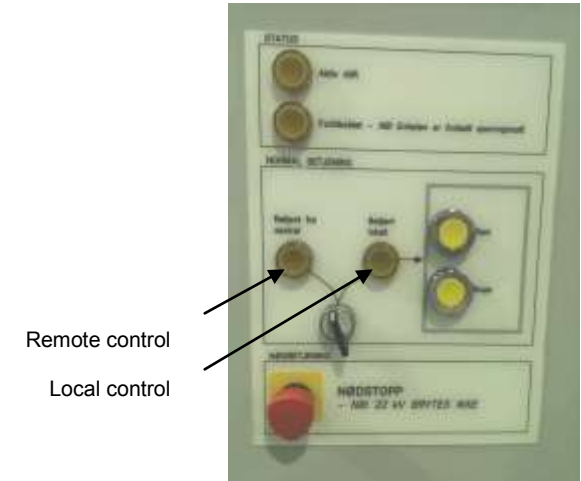
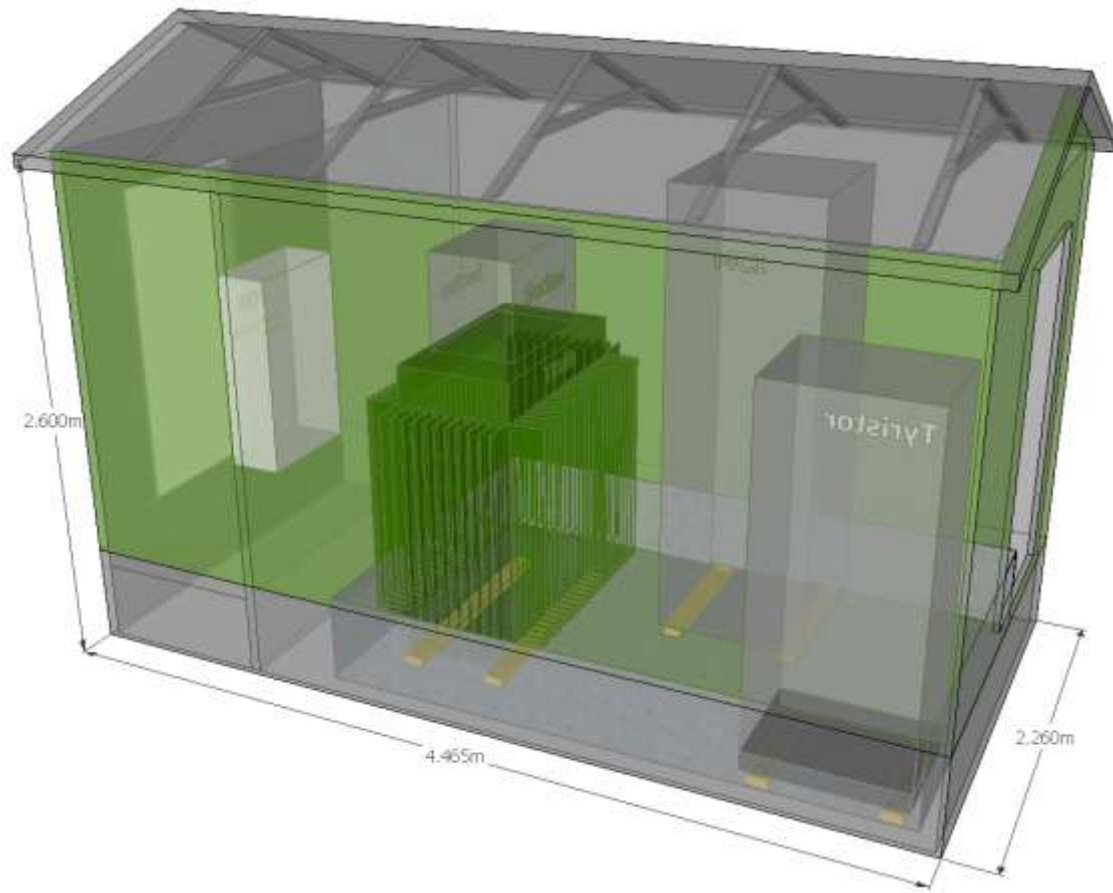
| Model | MVB30-22kV | MVB50-22kV | MVB60-11kV | MVB100-11kV | Other sizes on request |
|---|------------|------------|------------|-------------|------------------------|
| Frequency [Hz] | 50 | 50 | 50 | 50 | - |
| Voltage [Volts] (3 – phase) | 22000 | 22000 | 11000 | 11000 | - |
| Load, nominal [MVA] | 1,1 | 1,75 | 1,1 | 1,75 | - |
| Load, 6 hours, @20°C, [MVA] | 1,65 | 2,63 | 1,65 | 2,63 | - |
| Current nominal [ampere] | 30 | 50 | 60 | 100 | - |
| Current, 6 hours, @20°C, input voltage 195 V [ampere] | 45 | 75 | 90 | 150 | - |
| Voltage set point [volts] | 21700 | 21700 | 10800 | 10800 | - |
| Voltage lift [%] | 0...+8 | 0...+5 | 0...+8 | 0...+5 | - |
| Dynamic response [V/s] | 1000 | 700 | 500 | 350 | - |
| No-load loss [kW] | 2 | 2 | 2 | 2 | - |
| Efficiency [%] ¹ | 98,5 | 98,5 | 98,5 | 98,5 | - |
| Power factor [cos φ] ¹ | 0,99 | 0,99 | 0,99 | 0,99 | - |
| Total Harmonic Distortion [%] ¹ | 0,5...1,5 | 0,5...1,5 | 0,5...1,5 | 0,5...1,5 | - |

Features

| | | | | | |
|---|---|---|---|---|--|
| Bypass @ U_out ±15% or high temp - No voltage interruption - Automatic restart | √ | √ | √ | √ | |
| One controller per phase - individual regulation of phases | √ | √ | √ | √ | |
| Handles unbalanced load | √ | √ | √ | √ | |
| No moving parts in the power circuit | √ | √ | √ | √ | |
| Maintenance free | √ | √ | √ | √ | |
| 25 years designed lifetime | √ | √ | √ | √ | |
| Quick installation | √ | √ | √ | √ | |

¹ - nominal load, varying voltage boosting

Mechanical dimensions



Prefixed cables between units

Additional technical data:

MVB50-22kV: 5% voltage correction

Auto-transformer unit:

- kV BIL 1,2/50us 125
- kV r.m.s. 50Hz -1mn 24
- Weight (total): 1750 kg
- Oil: 650 kg (750 liter)
- Dimensions: 1290 x 436 x h: 1560 (inner tank) 1400 x 806 x h: 1570 (outside, including cooling ribs).

Magtech Controllable Inductors:

- Weight (total): 2000 kg
- Dimensions: 800 x 800 x h: 1850

Control cabinet:

- Dimensions: 800x600x2000



