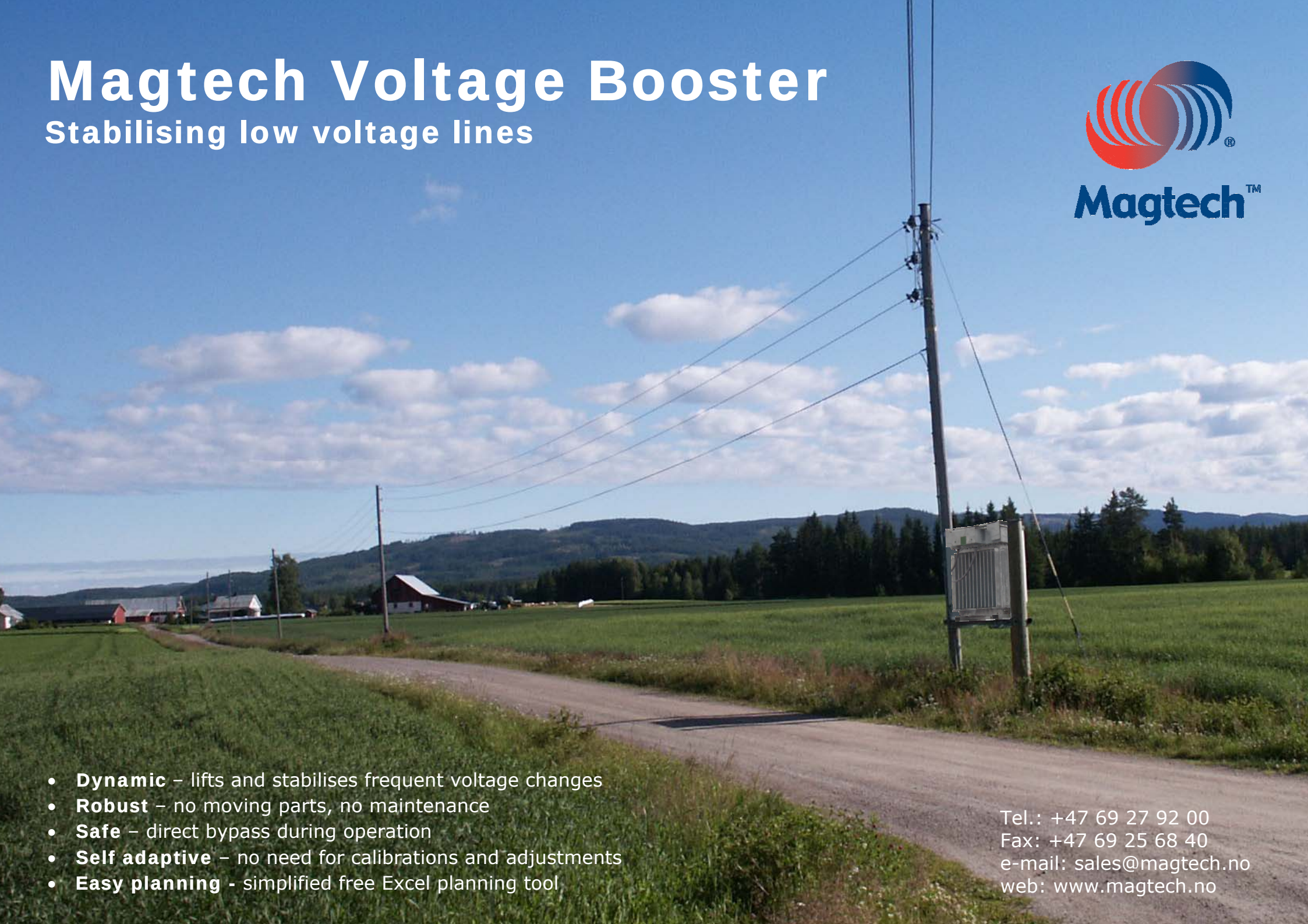
Magtech Voltage Booster

Stabilising low 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
- **Easy planning -** simplified free Excel planning tool

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Magtech Voltage Booster – MVB

Power Quality

- Lifts and stabilizes voltages for each phase individually.
- Corrects unbalanced voltages (symmetrical)
- Increases single pole short circuit capacity with typically 60 % or more for Y-ground network
- Voltage is not influenced if N-conductor is disconnected
- This is solved by a patented balance winding
- Fast regulation; 100 ms for a typical load change

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
- Galvanized casing for outdoor use
- Oil cooled, standard transformer oil, optional with organic decomposable oil
- Hermetically sealed with overpressure valve
- Over voltage protected

Safe

- Bypass contactor ensures fail safe (no power interruptions) at overload or faults
- Returns automatically to operation when fault is not present (e.g. high temperature, overload)
- Increases one pole short circuit capacity in ground Y networks.
- Ik1 increased by more than 60%
- Option: electronic circuit breaker on output takes care of very low short circuit levels

Patent nr.: NO 317045 US 6,788,180 B2

Proven

- Developed in close cooperation with several electric utilities (a.o. Vattenfall Eldistribution AB, Hafslund Nett AS)
- In compliance with EN50160 and CE-marking for domestic use
- A large number of units installed in Europe, first pilot installed 2003

Quick installation

- Easy to install - one day
- Pole mounted, no housing required, one or two poles
- Ground mounted, no housing required
- Free planning tool (Excel) available on www.magtech.no

Areas of application

- Stabilizing voltage for long LV lines or sea cables. Supporting telecom base station transmitters for GSM and UMTS, 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 LV side, when voltage drop is caused on 1kV or higher. For ground cables in rural or densely populated areas. Mounted on the ground or on poles.

