MITSUBISHI ELECTRIC
FACTORY AUTOMATION

Facility Management

Automation solutions

Reduce your energy costs With Automation

Energy reduction strategies /// Increased operation time /// Reduced maintenance /// Integrated control /// Remote management

Making the difference...

Global impact

We bring together the best minds to create the best technologies. At Mitsubishi Electric, we understand that technology is the driving force of change in our lives. By bringing greater comfort to daily life, maximising the efficiency of businesses and keeping things running across society, we integrate technology and innovation to bring changes for the better.

Mitsubishi Electric is involved in many areas including the following

Energy and Electric Systems
A wide range of power and electrical products from generators to large-scale displays.

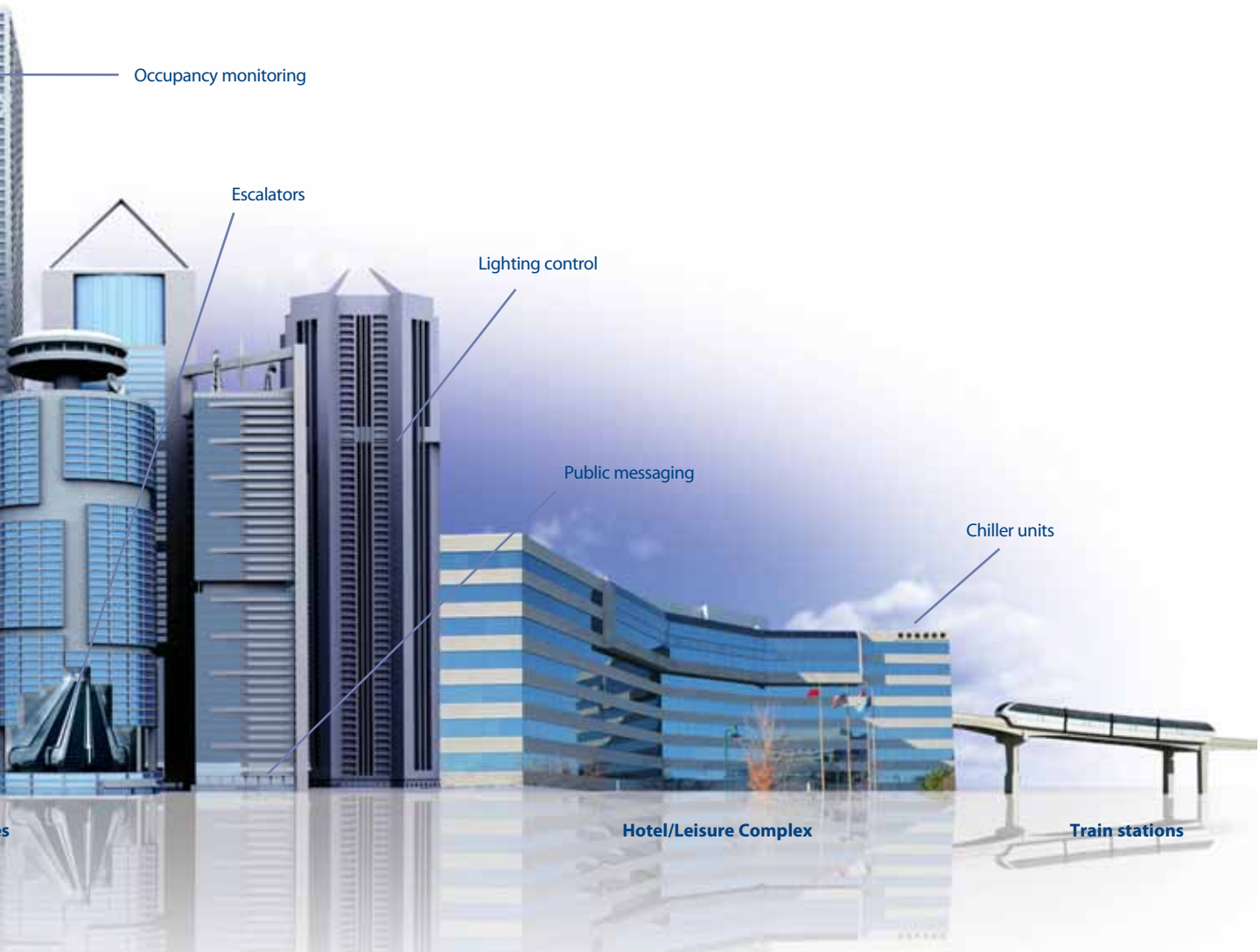
Electronic Devices
A wide portfolio of cutting-edge semiconductor devices for systems and products.

Home Appliances
Dependable consumer products like air conditioners and home entertainment systems.

Information and Communication Systems
Commercial and consumer-centric equipment, products and systems.

Industrial Automation Systems
Maximising productivity and efficiency with cutting-edge automation technology.

...whatever the building



We can make a difference

Mitsubishi Electric's products are already widely used to improve our living and working spaces; from factories and warehouses to office environments and public space projects such as train stations and community leisure facilities.

All of our products are manufactured to the very highest quality levels and naturally conform to international and national standards and directives and are often on Government approval schemes such as the UK's ECA register.

