LC Automation
control & safety

a.c. Inverters & Soft starters



www.lcautomation.com

Save energy!

LC Automation control & safety

– use a.c. inverters *(variable speed drives)*

Energy is saved by reducing the speed of an a.c. induction motor. In order to estimate the potential cost savings there are four main points to consider:

1 What type of load is the motor driving?

There are two types of load to consider when looking at energy saving, constant torque loads and variable torque loads.

Typical constant torque loads

- Screw compressors
- Piston pumps
- Bellows

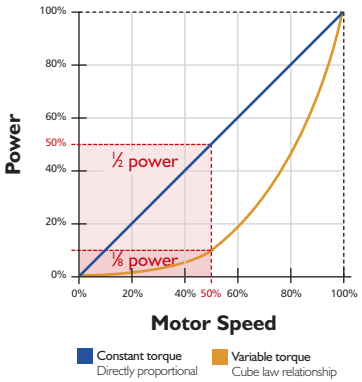
Energy saving with constant torque loads is directly proportional to the motor speed.

Typical variable torque loads

- Centrifugal fans
- Centrifugal pumps
- Regenerative turbines

Energy saving with variable torque loads is much greater, this is because of the cube law relationship with this type of load, a 50% reduction in speed saves 87.5% of the original full speed power. For a typical application a 20% speed reduction is achievable and would save 50% of the original full speed power.

Torque/speed laws

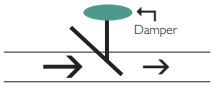


2 How is the process being controlled?

For many industrial and commercial applications the fans or pumps originally specified have proved to be oversized with little or no control. In these instances simply slowing down the motor produces energy saving without affecting the process quality.

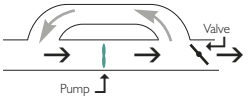
Mechanical control as detailed also provides opportunities for energy saving. The principle is to remove any mechanical restrictions and control the flow by slowing down the motor.

Mechanical flow control (e.g. damper)



Mechanical flow control offers no energy saving. Savings can be made by reducing the pump or fan speed and leaving the mechanical control fully open.

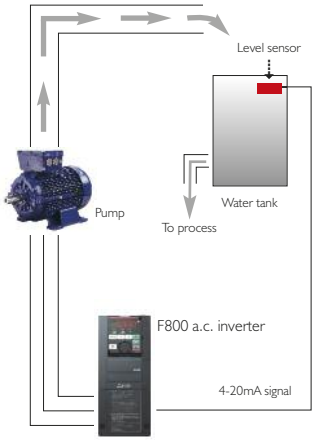
Re-circulation flow control (e.g. valve)



The re-circulation, or full flow system uses 100% of the full power requirement ALL of the time. Savings can be made by reducing the pump or fan speed and leaving the valve control fully open.

Please note: Consideration must be given to all parameters that may influence the control system. Typical examples that could affect the control requirements are outside temperature, humidity or changes to the process material. To compensate for these influences additional control measures may be required.

Installation requiring PI control



Example pumping solution

GOT2000 HMI

F800 a.c. inverter

Fluid pressure sensor

Pump

3 How much energy will be saved?

Calculating energy saving for variable torque loads

Step 1:

Determine the cost of the power currently used

Current cost (£s)	kW x T x C = £X	
kW = Power used by motor (measure if possible)	T = Time motor runs per year (hours)	C = Power cost (£s) per kW hour

NOTE: Don't forget to include the climate change levy to the basic kWh rate

Step 2:

Determine the cost of the power at reduced speed

Reduced cost (£s)	$\frac{kW}{Ed} \times S^3 \times T \times C = £Y$		
kW = Power used by motor at full speed (measure if possible) Ed = Efficiency of inverter (assume 0.9)	S = Reduced speed/ full speed (50% = ½ or 0.5) *Remember* *S = ½* *S^3 = ⅛*	T = Time motor runs per year (hours)	C = Power cost (£) per kW hour

NOTE: Don't forget to include the climate change levy to the basic kWh rate

Step 3:

Energy savings per year

Savings (£s)	X – Y per year = £Z
X = Cost of power currently used	Y = Cost of reduced power/speed

4 What is the payback time?

Step 4:

Overall payback time

Payback time (No. of years)	$\frac{\text{cost of inverter system}}{£Z \text{ (energy saving per year)}}$

FR-D700 series – Ultra compact a.c. inverters

MITSUBISHI ELECTRIC

FR-D700 a.c. inverters are the smallest members of the Mitsubishi FR-700 family, setting new standards of control and performance in a stand-alone ultra compact unit.

Features

- Exceptional energy saving for an ultra compact unit
- Built in safety stop function, for direct connection to a safety system
- High starting torque for demanding applications
- Built in keypad with display and one-touch digital dial control
- On board component life monitor
- Source logic safety input
- DIN rail mounting with adapter

Suitable applications include:

- Simple applications where space is very limited
- Feeder and conveyor lines
- Machine tools
- Fans and pumps
- Doors and gates

Technical specification

Output range 1-phase 0.1-2.2kW
3-phase 0.4-7.5kW

Frequency range 0.2-400Hz

Power supply
Single-phase . . . 200-240V, 50Hz input
Three-phase . . . 380-480V, 50Hz input

