Frequently asked questions about FCMA soft starters

1. What is the difference between an FCMA and conventional magnetic amplifier or saturable core reactor?
The FCMA works on the principle of two opposing sinusoidal fluxes whereas the saturable core reactor works on the principle of addition of DC flux to a sinusoidal flux. Thus the FCMA is totally different from the saturable core reactor.

2. Does the FCMA generate any harmonics?
The FCMA does not generate any harmonics as the core is always operated in the linear unsaturated zone of the B/H curve.

3. Has the FCMA been tested for Harmonic free operation?
Yes. The FCMA has been tested repeatedly for Harmonic free waveform at site under actual operating conditions by waveform recording. The waveform records are available on request.

4. Is the FCMA a widely implemented technology?
Yes. The FCMA has been used for virtually every starting application. Around 4000 units with cumulative ratings of more than 3000 MW are working in the field.

5. What is the largest rating FCMA commissioned to date?
The largest rating commissioned to date is 14.8 MW, 11KV on a 13 MW synchronous motor.

6. What is the motor voltage during starting with FCMA?
Typically the motor voltage at zero speed will be set at 40-60%. The voltage increases with motor speed gradually and steplessly to keep the motor current constant. The motor voltage typically ramps up to 95% as the motor reaches full speed. After closing the RUN contactor the motor voltage is equal to line voltage.

7. What is the starting current I can expect for my application?
All reduced voltage soft starters while reducing the starting current also reduce the torque developed by the motor by square proportion. It is to be ensured that the motor torque at the desired staring current is always larger than the load torque demand by 10% or 0.1p.u. Otherwise the motor will fail to accelerate satisfactorily. We plot the motor torque and load torque on a common graph and generate a set of curves for acceleration. The best match is called the theoretical minimum starting current for the drive and the same is guaranteed. (Any changes in the actual data of load and motor will necessitate change the starting current setting)

8. What is the starting time I can expect for my application?
The starting time is a direct function of the total rotating inertia and inverse function of accelerating torque. This is calculated from the load data, motor data and acceleration curves and guaranteed. (Any changes in the actual data of load and motor will lead to change in the starting time)

9. Is FCMA a standard product or tailor-made product?
FCMA is a standard product tailored to give pre-guaranteed starting current and starting time. This requires proper pre-engineering with motor and load data. It is a standard practice to perform starting current and starting time calculations and guarantee them for the specific application.

10. Is a soft starter superior to the star- Delta starter?
Not necessarily. In fact if your motor can accelerate in the star mode to full speed the star-delta is a better and more economical method. This is due to the fact that the torque reduction is directly proportional to the current reduction in star delta. However torque reduction is directly proportional to the square of the current reduction in soft starters. Thus one has to plot the acceleration curves to come to a correct conclusion. An adhoc decision is ill advised. Star-Delta has certain disadvantages such as changeover kicks etc, which are to be considered. Combinational FCMA modules are available to provide the best advantages.

11. What is the difference between thyristor soft starters and FCMA?
Thyristor soft starters are phase angle controlled reduced voltage starters. The rms value of the voltage is controlled by passing a part of sinusoid waveform set by the firing angle of thyristor. FCMA essentially reduces the amplitude of the supply waveform without changing the sinusoid wave shape.

12. What is the Total harmonic distortion generated by thyristor soft starters?
Different manufacturers confirm between 10 to 20% during starting and 4-5% during running without bypass. Some actual tests at site have shown THD figures to be 38-40% during starting. In principle, lesser the targeted starting current, lesser is the thyristor firing angle and hence more is the waveform distortion and more is the total harmonic distortion.

13. What are the ill effects of Harmonics?
During starting the Harmonics represent a wasted current. Thus a thyristor soft starter with 30% THD will draw a starting current, which is 30% higher than the theoretical minimum starting current required by the motor & load combination. In certain cases, particularly two pole motors the harmonics may actually develop a braking torque. To overcome this the thyristor soft starter may have to provide a still larger starting current. Harmonics during starting may create disturbance in the system. Particularly the excitation systems of the generator may be affected resulting into exciter failure or poor voltage regulation. Harmonics during starting and running can be very harmful to synchronous machines in particular the rotating diode assembly in brushless machines. It can be inferred that harmonics should avoided during starting and running. The FCMA soft starter produces no harmonics at all during starting and running.

14. Does the FCMA have any moving parts?
No the FCMA is a completely static device with no moving parts.

15. What facility does the FCMA starter have for changing the starting current at site?
The FCMA has suitable taps through which the starting current can be set at site. However once the pre-engineering is correct there is hardly any necessity to change from the factory settings.

16. Can I change the acceleration time?
The FCMA provides a speed dependent voltage ramp and not a time dependent voltage ramp. The starting time is dictated by the load and motor curves as well as the selected starting current. The FCMA provides the most optimum starting time at most optimum starting current without intentional delay. This minimizes the stress on the stator and rotor during starting.

17. Do I need an air-conditioned room to house the FCMA?
Not at all. The FCMA is designed for ambient temperatures up to 55 deg C and can be kept in normal working area. Moreover the FCMA is epoxy resin cast to prevent any effects of moisture or dirt.

18. What sort of maintenance is required by the FCMA?
Being resin cast the FCMA does not require any maintenance at all except routine preventive maintenance such as cleaning or tightening of connections may be once in couple of years. Switchgear items used in the FCMA soft starters are to be maintained at electrician level as a very infrequent routine maintenance. The maintenance requirements are virtually NIL.

19. What are the limitations of the FCMA technology?
The limitations are higher weight, limited flexibility for interchangeability in case of different machine types, tailored design. However the advantages of zero harmonics, excellent reliability, negligible maintenance and very low life cycle cost more than compensate for these limitations.