DS1000 series Detuned Filter Bank
DS2000 series Tuned Filter Bank

MEDIUM VOLTAGE 2400, 4160 VOLTS
(OTHERS VOLTAGE ON REQUEST)

Rated for :

- 400 HP to 2000 HP
- 2400 to 4800 Volts
- Nema / type1, 12, 3R

Variable Frequency Drive and distribution networks are designed to operate with sinusoidal voltage and current having constant frequency. However, there are a number of non-linear loads, such as thyristor drives and converters that generate harmonics to the network. This causes distortion in the voltage and current wave forms.

The **DriveSaver** ***DS1000*** having detuned frequency in the anti-resonant and the ***DS2000*** having tuned frequency in the resonant circuit formed by the capacitance of the power capacitor and the network inductance may match an existing harmonic frequency. If there is harmonic current source for the particular harmonic frequency in the network, the harmonic current of this frequency may reach as high 20 times the normal level. Due to the amplified harmonics caused by the resonance, the voltage and current waveforms are distorted. Current and voltage correction by means of conventional capacitors is not possible in systems affected by harmonics.

To avoid the resonance phenomena described above in an electricity network affected by harmonics, a reactor must be connected in series with the power capacitor. This results in a design which can compensate the fundamental frequency reactive power but does not amplify the harmonics, save the VFD and power quality improvement

TECHNICAL DATA - **DS1000 / DS2000 series**	
Rated Voltage / Phase	1200 to 4160 Volts / 3 phases
Rated Frequency	50Hz or 60Hz
Rated Power	20 to 1000 kVAR / unit
Tuned frequency	7% or 12.6% (other tune frequency on request
Insulation level	60 and 75 kV BIL
Continuous overvoltage	110 %
Harmonic dimensioning	IEEE 519
Mounting type	Floor mounting
Enclosure type	Indoor and outdoor
Temperature class	0 `C to 45`C
o Average 24h :	+ 35`C
Color	ASA 61 (light grey)
Construction Standard	UL, CSA

■ Standard Features	Series I	Series II
Enclosure floor mounted (Type 1, 12, 3R)	1, 12, 3R	1, 12, 3R
ASA 61 gray (other color on request)	■	■
Incoming silver Flashed Copper Bus 60 kV BIL c/w mechanical lugs	■	■
Top or bottom Cable entry	■	■
Capacitors space / KVAR max / Unit (Custom Staging Ratios)	1,2, 3	1,2, 3
Power and Control wires	**T90 / T105**	**T90 / T105**
HVCB Capacitor (Heavy Duty type on request)	■	■
Current limiting fuses HRC type ____ Amp. 50 ka	■	■
Vacuum Contactor c/w special switching devices	n/a	■
Detuned Filter reactor c/w thermal detection device	■	■
Control Transformer c/w GFI breaker*, CT Shorting device	O	O
● ***Optional (s) Feature***		
Blown fuses indicating light c/w push bottom test	O	O
Main current metering c/w A Featuresmmeter and phase selector	**O**	**O**
Kirk Key system interlock with the remote main breaker	O	O
Special Metering Arrangement	**O**	**O**
Ground switch interlocked with doors and main supply	O	O
Power Quality Meter	**O**	**O**
Thermostatic Control devices c/w cooling fan	O	O

➢ Technical Application

If harmonic filters are being considered only for the purpose of power factor correction, then detuned filter bank is the best choice. This filter will do little for removing any harmonic distortion present on the system but will allow the installation of a large capacitor bank without any adverse system interactions. Detuned filter banks are less costly an are more reliable than partially tuned and tuned filter banks. The anti-resonant frequency should be considered to assure that it does not fall near the 3rd harmonic.

? **DriveSaver**

When the resonant frequency of the series resonant filter circuit is tuned to a frequency lower than the harmonic occurring in the system, the filter circuit is termed as detuned filter. The philosophy of the detuned filters would be clear from the following example.

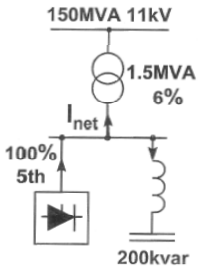
The harmonics that would be generated are 5th,7th, 11th and 13th and so on. The lowest harmonic frequency which would occur in the system is the fifth harmonic i.e. 300 Hz. If the series resonant circuit is tuned to a frequency of 245 Hz, then at all the harmonic frequencies the filter acts as an inductive component and the possibility of resonance at the fifth harmonic is eliminated.
The impedance offered to the 5th harmonic signal is less than the capacitor alone. This means that the series resonant filter will absorb the 5th harmonic to a certain extent.