Overload rating . . . Up to 200% available

FR-D720S – single phase

Rated Motor Capacity	Rated Current	Order Code	List Price	EMC Noise Filters Order Code	EMC Noise Filters List Price	External Brake Resistors Order Code	External Brake Resistors List Price
0.1kW	0.8A	FR-D720S-008SC-EC	£111.00	FFR-CS-050-14A-SF1	£13.50	—	—
0.2kW	1.4A	FR-D720S-014SC-EC	£121.00	FFR-CS-050-14A-SF1	£13.50	—	—
0.4kW	2.5A	FR-D720S-025SC-EC	£132.50	FFR-CS-050-14A-SF1	£13.50	FR-ABR-0.4K	£18.00
0.75kW	4.2A	FR-D720S-042SC-EC	£154.00	FFR-CS-050-14A-SF1	£13.50	FR-ABR-0.75K	£24.50
1.5kW	7A	FR-D720S-070SC-EC	£188.00	FFR-CS-080-20A-SF1	£19.50	FR-ABR-2.2K	£32.00
2.2kW	10A	FR-D720S-100SC-EC	£264.50	FFR-CS-110-26A-SF1	£25.50	FR-ABR-2.2K	£32.00

FR-D740 – three phase

Rated Motor Capacity	Rated Current	Order Code	List Price	EMC Noise Filters Order Code	EMC Noise Filters List Price	External Brake Resistors Order Code	External Brake Resistors List Price
0.4kW	1.2A	FR-D740-012SC-EC	£170.50	FFR-CSH-036-8A-SF1	£27.50	FR-ABR-H0.4K	£18.00
0.75kW	2.2A	FR-D740-022SC-EC	£188.00	FFR-CSH-036-8A-SF1	£27.50	FR-ABR-H0.75K	£24.50
1.5kW	3.6A	FR-D740-036SC-EC	£212.50	FFR-CSH-036-8A-SF1	£27.50	FR-ABR-H1.5K	£32.00
2.2kW	5A	FR-D740-050SC-EC	£305.50	FFR-CSH-080-16A-SF1	£36.00	FR-ABR-H2.2K	£37.00
3.7kW	8A	FR-D740-080SC-EC	£417.50	FFR-CSH-080-16A-SF1	£36.00	FR-ABR-H3.7K	£49.50
5.5kW	12A	FR-D740-120SC-EC	£578.00	FFR-MSH-170-30A-SF1	£41.00	FR-ABR-H5.5K	£67.00
7.5kW	16A	FR-D740-160SC-EC	£793.00	FFR-MSH-170-30A-SF1	£41.00	FR-ABR-H7.5K	£109.00

FR-D700 DIN rail mounting adapters

Description	Order Code	List Price
DIN rail mounting adapter; 68mm wide	FR-UDA01	£10.50
DIN rail mounting adapter; 108mm wide	FR-UDA02	£15.50

Go to pages 20-21 for options & accessories

FR-E700 series – Compact a.c. inverters

MITSUBISHI ELECTRIC

The FR-E700 series are compact a.c. inverters with integrated RS485, Modbus RTU and USB interfaces. Plug in option cards are also available to connect to open networks including ProfiBus DP, DeviceNet and CC-Link.

Features

- Built in RS485/Modbus RTU interface
- Network options include ProfiBus DP, DeviceNet and CC-Link *(see options and accessories on pages 20-21)*
- Built in safety stop function, for direct connection to a safety system
- USB port for high speed monitoring
- Built in keypad with display and one-touch digital dial control
- Exceptional motor shaft handling at low speeds
- On board component life monitor
- Sensorless vector control
- Advanced auto-tuning
- Overload capacity increased to 200%
- Current limiting
- 150% torque down to 1Hz

Suitable applications include:

- Space limited applications which still require network connectivity
- Conveyor systems
- Textile and printing machines
- Fans and pumps
- Doors and gates

Technical specification

Output range 1-phase 0.1-2.2kW
3-phase 0.4-15kW
Frequency range 0.2-400Hz
Power supply
Single-phase . . . 200-240V, 50Hz input
Three-phase . . . 380-480V, 50Hz input
Overload rating . . . Up to 200% available

FR-E720S – single phase

				EMC Noise Filters		External Brake Resistors	
Rated Motor Capacity	Rated Current	Order Code	List Price	Order Code	List Price	Order Code	List Price
0.1kW	0.8A	FR-E720S-008SC-EC	£138.50	FFR-CS-050-14A-SF1	£13.50	—	—
0.2kW	1.5A	FR-E720S-015SC-EC	£145.00	FFR-CS-050-14A-SF1	£13.50	—	—
0.4kW	3.0A	FR-E720S-030SC-EC	£151.00	FFR-CS-050-14A-SF1	£13.50	FR-ABR-0.4K	£18.00
0.75kW	5.0A	FR-E720S-050SC-EC	£175.50	FFR-CS-080-20A-SF1	£19.50	FR-ABR-0.75K	£24.50
1.5kW	8.0A	FR-E720S-080SC-EC	£277.00	FFR-CS-080-20A-SF1	£19.50	FR-ABR-2.2K	£32.00
2.2kW	11A	FR-E720S-110SC-EC	£325.00	FFR-CS-110-26A-SF1	£25.50	FR-ABR-2.2K	£32.00

