Measurement and Dimensioning

Customer-Specific Suppression Equipment

EMC measuring station in front of measuring cabin

Test environment for motor-side filter measures

Every electric or electronic device may cause electromagnetic oscillations, which may lead to interference in electric or electronic equipment nearby

The objectives of interference suppression are set up in consultations with the customers.
The test laboratory of FUSS-EMV leaves nothing to be desired in terms of size and equipment. It includes a standard measuring station for conducted EMC according to international standards, shielded measuring cabin for radiated EMC, leakage-current measuring station, test environment for motor-side filter measures.
The mobile test service also will come at your request to carry out EMC measurements on site.

The applicable interference suppression filters, output chokes, or combined units either come from our standard product line, or custom-made solutions are developed and produced by Ing. Max FUSS GmbH – from a single item all the way to mass-produced items.
At your request, the interference suppression filters will be delivered with a quality certificate like UL.

We support you in developing your EMC and earthing concepts for machines and equipment, in setting up your switch gear cabinets according to EMC standards, and in ensuring CE conformity for your products.
Our measurement service will even come to you to detect EMC interference on the scene.

Radio Interference Voltages
Tests at the standard measuring station or in a measuring cabin at the mains connection without interference suppression or with interference suppressors from our standard programme; modification of existing interference suppressors, if necessary.

Radiated Interference
Measurement of the magnetic component of the field with special antennae in the measuring chamber and measurement of the electric component in the free field.

Measurement of Harmonic Frequencies
We possess measurement technology to measure relative harmonic content up to the 50th harmonic of power supply units or frequency converters according to EN 61000-3-2.

Measurement of Installed Systems
- Determination of interference in the frequency range of 9 kHz to 1 GHz
- Tests of interference voltage with impedance stabilization grid up to 250 A
- Tests of interference voltage with high impedance sensing heads
- Radiated, magnetic or electric component
- Measurement and examination with near field probe, spectrum analysis, bearing identification antennae

Measurement and analysis of Power Quality

FUSS-EMV

Your FUSS-Team

For EMC and Power Quality

The FUSS-EMV service team: Dipl.-Kfm. Christoph Keddig, Dipl.-Ing. Volker Keddig, Tobias Gustke, B.Eng and Dipl.-Ing. André Domurat-Linde (from left to right)

EMI Filters and Harmonic Filters are the solution to fulfill the standards and are found in many applications:

- *PV-Systems*
- *Wind Power Plants (WEC)*
- *Mechanical engineering*
- *Instrument manufacture*
- *Medical engineering*
- *Engine bench testing*
- *Centrifuges*
- *Electric trains*
- *Ventilation and air conditioning technology*
- *Hoists, lifts, cranes*
- *Escalators, autowalks*

Nothing can replace know-how. In 1986, we developed the first interference-suppression filter - the engineers and technicians of Ing. Max FUSS GmbH have been working to improve EMC ever since, experiences acquired in the production of electromechanical regulators, transformers and rectifiers have been our advantage since the founding of our company in 1908.

Today FUSS-EMV - as a leading supplier in the field of line-bound EMC interference suppression of electrical propulsion systems, offers its customers an approach to problem solving based on service and consultation.
As a medium-sized business, we have the lean structure to develop solutions quickly, start production without delay and deliver our products smoothly to the customer.

And all this Made in Germany!

Production hall

Training class room

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FUSS-EMV

Vision

- EMC
- Power Quality
- Filter for Renewable Energy
- e-mobility

EMI - Filters

Output Filters

Filter for Renewable Energy

Filter for Power Quality

Green Technologies
Developed and Manufactured in Germany
CO_2- Reduced Production

FUSS-EMV

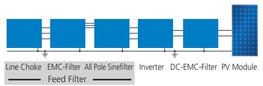
EMC and Power Quality

Fundamentals

- **Green Technologies**
  FUSS-EMV has made a name for itself in renewable energies. The latest development - voltage controlled Active Filters for Wind Power Plants.
- **Developed and Manufactured in Germany**
  Flexibility and the highest levels of quality with short lead times.
- ***CO_2 Reduced Production***
  In the new company headquarters, FUSS-EMV has implemented measures for reducing CO_2 emissions in its business operations. A 64 KW_p photovoltaic plant coupled with geothermal heating has resulted in an annual CO_2 reduction of approx. 74 tons.