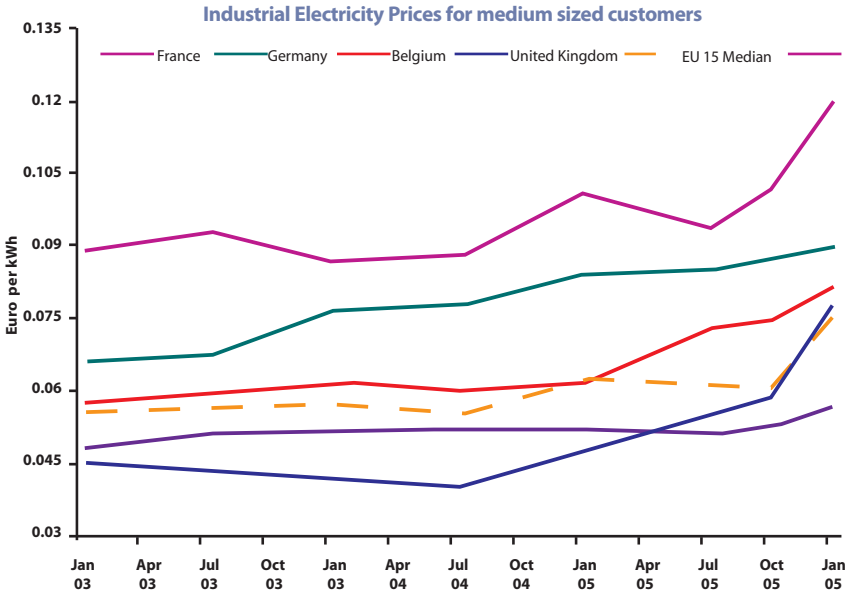
Profit and save

Our products include many important innovations from spiral escalators, high speed elevators to the humble yet important jet towel. We also offer security systems, Air conditioning solutions and even Photovoltaic energy systems. However, one of the biggest benefits we have provided users is with efficient motor management. This has helped to save our customers hundreds of thousands of Euros in energy costs while reducing maintenance and extending operation life of motor driven applications.

A time of change

A few years ago it was said that energy costs were at their lowest point. Unfortunately, year after year since then, there has been a significant increase and this upward trend is unlikely to change. Coupled with this has been an increased awareness of the dangers of global warming, prompting many governments to implement additional taxes and regulations.

Manufacturing industries have been very aware of rising energy costs and have been updating their control systems, improving motor management giving dramatic increases in energy savings.



Unsurprisingly, electricity prices are still rising because of increasing gas and oil prices – figures are based on material from the UK Government's Department of Trade and Industry for a medium sized company.

However, the building management, construction and HVAC industries have not always had the luxury of being able to implement similar technologies, as their market is aggressively competitive with the priorities being set by the end customer of

- Lowest cost
- Speed of delivery
- Guaranteed user comfort

But with the emphasis now changing and greater awareness of global warming and the need to save energy, there has been a shift of priorities with cost of ownership coming to the fore - a very visible part of this being energy costs.

Life time costs

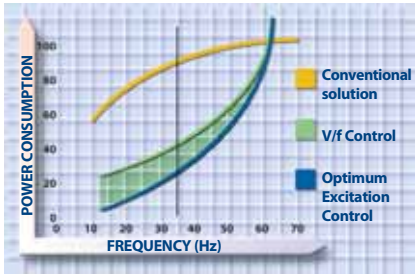
Consider this; it has been a long-established fact that the lifetime running costs of a motor will far outweigh the initial costs. Typically an a motor could cost around €300 to purchase, but its lifetime energy consumption can be 100 times this, i.e. €30,000. Many end customers are realising that, if they could save or reduce the energy used by their motors, (often there are multiple motors for air handling and water/waste pumping) they could add significant cash savings to their bottom line. The good news is there is a simple answer: the frequency inverter.

Background data
Motor size: 75kW
Electricity cost: €0,1575 per kWh
Air volume to be moved: 60%
Operation period: 24hrs x 365 days = 8760h

Power consumption (see graph)
Mechanical system: 90%
FR-F700 inverter: 33%

Calculation for running cost: motor power x hours run x electricity cost x power consumption rate
Mechanical system:
75 x 8760 x 0,1575 x 0.9 = 93,129
Inverter system:
75 x 8760 x 0,1575 x 0.33 = 34,147

Savings for inverter system:
€58,982 per year ……every year!



The inverters energy saving capability is based on a principle called the cube law.

False economy

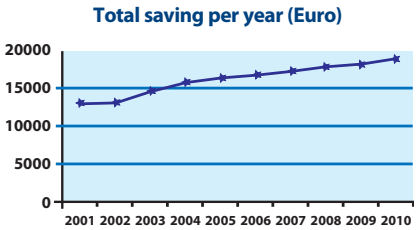
In order to 'win' the contract, keep the end customer 'happy', or improve existing running costs many consultants, facilities managers or construction firms have opted to use mechanical damping systems to regulate air or liquid flows. This, typically, leaves electric motors running at full speed for 100% of the time. The alternative option of installing variable speed inverter drives is a much better solution giving control of the flow of the air/liquid simply by varying the motor speed – and producing energy savings too. Take a look at this air handling example:

ROI

The choice of the electrical variable speed inverter drive system over the mechanically damped one gives end users a "Return On Investment" (ROI) within months and not years - and that saving goes on year after year.