FR-E740 – three phase

				EMC Noise Filters		External Brake Resistors	
Rated Motor Capacity	Rated Current	Order Code	List Price	Order Code	List Price	Order Code	List Price
0.4kW	1.6A	FR-E740-016SC-EC	£271.00	FFR-MSH-040-8A-SF1	£32.00	FR-ABR-H0.4K	£18.00
0.75kW	2.6A	FR-E740-026SC-EC	£287.00	FFR-MSH-040-8A-SF1	£32.00	FR-ABR-H0.75K	£24.50
1.5kW	4A	FR-E740-040SC-EC	£309.00	FFR-MSH-040-8A-SF1	£32.00	FR-ABR-H1.5K	£32.00
2.2kW	6A	FR-E740-060SC-EC	£427.50	FFR-MSH-095-16A-SF1	£41.00	FR-ABR-H2.2K	£37.00
3.7kW	9.5A	FR-E740-095SC-EC	£568.00	FFR-MSH-095-16A-SF1	£41.00	FR-ABR-H3.7K	£49.50
5.5kW	12A	FR-E740-120SC-EC	£689.00	FFR-MSH-170-30A-SF1	£41.00	FR-ABR-H5.5K	£67.00
7.5kW	17A	FR-E740-170SC-EC	£950.00	FFR-MSH-170-30A-SF1	£41.00	FR-ABR-H7.5K	£109.00
11kW	23A	FR-E740-230SC-EC	£1,004.00	FFR-MSH-300-50A-SF1	£91.00	FR-ABR-H11K	£176.50
15kW	30A	FR-E740-300SC-EC	£1,174.00	FFR-MSH-300-50A-SF1	£91.00	FR-ABR-H15K	£212.50

Go to pages 20-21 for options & accessories

The FR-E700 a.c. inverters are also available with CC Link IE Field basic communications

To order inverters with this capability change the EC code to ENE

Standard E700: FR-E720S-008SC-**EC**

With CC-Link IE Field basic: FR-E720S-008SC-**ENE**

See page 21 for Mitsubishi FR Configurator-M + FR-Configurator2

a.c. inverter programming and setup software

FR-F800-E – a.c. inverters with integrated Ethernet

MITSUBISHI ELECTRIC

NEW

The FR-F800-E with integrated Ethernet is designed for unparalleled energy saving, optimised speed control, simple start-up and easy connection.

Mainly designed to be used with pumps, fans & compressors and HVAC applications, it features functions that allow for the best combination of efficiency and control.

New functionality includes embedded Ethernet which supports Modbus TCP/BACnet IP/CC-Link IE Field basic and allows the user to remotely connect to the drive. It also has built in STO (Safety Torque Off).

Features

- Detects mechanical faults
- Autotuning of PM and IM motors
- Built-in PLC functionality
- Advanced PID control functions
- Built in STO (Safety Torque Off)
- Easy setup with FR Configurator 2
- GOT2000 HMI compatibility with pre-defined screens

Suitable applications include:

- Pumps and fans
- Heating, ventilation and air conditioning

Technical specification

Supply voltage . . . . . 380-500V a.c.
Supply frequency 50/60Hz
Output range 0.75-630kW
Output frequency range 0.2-590Hz
Starting torque 120% 0.5Hz
Overload rating . . . . . Up to 150%
Frequency setting . . . . . Analogue/digital
Analogue inputs
Terminals 2 & 4 . . . . 0 to 5V , 0 to 10V, 4 to 20mA
Terminal 1 . . . . -5 to +5V, -10 to +10V
Protection
Up to 22kW IP20
From 30kW IP00
Built in PLC functions
Max digital I/O . . . . . 64 input/64 output
Built in digital I/O . . . . 12 input/7 output
Analogue I/O . . . . . 3 input/2 output

FR-AF840 a.c. inverters plus separate FR-CF80 control card

Rated Motor Capacity	Rated Current	Order Code	List Price	EMC Noise Filters Order Code	EMC Noise Filters List Price	DC Link Choke** Order Code	DC Link Choke** List Price
0.75kW	2.3A	FR-F840-00023-E2-60	£522.00	FFR-BS-00126-18A-SF100	£61.00		
1.5kW	3.8A	FR-F840-00038-E2-60	£556.00	FFR-BS-00126-18A-SF100	£61.00		
2.2kW	5.2A	FR-F840-00052-E2-60	£615.00	FFR-BS-00126-18A-SF100	£61.00		
3.7kW	8.3A	FR-F840-00083-E2-60	£703.00	FFR-BS-00126-18A-SF100	£61.00		
5.5kW	12.6A	FR-F840-00126-E2-60	£786.00	FFR-BS-00126-18A-SF100	£61.00		
7.5kW	17A	FR-F840-00170-E2-60	£915.00	FFR-BS-00250-30A-SF100	£82.00		
11kW	25A	FR-F840-00250-E2-60	£1,033.00	FFR-BS-00250-30A-SF100	£82.00		
15kW	31A	FR-F840-00310-E2-60	£1,282.00	FFR-BS-00380-55A-SF100	£106.00		
18.5kW	38A	FR-F840-00380-E2-60	£1,571.00	FFR-BS-00380-55A-SF100	£106.00		
22kW	47A	FR-F840-00470-E2-60	£2,097.00	FFR-BS-00620-75A-SF100	£106.00		
30kW	62A	FR-F840-00620-E2-60	£2,621.00	FFR-BS-00620-75A-SF100	£172.50		
37kW*	77A	FR-F840-00770-E2-60	£3,258.00	—	—	—	—
45kW*	93A	FR-F840-00930-E2-60	£3,953.00	—	—	—	—
55kW*	116A	FR-F840-01160-E2-60	£4,689.00	—	—	—	—
90kW*	180A	FR-F840-01800-E2-60	£4,630.00	—	—	FR-HEL-H75K	£299.00
110kW*	216A	FR-F840-02160-E2-60	£4,856.00	—	—	FR-HEL-H90K	£335.00
132kW*	260A	FR-F840-02600-E2-60	£5,499.00	—	—	FR-HEL-H110K	£757.00
160kW*	325A	FR-F840-03250-E2-60	£6,882.00	—	—	FR-HEL-H132K	£891.00
185kW*	361A	FR-F840-03610-E2-60	£7,748.00	—	—	FR-HEL-H160K	£958.00
220kW*	432A	FR-F840-04320-E2-60	£10,048.00	—	—	FR-HEL-H185K	£1,210.00
250kW*	481A	FR-F840-04810-E2-60	£11,014.00	—	—	FR-HEL-H220K	£1,414.00
280kW*	547A	FR-F840-05470-E2-60	£11,969.00	—	—	FR-HEL-H250K	£1,583.00
315kW*	610A	FR-F840-06100-E2-60	£14,826.00	—	—	FR-HEL-H280K	£1,816.00
355kW*	683A	FR-F840-06830-E2-60	£14,906.00	—	—	FR-HEL-H315K	£1,923.00