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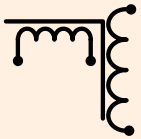
Technology

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.

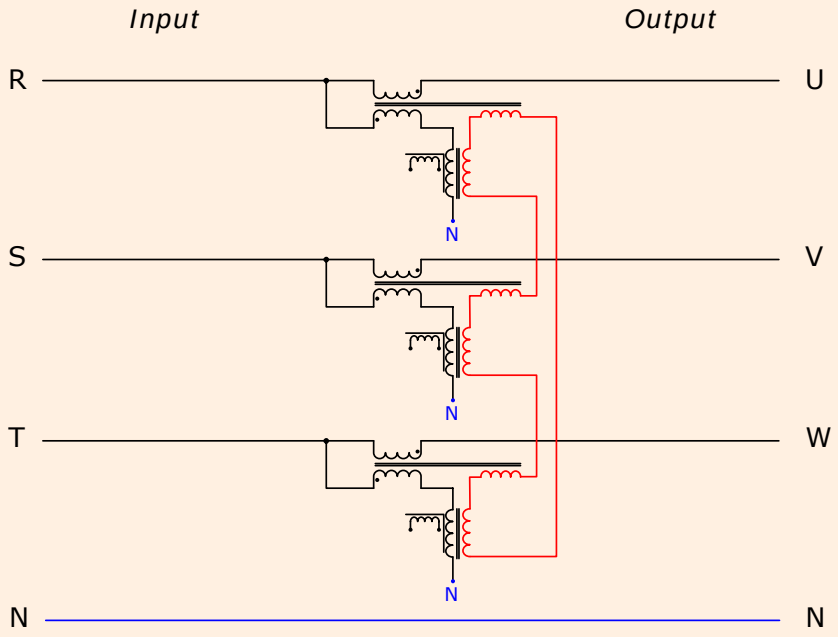
The main copper winding on the outside produce AC flux lines in the core. A hidden control winding on the inside produces DC flux lines 90° on the main flux lines. The amount of DC flux sets the inductance value in the main winding.

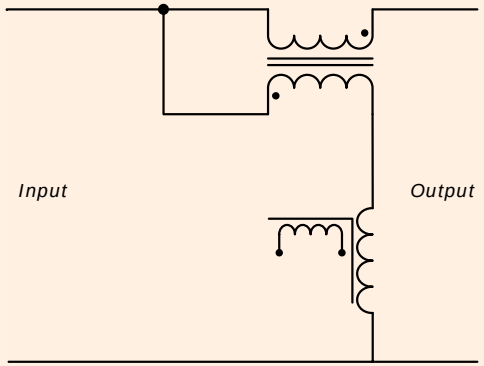


MCI - new symbol

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.

Balance winding. The MVB has a patented balance winding (drawn red) between all phases to help stabilizing the voltages. In addition to stabilizing, the balance winding also increase the one pole short circuit capacity considerable – both in front and behind of the booster.

Bypass. If the voltage output of the MVB is detected to be less than 190 volts, a 3-pole contactor bypasses the secondary 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.

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Technical data

Model	MVB40-230	MVB125-230	MVB250-230	MVB70-400	MVB160-400	MVB250-400
Distribution system connection	IT	IT	IT	TN / TT	TN / TT	TN / TT
Frequency [Hz]	50	50	50	50	50	50
Voltage [volts] (3 – phase)	230	230	230	230 / 400	230 / 400	230 / 400
Load, nominal [kVA]	10	32	65	30	70	112
Load, 6 hours, @20°C, input voltage 195 V [kVA]	16	50	100	50	110	170
Current nominal [A]	25	80	160	40	100	160
Current, 6 hours, @20°C, input voltage 195 V [A]	40	125	250	70	160	250
Voltage set point [V]	235	235	235	235	235	235
Voltage lift [%] (symmetrical loads)	0…+17	0…+20	0…+10	0…+15	0…+15	0…+10
Voltage lift, voltage reduction [%] (unbalanced loads)	0…+17	0…+20	0…+10	0…+28, 0…-7	0…+28, 0…-7	0…+18, 0…-7
Dynamic response [ms]	150	200	200	150	200	200
No-load loss [W]	200	340	340	200	340	340
Efficiency [%] [1]	94-96	94-96	94-96	96-97	96-97	96-97
Power factor [cos φ] [1]	0,96-0,97	0,96-0,97	0,96-0,97	0,98-0,99	0,98-0,99	0,98-0,99
Total Harmonic Distortion [%] [1]	1-4	1-4	1-3	1-5	1-5	1-4
Mechanical dimensions						
Width x Height x Depth [mm]	754x928x539	1003x1190x648	1003x1190x648	754x928x539	1003x1190x648	1003x1190x648
Weight [kg]	390	750	750	390	750	750
Cable connection [Copper mm^2]	≤ 16	≤ 50	≤ 70	≤ 16	≤ 50	≤ 70
Oil filled [liters]	75	158	158	75	158	158
Enclosure oil filled	Galvanized	Galvanized	Galvanized	Galvanized	Galvanized	Galvanized
Features						
Bypass @ U_out ±15% or high temp - No voltage interruption - Automatic restart	√	√	√	√	√	√
Handles 100% unbalanced load and maintains the voltage	50%	50%	50%	√	√	√
Single pole short circuit capacity increased by a minimum of 60%	unchanged	unchanged	unchanged	√	√	√
No moving parts in the power circuit	√	√	√	√	√	√
Maintenance free	√	√	√	√	√	√
25 years designed lifetime	√	√	√	√	√	√
Quick installation < one day	√	√	√	√	√	√