Power Quality
Mains efficiency requires that a grid or a partial load is free from interferences. Current and voltage must be available in regulation - compliant sinus quality with cos φ proportioned commensurately.
To achieve this, EMC interferences have to be suppressed and harmonics, intermediate harmonics and resonances likewise.
To generate this condition in mains networks and partial loads, special filters are necessary: EMC filters, harmonics filters or the innovative Active Hybrid Filters. Deployment of these filters is a prerequisite for maintaining the applicable international Standards.

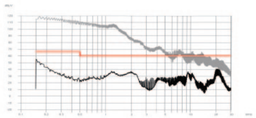
Filter for Renewable Energy Plant Operation
Renewable energies such as those generated by wind power plant or photovoltaic plants (PV modules) are the only by and large emission-free energy sources of our times. However, their massed operation causes considerable problems in terms of Power Quality.



Principle picture of filter arrangement

PV modules require an inverter to feed the generated direct current in the form of alternating current. These inverters emit high frequency interference voltages and high levels of harmonics in the power lines.
A FUSS DC filter between the inverter and the module field prevents this.

EMC (Electro Magnetic Compatibility)
The following applies to all electrically powered products: provisions for electromagnetic compatibility are absolutely necessary on functional grounds and are also demanded by EMC legislation and various other statutory regulations.



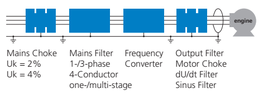
Typical test chart: grey curve before interference suppression, black afterwords, red line marks the limiting values

Interference is produced by the electromagnetic oscillations that occur when the electrical charge carriers change their flux in size or direction.
The change in flux can be determined by the measurement of current or voltage.

Excitation in periodic and non-periodic electric circuits is caused by:

- turning on or off electric equipment
- clock frequency of microprocessors
- analog or digital functioning of semiconductors
- controlling of engines, for example by means of frequency converters

To ascertain EMC of equipment we conduct the necessary measurements in our laboratory. The applicable EMI-filters come from our standard productor custom - made solutions are developed.



FUSS-EMV

Interference Suppression Components

Standard Program

EMI-Filter - Filter Components for suppressing the high frequency interferences, range 9 kHz up to 30 MHz and Low Harmonics

EMI-Filters

Phase	Voltage	Current
1	**up to 230 V**	**1 - 32 A**

Attached to base, side, round, booktype
IP20

Phase	Voltage	Current
3	**230 - 690**	**1 - 2500 A**

Attached to base, side, booktype
IP20, ab 180 A: IP00

Phase	Voltage	Current
3	**480 V**	**1 - 63 A**

With low contact current (suitabel for FI-switches)
IP20

Phase	Voltage	Current
3	**480 V, 500V**	**1 - 250 A**

For IT - nets, IP20, from 180 A: IP00

Phase	Voltage	Current
3 + N	**480 V**	**1 - 630 A**

4 conductor Filter, IP20, from 180 A: IP00

Line Reactors

Phase	Voltage	Current
1	**up to 230 V**	**1 - 32 A**

With 2% or 4% U_k
IP00

Phase	Voltage	Current
3	**up to 690 V**	**1 - 2100 A**

With 2% or 4% U_k
IP00

EMI Combinations

Voltage	Current
up to 480 V	**1 - 200 A**

EMI Filter and Line Reactor with 4% U_k
IP20

Harmonic Filters, passive

Voltage	Current
up to 400 V	**1 - 450 A**

THDi 10% or 16%
IP20

Voltage	Current
up to 400 V	**1 - 450 A**

For unregulated B6 bridge, THDI < 8%
IP00

Filter for chambers

Phase	Voltage	Current
1 / 3	**250 V / 440 V**	**1 - 350 A**

Frequency range 14 kHz - 40 GHz
IP20

DC Chokes

Voltage	Current
up to **800 V**	**3,2 - 450 A**

IP00

New developments and customized developments on request.