*** Supplied with separate FR-CF80 control card**

****It is essential that the 90-355kW drives are fitted with the DC link choke – failure to do this will cause damage to the drive**

FR-A800-E – a.c. inverters with integrated Ethernet

MITSUBISHI ELECTRIC

The FR-A800-E a.c. inverters are successors to the FR-A700 series, they are equipped with integrated Ethernet, a new high speed processor and have better than ever levels of control and quicker response times.

Now with embedded Ethernet which supports Modbus TCP/BACnet IP/CC-Link IE Field basic, integrated USB port for programming/copying data, a built-in PLC/absolute positioning, along with improved safety to EN 61508 SIL CL2 or EN ISO 13849 PLd.

Features

- Real sensorless vector control
- Auto tuning for PM and IM motors
- Integrated Ethernet
- Built-in PLC functionality
- Optimum excitation control for improved energy saving
- Built-in safety functionality
- Built-in EMC filters
- Extensive network connectivity
- Easy set up with FR Configurator 2
- GOT2000 HMI compatibility with pre-defined screens
- Built-in LCD keypad

Typical applications include:

- Line control (winding & unwinding)
- Crane and hoist control
- Digging and earth moving
- High speed machine tool control
- Saws and wood processing machines
- Conveyor systems
- Printing and packaging machines
- Compressors

Technical specification

Supply voltage . . . . . 380 – 500V a.c.
Supply frequency 50/60Hz
Output range . . . . . 0.4 – 280kW
Output frequency range . . . 0.2 – 590Hz
Starting torque . . . . . Up to 250%
Frequency setting . . . . . Analogue/digital
Input and speed signals . . . . . 12 options
Output signals . . . . . 5 transistor, 2 relay
Indication . . . . . Via parameter unit
Warning functions . . . . . 21 alarms
Protection
Up to 22kW IP20
30-280kW IP00
IP55 option available
Built-in PLC functions
Max digital I/O . . . . 64 input/64 output
Built-in digital I/O . . . 12 input/7 output
Analogue I/O . . . . . 3 input/2 output
Programming method . . . Ladder logic or function block

Contact sales for advice on the breaking requirements of these drives

Rated Motor Capacity	Rated Current	Order Code	List Price	EMC Noise Filters Order Code	EMC Noise Filters List Price
0.4kW	1.5A	FR-A840-00023-E2-60	£596.00	FFR-BS-00126-18A-SF100	£61.00
0.75kW	2.5A	FR-A840-00038-E2-60	£628.00	FFR-BS-00126-18A-SF100	£61.00
1.5kW	4A	FR-A840-00052-E2-60	£687.00	FFR-BS-00126-18A-SF100	£61.00
2.2kW	6A	FR-A840-00083-E2-60	£772.00	FFR-BS-00126-18A-SF100	£61.00
3.7kW	9A	FR-A840-00126-E2-60	£853.00	FFR-BS-00126-18A-SF100	£61.00
5.5kW	12A	FR-A840-00170-E2-60	£978.00	FFR-BS-00250-30A-SF100	£82.00
7.5kW	17A	FR-A840-00250-E2-60	£1,091.00	FFR-BS-00250-30A-SF100	£82.00
11kW	23A	FR-A840-00310-E2-60	£1,333.00	FFR-BS-00380-55A-SF100	£106.00
15kW	31A	FR-A840-00380-E2-60	£1,618.00	FFR-BS-00380-55A-SF100	£106.00
18.5kW	38A	FR-A840-00470-E2-60	£2,131.00	FFR-BS-00620-75A-SF100	£106.00
22kW	44A	FR-A840-00620-E2-60	£2,643.00	FFR-BS-00620-75A-SF100	£172.50
30kW	57A	FR-A840-00770-E2-60	£3,688.00	FFR-BS-00770-95A-SF100	£251.50

FR-AF840 a.c. inverters plus separate FR-CA80 control card

Rated Motor Capacity	Rated Current	Order Code	List Price	DC Link Choke** Order Code	DC Link Choke** List Price
37kW*	71A	FR-A840-00930-E2-60	£4,368.00	—	—
45kW*	86A	FR-A840-01160-E2-60	£5,084.00	—	—
55kW*	110A	FR-A840-01800-E2-60	£5,320.00	—	—
75kW*	144A	FR-A840-02160-E2-60	£5,970.00	FR-HEL-H75K	£299.00
90kW*	180A	FR-A840-02600-E2-60	£6,691.00	FR-HEL-H90K	£335.00
110kW*	216A	FR-A840-03250-E2-60	£7,684.00	FR-HEL-H110K	£757.00
132kW*	260A	FR-A840-03610-E2-60	£8,643.00	FR-HEL-H132K	£891.00
160kW*	325A	FR-A840-04320-E2-60	£10,136.00	FR-HEL-H160K	£958.00
185kW*	361A	FR-A840-04810-E2-60	£11,873.00	FR-HEL-H185K	£1,210.00
220kW*	432A	FR-A840-05470-E2-60	£12,827.00	FR-HEL-H220K	£1,414.00
250kW*	481A	FR-A840-06100-E2-60	£15,551.00	FR-HEL-H250K	£1,583.00
280kW*	547A	FR-A840-06830-E2-60	£15,579.00	FR-HEL-H280K	£1,816.00