Option: SSP = Short-Circuit Safety Protection, 3-pole circuit breaker installed on output, FR3 = Environmental friendly organic oil.
[1] - nominal load, varying voltage boosting

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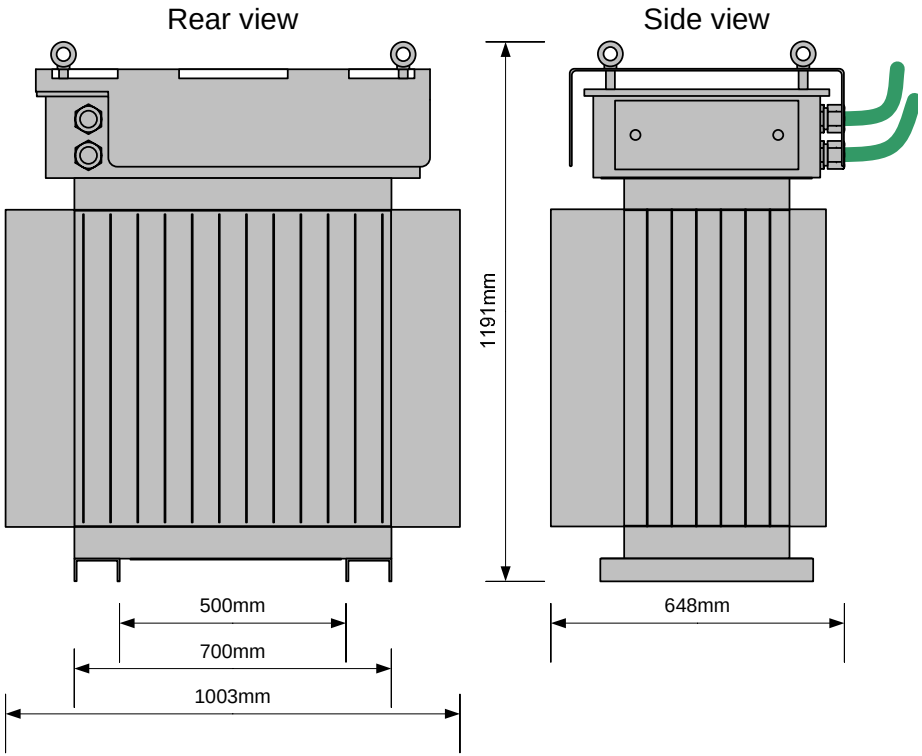
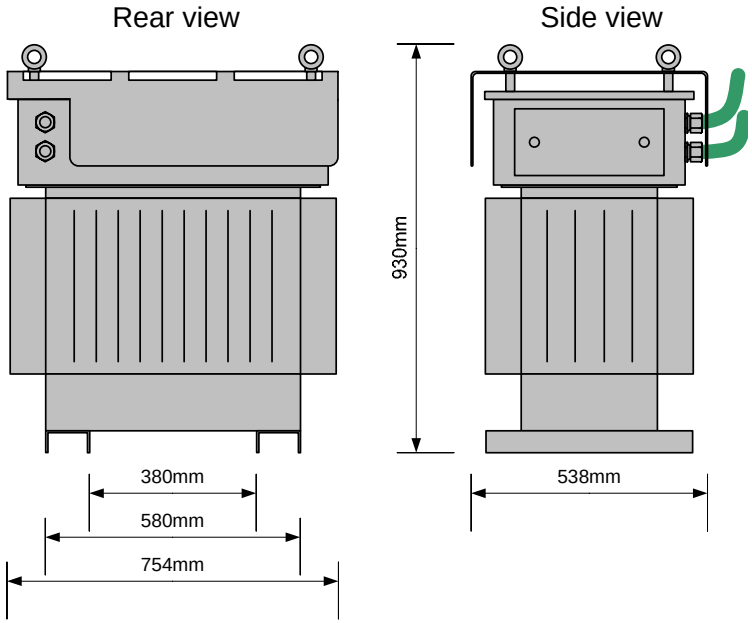
Mechanical dimensions



MVB160-400
750kg



MVB70-400
390kg

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