Motor Chokes - Passive EMI-Filter for sinusoidal input signals for motors with frequency converters

Motor Chokes

Phase	Voltage	Current
1	**up to 528 V**	**1 - 500 A**

Bis 3.000 oder 12.000 U/min
Höhere Drehzahlen auf Anfrage
OP20, ab 180 A: IP00

dU / dt - Filters

Phase	Voltage	Current
3	**up to 530 V**	**6 - 610 A**

Stahlgehäuse
IP20, ab 180 A: IP00
Sonderentwicklungen insbesondere für Drehzahlen bis 100.000 U/min

Sinusoidal

Phase	Voltage	Current
3	**up to 260 V**	**1 - 16 A**

Steel housing
IP20

Phase	Voltage	Current
3	**up to 690 V**	**1 - 35 A**

Steel housing
IP20

Phase	Voltage	Current
3	**up to 690 V**	**2,5 - 1250 A**

Contact protection acc. to VBG4
IP00

Phase	Voltage	Current
3	**up to 690 V**	**1 - 250 A**

For high rotations up to 100.000 U/min
IP20

All Pole Sinefilters

Phase	Voltage	Current
3	**up to 260 V**	**1 - 13 A**

Steel housing
Switching frequency from 6 kHz on, IP20

Phase	Voltage	Current
3	**up to 690 V**	**1 - 35 A**

Steel housing
Switching frequency from 6 kHz on, IP20

Common Mode Sinefilter

Phase	Voltage	Current
3	**up to 690 V_{AC}**	**50 - 200 A**

In combination with 3AFS400-xxx
switching frequency from 6 kHz on

FUSS-EMV

Interference Suppression Components

Standard Program

EMI-Filter - Active und Passive EMI-Filters for Renewable Energy Plant Operation

Feed Filters for PV

Phase	Voltage	Current
3	**up to 690 V**	**1 - 600 A**

Attached to base side
IP00

DC Filters for PVS

Voltage	Current
up to 1200 V	**13 - 450 A**

Steel housing, 3-stepped
IP20

DC Bus Bars Filters for PVS

Voltage	Current
up to 1200 V	**1600 A**

Steel housing, 2-stepped
IP00

ISUVOC 100+ WKA

Phase	Voltage	Current
3 / 3+N	**480 V**	**1 - 100 A**

Active Filter (for WEC) for any grid
Parallel operation possible
Noise emission < 60 dB, IP54

ISUVOC Filter - Voltage controlled Active Filters for highest Power Quality

ISUVOC 50

Phase	Voltage	Current
3 / 3+N	**400 V**	**1 - 50 A**

Effective and economic Active Filter,
19" design, up to 4 modules connectable
IP20

ISUVOC 100+

Phase	Voltage	Current
3 / 3+N	**480 V**	**1 - 100 A**

Voltage controlled High End Active Filter,
Parallel operation possible
Noise level < 60 dB, IP43 (IP54 optional)

ISUVOC C

Phase	Voltage	Switching frequency
3 / 3+N	**380 - 690 VAC**	**2 - 12 kHz**

Controller, combined with power electronics
it works as a closed control loop to reach
the exact compensation

ISUVOC EPS

Phase	Voltage	Power
3 / 3+N	**380 - 690 VAC**	**20 kVA -10 MVA**

Ideal current and voltage source, replaces common motor-generator sets, also available as mobile measurement system

ISUVOC Net Analyser INA - Power Quality Analyser

ISUVOC INA

Voltage	Frequency
110 - 690 V	**40 - 70 Hz**

Comparative measurements, recording and analysis via PC and evaluation software, acc. to EN 50160, IEC 614000-4-30, class A (mostly)

FUSS-EMV