*** Supplied with separate FR-CA80 control card**

****It is essential that the 90-355kW drives are fitted with the DC link choke – failure to do this will cause damage to the drive**

a.c. Inverter options and accessories

Input/output cards and communication options

Description	For use with D700	E700	F800	A800	Order Code	List Price
Analogue input/output, thermistor interface	—	—	●	●	FR-A8AZ	£156.00
16-bit digital input function card	—	—	●	●	FR-A8AX	£59.00
12-bit digital input function kit *(safety version)*	—	●	—	—	FR-A7AX-EKit-SC-E	£78.00
7 digital and 2 analogue output card	—	—	●	●	FR-A8AY	£89.00
7 digital and 2 analogue output kit *(safety version)*	—	●	—	—	FR-A7AY-Ekit-SC-E	£115.00
3 relay output card	—	—	●	●	FR-A8AR	£54.00
3 relay output kit *(safety version)*	—	●	—	—	FR-A7AR-Ekit-SC-E	£78.00
CC-Link interface	—	—	●	●	FR-A8NC	£138.00
CC-Link IE field interface	—	—	●	●	FR-A8NCE	£163.00
CC-Link interface *(safety version)*	—	●	—	—	FR-A7NC-Ekit-SC-EC	£149.00
Ethernet/IP 2 port interface	—	—	●	●	A8NEIP-2P	£166.00
EtherCat 2 port interface	—	—	—	●	A8NECT-2P	£204.00
LON Works interface *(safety version)*	—	●	—	—	FR-A7NL-Ekit-SC-E	£219.50
ProfiBus interface with FR-A/F700 PPO types	—	—	●	●	FR-A8NP	£178.00
ProfiBus DPV1 with Dsub interface	—	—	●	●	A8NDPV1	£142.00
ProfiBus interface *(safety version)*	—	●	—	—	FR-A7NP-Ekit-SC-E	£219.50
ProfiBus interface with 9-pin D sub connector *(safety version)*	—	●	—	—	FR-A7NP-Ekit-SC-E-01	£219.50
ProfiNet 2 port interface	—	—	●	●	A8NPRT-2P	£166.00
DeviceNet interface	—	—	●	●	FR-A8ND	£191.00
DeviceNet interface *(safety version)*	—	●	—	—	FR-A7ND-Ekit-SC-E	£219.50
Encoder feedback	—	—	—	●	FR-A8AP	£104.00
Terminal block with integrated encoder interface	—	—	—	●	FR-A8TP	£144.00

Replacement/additional parameter units and cables

Description	For use with D700	E700	F800	A800	Order Code	List Price
Replacement simple keypad	●	●	—	—	FR-PA07	£36.00
Replacement LCD parameter unit	— —	— —	● ●	— ●	FR-DU07 FR-LU08	£46.50 £89.00
Replacement LCD parameter unit; IP54 version	—	—	●	—	FR-DU07-IP54	£48.50
Extension cable for replacement LCD parameter unit; 1m	—	—	●	—	FR-CB201-ADP-KIT	£25.50
Extension cable for replacement LCD parameter unit; 3m	—	—	●	—	FR-CB203-ADP-KIT	£34.00
Extension cable for replacement LCD parameter unit; 5m	—	—	●	—	FR-CB205-ADP-KIT	£49.50
LCD parameter unit with keypad & extended functions	●	●	●	●	FR-PU07-01	£87.50
Extension cable for LCD parameter unit with keypad; 1m	●	●	●	—	FR-CB201	£19.50
Extension cable for LCD parameter unit with keypad; 3m	●	●	●	—	FR-CB203	£30.00
Extension cable for LCD parameter unit with keypad; 5m	●	●	●	—	FR-CB205	£44.50
Adapter for control terminal of AF700 to AF800	—	—	●	●	FR-A8TAT	£140.00

Accessories and cables

Description	For use with D700	E700	F800	A800	Code	List Price
RS485 4-port hub (connect up to 2 inverters to a serial network)	●	●	●	●	FR-RJ45-HUB4	£73.00
RS485 10-port hub (connect up to 8 inverters to a serial network)	●	●	●	●	FR-RJ45-HUB10	£143.50
Interconnecting cable for RS485 hub; 1m	●	●	●	●	FR-A5-CBL-1	£11.00
Interconnecting cable for RS485 hub; 2.5m	●	●	●	●	FR-A5-CBL-2.5	£13.00
Interconnecting cable for RS485 hub; 5m	●	●	●	●	FR-A5-CBL-5	£15.00
RS485 terminal resistor	●	●	●	●	FR-RJ45-TR	£23.50
RS485 multidrop cable and connector	●	●	●	●	FR-CB2-485	£14.00
USB to RS232 adapter	—	—	—	●	USB-RS232	£29.00

a.c. Inverter options and accessories (continued)

MITSUBISHI ELECTRIC

Brake units for three phase, 400V high performance inverters

Rated Motor Current	0% ED	10% ED	50% ED	100% ED	Order Code	List Price
7.5kW	5	10	27	47	FR-BU2-H7.5K	£504.50
15kW	5	13	40	74	FR-BU2-H15K	£532.00
30kW	5	20	72	137	FR-BU2-H30K	£560.00
55kW	5	37	140	268	FR-BU2-H55K	£602.00
75kW	5	49	174	331	FR-BU2-H75K	£815.00

Brake resistors

Rated Motor Current	Order Code	List Price
15kW	FR-BR-H15K	£412.50
30kW	FR-BR-H30K	£758.00
55kW	FR-BR-H55K	£814.00