The reactor to capacitance ratio p(%) reflects the ratio of reactor reactance to capacitor reactance at fundamental frequency. The resonant frequency of the series resonant filter circuit is indicated indirectly by p. The following table shows a comparison for various reactor/ capacitor combinations at fundamental frequency of 60 Hz.

Resonance Frequency *Fr*	Relative Resonance	Reactor/Capacitor Factor : *p*
227	3.8	7.0
245	**4.1**	**6.0**
252	4.2	5.67
282	**4.7**	**4.52**
288	4.8	4.33
300	**5.0**	**4.0**

current to the network with different tuning frequencies

Tuning frequency Hz	*Reactor percentage %*	I_{net} %
227	7.00	77
245	6.00	69
252	5.67	65
270	4.94	52
282	4.53	24



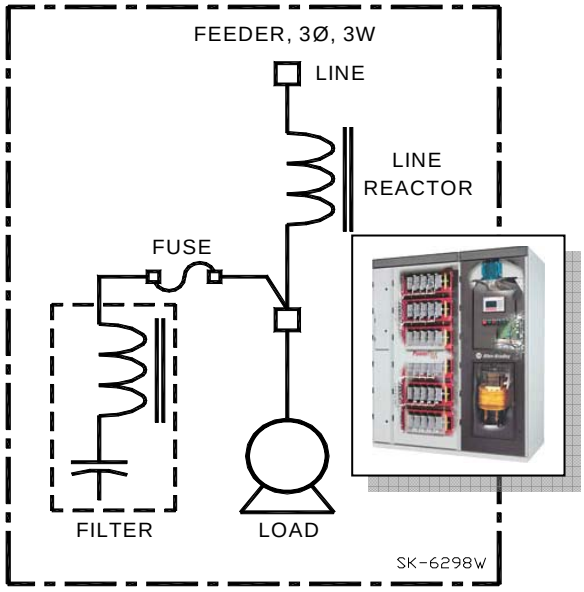
Motor	DS1000	series				Options				
HP	Basic Part. #	System Voltage	Motor HP	Tuned Filter	Series I or II	Type 1. 12, 3R	Protection Device	Blown Fuse ind	Interlock	Fig
4160 V.	+ --→	Suffix	Suffix	Suffix	Suffix	Suffix	Suffix	Suffix		#
400	DS1000	**4160**	**400**	**5**	**I**	**1**	**G**	**BFI**	KK	1
500	DS1000	**4160**	**500**	**5**	**I**	**1**	**G**	**BFI**	KK	1
600	DS1000	**4160**	**600**	**5**	**I**	**1**	**G**	**BFI**	KK	1
700	DS1000	4160	700	5	I	1	G	BFI	KK	1
800	DS1000	4160	800	5	I	1	G	BFI	KK	1
900	**DS1000**	**4160**	**900**	**5**	**I**	**1**	**G**	**BFI**	**KK**	**1**
1000	**DS1000**	**4160**	**1000**	**5**	**I**	**1**	**G**	**BFI**	**KK**	**1**
1100	**DS1000**	**4160**	**1100**	**5**	**I**	**1**	**G**	**BFI**	**KK**	**1**
1200	**DS1000**	**4160**	**1200**	**5**	**I**	**1**	**G**	**BFI**	**KK**	**1**
1500	DS1000	4160	1500	5	I	1	G	BFI	KK	1
2000 ***	DS1000	4160	2000	5	I	1	G	BFI	KK	1
Model	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	
No …	DS1000	4160	1200	5	II	1	LB	BFI	KK	

*** **Contact Factory for special configuration and are available on request (No extra cost)**

1	DS1000 Series DriveSaver (Motor application)
2	System Voltage applied
3	Total Reactive Power __ Kvar
4	Detuned Filter 4.5 Th
5	Configuration = I (Fixed) or II (Automatic)
6	Enclosure type : 1. 12. 3R etc...
7	Option : LB : Load break switch D : Disconnect Switch G : Ground Switch
8	Option: Blown Fuses indicators
9	Option : KK = Kirk Key interlock

DS2000 SERIES

ONLINE DIAGRAM



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