Brake resistors

Rated Motor Current	For use with: FR-D720S	FR-D740	FR-E720S	FR-E740	FR-F840	FR-A840*	Order Code	List Price
0.4kW	●	—	●	—	—	—	FR-ABR-0.4K	£18.00
0.4kW	—	●	—	●	—	—	FR-ABR-H0.4K	£18.00
0.75kW	●	—	●	—	—	—	FR-ABR-0.75K	£24.50
0.75kW	—	●	—	●	—	—	FR-ABR-H0.75K	£24.50
1.5/2.2kW	●	—	●	—	—	—	FR-ABR-2.2K	£32.00
1.5kW	—	●	—	●	—	—	FR-ABR-H1.5K	£32.00
2.2kW	—	●	—	●	—	—	FR-ABR-H2.2K	£37.00
3.7kW	—	●	—	●	—	—	FR-ABR-H3.7K	£49.50
5.5kW	—	●	—	●	—	—	FR-ABR-H5.5K	£67.00
7.5kW	—	●	—	●	—	—	FR-ABR-H7.5K	£109.00

** Brake resistor built-in as standard*

Inverter output dv/dt reduction filters

Output filters efficiently reduce the voltage rise time, motor heat generation, insulation stressing and motor noise generation

Rated Motor Current	Power Loss	For use with Frequency Inverters: FR-D720S	FR-D740	FR-E720S	FR-E740	FR-F840	FR-A840	Order Code	List Price
10A	25W	●	●	●	●	●	●	FFR-DT-10A-SS1	£82.00
25A	45W	●	●	●	●	●	●	FFR-DT-25A-SS1	£107.00
47A	60W	—	—	—	●	●	●	FFR-DT-47A-SS1	£183.50
93A	75W	—	—	—	—	●	●	FFR-DT-93A-SS1	£271.00
124A	110W	—	—	—	—	●	●	FFR-DT-124A-SS1	£298.50
182A	140W	—	—	—	—	●	●	FFR-DT-182A-SS1	£403.00
330A	240W	—	—	—	—	●	●	FFR-DT-330A-SS1	£682.00
500A	340W	—	—	—	—	●	●	FFR-DT-500A-SS1	£915.00
610A	380W	—	—	—	—	●	●	FFR-DT-610A-SS1	£985.00
683A	410W	—	—	—	—	●	●	FFR-DT-683A-SS1	£1,062.00
790A	590W	—	—	—	—	●	●	FFR-DT-790A-SS1	£1,412.00
1100A	760W	—	—	—	—	●	●	FFR-DT-1100A-SS1	£1,892.00
1500A	1100W	—	—	—	—	●	●	FFR-DT-1500A-SS1	£2,646.00

FR Configurator-M + FR-Configurator2 – Programming software for D700, E700 and 800 series a.c.inverters

This software is a powerful tool for operating and managing your a.c. inverters from a standard PC.

Features

- Up to 32 networked a.c. inverters can be operated simultaneously
- Analyser tests the resonant frequency of the machine as it accelerates
- Trace function, emulates an oscilloscope
- Test operation function and tuning
- Diagnostics and help functions

Benefits

- Comprehensible functions display data, analogue, oscillograph & alarms
- Analysis of inverter status provides a thorough error correction
- Test operation provides simulation and adjustment via auto-tuning.
- Extensive online help provides support with settings and operation

Description	Order Code	List Price
Software for 700/800 series a.c. inverters*	FR Configurator-M + FR-Configurator2	£37.00
RS485 programming cable (PU Port)	SC-FR-PC	£110.00

** Available to download free from the Mitsubishi website*

Sirius 3RW30 – Soft starters 1.5 to 55kW

SIEMENS

Sirius 3RW30 soft starters reduce motor voltage through variable phase control and increase it in ramp-like mode from a selectable starting voltage up to mains voltage.

During starting, these devices limit the torque as well as the current and prevent the shocks which arise during direct starts or star-delta starts. In this way, mechanical loads and mains voltage dips can be reliably reduced.

Soft starting reduces the stress on the connected equipment and results in lower wear and therefore trouble-free production. Selectable start values mean the soft starters can be adjusted to the requirements of the application and, unlike star-delta starters, are not restricted to two stage starting with fixed voltage ratios.

Features

- Soft start only
- Compact size
- Uninterrupted switching without current peaks
- Simple installation and commissioning
- Compact, space-saving design
- Screw terminal connection
- Integrated jumper contacts

Technical specification

Supply voltage . . . . . .200-480V a.c.
Ramp up time 0-20s
Starting voltage 40-100%
Ambient temperature . . . -25 to +60°C

Frame Size	Dimensions h x w x d (mm)
00	95 x 45 x 150
0	125 x 45 x 150
2	160 x 55 x 170
3	170 x 70 x 190

Rated Motor Capacity @ 400V	Output Current @ 40°	Frame Size	24V a.c./d.c. Control Voltage Order Code	List Price	110-230V a.c./d.c. Control Voltage Order Code	List Price
1.5kW	3.6A	00	3RW3013-1BB04	£102.65	3RW3013-1BB14	£102.65
3kW	6.5A	00	3RW3014-1BB04	£115.79	3RW3014-1BB14	£115.79
4kW	9A	00	3RW3016-1BB04	£128.11	3RW3016-1BB14	£128.11
5.5kW	12.5A	00	3RW3017-1BB04	£144.53	3RW3017-1BB14	£144.53
7.5kW	17.6A	00	3RW3018-1BB04	£165.06	3RW3018-1BB14	£165.06
11kW	25A	0	3RW3026-1BB04	£192.98	3RW3026-1BB14	£192.98
15kW	32A	0	3RW3027-1BB04	£224.19	3RW3027-1BB14	£224.19
18.5kW	38A	0	3RW3028-1BB04	£277.57	3RW3028-1BB14	£277.57
22kW	45A	2	3RW3036-1BB04	£341.62	3RW3036-1BB14	£341.62
30kW	63A	2	3RW3037-1BB04	£415.53	3RW3037-1BB14	£415.53
37kW	72A	2	3RW3038-1BB04	£491.90	3RW3038-1BB14	£491.90
45kW	80A	3	3RW3046-1BB04	£565.81	3RW3046-1BB14	£565.81
55kW	106A	3	3RW3047-1BB04	£631.50	3RW3047-1BB14	£631.50

NOTE: Selection of the soft starter depends on the rated motor current.

The Sirius 3RW30/ 3RW40 solid state soft starters are designed for easy starting conditions.
One load < 10 x one motor. In the event of deviating conditions or increased switching frequency, it may be necessary to choose a larger device. Siemens recommends the use of the selection and simulation programme Win-Soft Starter.

Sirius 3RW40 – Soft starters 5.5 to 250kW

SIEMENS

3RW40 soft starters are only half the size of comparable star-delta starters, saving valuable space in your control cabinet.

Configuring and mounting the 3RW40 soft starters is quick and easy with simple 3-wire connection. Larger versions (frame size 6 or 12), are suitable for explosion-proof motors with increased safety type of protection EEx e according to ATEX directive 94/9/EC.

Features

- Soft start/soft stop
- Uninterrupted switching without current peaks
- Built-in overload motor protection feature
- Simple installation and commissioning
- Compact, space-saving design
- Solid state motor overload and intrinsic device protection
- Adjustable current limiting
- Optional thermistor motor protection (up to frame size 3)
- Integrated remote reset (up to frame size 3)
- Two-phase control method (polarity balancing)
- Low power loss
- Screw terminal connection
- Integrated jumper contacts

Technical specification

Supply voltage . . . . . .200-480V a.c.
Ramp up/down time 0-20s
Starting voltage 40-100%
Ambient temperature . . . -25 to +60°C

Frame Size	Dimensions h x w x d (mm)
0	125 x 45 x 155
2	160 x 55 x 170
3	170 x 70 x 190
6	550 x 370 x 311
12	650 x 370 x 347

Rated Motor Capacity @ 400V	Output Current @ 40°	Frame Size	24V a.c./d.c. Control Voltage Order Code	List Price	110-230V a.c./d.c. Control Voltage Order Code	List Price
5.5kW	12.5A	0	3RW4024-1BB04	£214.33	3RW4024-1BB14	£214.33
11kW	25A	0	3RW4026-1BB04	£252.11	3RW4026-1BB14	£252.11
15kW	32A	0	3RW4027-1BB04	£299.74	3RW4027-1BB14	£299.74
18.5kW	38A	0	3RW4028-1BB04	£359.99	3RW4028-1BB14	£359.99
22kW	45A	2	3RW4036-1BB04	£427.85	3RW4036-1BB14	£427.85
30kW	63A	2	3RW4037-1BB04	£507.50	3RW4037-1BB14	£507.50
37kW	72A	2	3RW4038-1BB04	£589.62	3RW4038-1BB14	£589.62
45kW	80A	3	3RW4046-1BB04	£663.53	3RW4046-1BB14	£663.53
55kW	106A	3	3RW4047-1BB04	£723.48	3RW4047-1BB14	£723.48

Rated Motor Capacity @ 400V	Output Current @ 40°	Frame Size	115V a.c. Control Voltage Order Code	List Price	230V a.c. Control Voltage Order Code	List Price
75kW	134A	6	3RW4055-6BB34	£766.18	3RW4055-6BB44	£766.18
90kW	162A	6	3RW4056-6BB34	£960.80	3RW4056-6BB44	£960.80
132kW	230A	12	3RW4073-6BB34	£1,059.35	3RW4073-6BB44	£1,059.35
160kW	280A	12	3RW4074-6BB34	£1,198.95	3RW4074-6BB44	£1,198.95
200kW	356A	12	3RW4075-6BB34	£1,404.25	3RW4075-6BB44	£1,404.25
250kW	432A	12	3RW4076-6BB34	£1,855.91	3RW4076-6BB44	£1,855.91

SSW07 – Soft starters with digital signal processor 7.5 to 220kW

The SSW07 soft starter with digital signal processor (DSP) control is designed for high performance motor starts and stops. Easy to set up, it simplifies start up activities and daily operation.

Integral bypass contacts eliminate heat dissipation once the motor is at full voltage. This improves energy saving while reducing it's size, saving money and space in your control panel.

Standard features

- 220-575V, 50/60Hz input power supply
- Start cycle: 300% of full load current for 30 seconds:
  - 10 starts per hour with ventilation kit
  - 3 starts per hour without ventilation kit
- 3 isolated digital inputs
- 2 programmable relay outputs
- A range of communication options
- Built in EMC filter (Class A)

Protective features

- Motor overload
- Phase sequence
- Motor phase loss
- Locked rotor
- Thyristors overload and overcurrent
- Heatsink overtemperature
- External fault
- Open bypass contact
- Frequency out of range
- Electronic supply undervoltage

Technical specification

Supply voltage . . . . . .220-575V a.c.
Starting time 1-40s
Kick start . . . . . off or 0.2-2s
Deceleration time . . . . . 1 to 40s
Relay outputs . . . . . 2 N/O (1A)
Initial voltage adjustment . . . .30 to 90%
Ambient temperature . . . . . 0 to +55°C

Frame Size	Weight (kg)	Dimensions h x w x d (mm)
1	1.3	162 x 95 x 157
2	3.3	208 x 144 x 203
3	7.6	276 x 223 x 220
4	9.2	331 x 227 x 242

Control voltage, 110-240V a.c.

Motor Capacity	Output Current	Frame Size	Ident No.	Order Code	List Price
7.5kW	17A	1	10194183	SSW07-0017-T-5SZ	£329.00
11kW	24A	1	10194184	SSW07-0024-T-5SZ	£366.00
15kW	30A	1	10194185	SSW07-0030-T-5SZ	£382.00
22kW	45A	2	10233144	SSW07-0045-T-5SZ	£446.00
30kW	61A	2	10233145	SSW07-0061-T-5SZ	£525.00
45kW	85A	2	10233146	SSW07-0085-T-5SZ	£651.00
55kW	130A	3	10233147	SSW07-0130-T-5SZ	£944.00
90kW	171A	3	10233148	SSW07-0171-T-5SZ	£1,199.00
110kW	200A	3	10233149	SSW07-0200-T-5SZ	£1,421.00
132kW	255A	4	11250198	SSW07-0255-T-5SH2Z	£1,607.00
160kW	312A	4	11250204	SSW07-0312-T-5SH2Z	£1,667.00
200kW	365A	4	11250209	SSW07-0365-T-5SH2Z	£1,732.00
220kW	412A	4	11250215	SSW07-0412-T-5SH2Z	£2,050.00

Remote keypad with double display (LCD and LED)

Description	Order Code	List Price
Remote keypad	HMI-LOCAL-SSW07	£67.00
Remote keypad cable; 3m	CAB-RS-3	£17.00

DLW/DLWM – Enclosed direct-on-line starters

Size 02

Size 05

Single (DWLM) and 3-phase (DWL) direct-on-line starters, assembled with or without thermal overload relay. Please note; separate short circuit protection is also required.

Features

- Thermal overload relay reset integrated into the stop button
- Independant start/stop contacts (from main contactor and overload relay)
- Durable, insulated plastic enclosure

Technical specification

Power ranges:
0.25 to 7.5kW . . 230V - 1 phase; 50Hz
0.09 to 25kW . . . 400V - 3 phase; 50Hz
Cable connections . . Top, bottom or rear
Type of Operation . . . Start + Stop/Reset
Ambient temperature . . . . . Up to 40°C
Protection
Size 02 . . . . . IP65
Size 05 . . . . . IP66
Enclosure dimensions:
Size 02 . . . . . h155 x w90 x d98mm
Size 05 . . . . h217 x w114 x d117.5mm

Size 02

Single-phase, 230V a.c.

Motor Capacity at 230V a.c.	Setting Range	Ident No.	Order Code	List Price
0.25kW	1.8 - 2.8A	11897985	DLWM-7D24P65-R06	£30.25
0.37kW	2.8 - 4A	11624215	DLWM-7D24P65-R07	£30.25
0.55 - 0.75kW	4 - 6.3A	11624214	DLWM-7D24P65-R08	£30.25
1.1kW	6.3 - 8A	11933533	DLWM-7D24P65-R09	£30.25

Three-phase, 400V a.c.

Motor Capacity at 400V a.c.	Setting Range	Ident No.	Order Code	List Price
0.09kW	0.28 - 0.4A	10072767	DLW-7D34P65-R01	£30.26
0.12 - 0.18kW	0.4 - 0.63A	10071275	DLW-7D34P65-R02	£30.26
0.25kW	0.56 - 0.8A	10071276	DLW-7D34P65-R03	£30.26
0.37kW	0.8 - 1.2A	10682988	DLW-7D34P65-R04	£30.26
0.55kW	1.2 - 1.8A	10071277	DLW-7D34P65-R05	£30.26
0.75 - 1.1kW	1.8 - 2.8A	10186296	DLW-7D34P65-R06	£30.26
1.5kW	2.8 - 4A	10046219	DLW-7D34P65-R07	£30.26
2.2kW	4 - 6.3A	10046239	DLW-7D34P65-R08	£30.26
3kW	5.6 - 8A	10689892	DLW-7D34P65-R09	£30.26

Size 05

Single-phase, 230V a.c.

Motor Capacity at 230V a.c.	Setting Range	Ident No.	Order Code	List Price
1.5 - 2kW	8 - 12.5A	13601260	DLWM-B12D24P66-RM64	£51.10
2.2 - 3kW	10 - 15A	13601261	DLWM-B18D24P66-RM65	£53.04
3 - 4kW	15 - 23A	14253845	DLWM-B18D24P66-RM67	£53.04
3.7 - 5kW	15 - 23A	13601264	DLWM-B25D24P66-RM67	£59.35
5.5 - 7.5kW	22 - 32A	13601265	DLWM-B32D24P66-RM68	£78.24

Three-phase, 400V a.c.

Motor Capacity at 400V a.c.	Setting Range	Ident No.	Order Code	List Price
4 - 5.5kW	7 - 10A	13339045	DLW-B9D34P66-R63	£48.38
5.5 - 7.5kW	8 - 12.5A	13338985	DLW-B12D34P66-R64	£49.14
7.5 - 10kW	10 - 15A	13601190	DLW-B18D34P66-R65	£50.23
11 - 15kW	15 - 23A	13601193	DLW-B25D34P66-R67	£57.07
15 - 20kW	22 - 32A	13601194	DLW-B32D34P66-R68	£75.23
18.5 - 25kW	25 - 40A	13601195	DLW-B38D34P66-R69	£84.71

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