Cost of a typical 22kW inverter, €2,370

In the theoretical example the breakeven for 1 motor would be approx 2.2 months in 2001 (see graph right) but only 1.6 months at 2007 electricity price levels!



Graph showing the increased savings based on increasing electricity costs. Electricity price levels are based on material from the UK Governments Department of Trade and Industry.

A new viewpoint

It has been common practise for consultants and construction companies to over-specify motor sizes, compared to actual fan and pump requirements because;

- It is expensive and time-consuming to have to replace a motor if it is undersized
- The difference in motor cost is small in the scheme of things
- The motor is specified to cope easily with the biggest demand, i.e. to get still air or static liquid moving.

However, although the additional capital cost may be relatively small, the implications for extra energy consumption costs can be huge.

Do more with less

This leads to the second benefit of using variable frequency inverter drives. This is the freedom to allow a motor to be sized to the actual `running` task and not the initial start-up conditions (although these are still important considerations). Inverter drives can provide high start-up currents to overcome high inertias, to get the system moving – effectively overloading the motor, in some cases, by up to 200%, for short periods of time, reducing power and speed for the ongoing process. This reduces the motor costs and the ongoing operational costs.

And finally, the inverter driven motor system experiences reduced wear because the motor is

- not running constantly at 100% load
- not trying to push 100% flow rate past a mechanical damper which is 80% closed

This means reduced maintenance costs, as well as reduced motor noise, and a lower operating temperature - a byproduct of waste energy. What is more, consultants or facility managers no longer have the problems associated with high operating temperatures, or the complaints that arise from noisy motors. And it's safer for operators or maintenance staff too.

Why trust us?

Our experience across the world's industries is unsurpassed. Mitsubishi automation schemes are increasing efficiency and productivity whilst reducing waste, energy and overall costs in many thousands of industrial and commercial premises. Here are just a few examples:

Efficient extraction system saves €180,000 per year

BLP UK Ltd. is a large woodworking company producing doors and shaped wood mouldings.

Comment: Engineering manager Dave White comments "The best part of 1000 kW of installed motor power, for extract fans, was running constantly, eating power day and night. We had to devise a project strategy that let us improve the existing system, whilst not compromising standards, nor disrupting production. Effective dust extraction is critically important to our business for Health & Safety and maintaining product quality."

Solution: A CC-Link network of PLC's, HMI's and inverters were applied to the existing extraction system to provide management, control and energy efficient operation.

Savings: €180,000 per year

Finnish city office saves to 57%

The Finnish city of Tampere renovated the heating and ventilation system of one of its key public buildings.

Comment: Jyrki Viitakoski, of system integrator UTU Power Electronics, said, "Now, using FR-F700 with LON, there is central monitoring of all key parameters, with plenty of advance warning of any problems, improving the quality and reliability of air handling in the building."

Solution: Three FR-F740 inverters fitted with LONworks network cards manage a range of 2.2kW and 1.5kW motors.

Savings: Up to 57% reduction in associated electricity costs

Community swimming pool gets ROI in 13 weeks

Local government, North Somerset Council, UK, installed inverters on the pool pumps at their largest swimming complex in Hutton Moor.

Comment: Steve Hodges, Energy Officer at the Council, said, "The inverter reduced the operating frequency of the motor from the standard 50Hz to 32Hz. This may not sound very significant, until you realise that the power saving is related to the cube of the frequency reduction – in this case over 80 per cent!"

Solution: Inverters applied to the pool water pumping system.

Savings: Payback on the inverter cost from the savings took 13 weeks. Total savings per year around €8,250.

How can we help?

As well as being a world leader in frequency inverter sales, Mitsubishi Electric is a pioneer of core inverter technology. Many competitors use our semiconductor know-how and products in their own inverters.

This unique position is based on our wealth of experience in factory and process automation, as well as our expert knowledge from working with many utility companies. This has all helped us to develop industry-beating frequency inverters that are optimised for fan and pump applications. The applications typically seen by consultants, construction companies and facility managers.

A second problem can be an automatic restart after a brief power dip or outage. The same feature allows the FR-F700 to automatically "catch" the motor while it is coasting and accelerate it back to its original preset speed. This happens seamlessly and provides immediate recovery with the minimum loss of control.

The best yet

Our range of FR-F700 inverters brings our best-ever energy savings and products together in a single drive that is optimised for fan and pump applications.

Control free-wheeling pumps and fans

Freewheeling occurs when external pressures turn a non-powered motor in either direction. For example, static head pressure can force a pump to freely rotate. Starting the motor in this state can cause the motor to trip under an overload condition. The FR-F700 virtually eliminates this problem since it can automatically sense the speed and direction of the motor and bring it directly under control. This feature is also sometimes called a "flying start".

Motor protection

Overhauling loads are not so common but when they do occur they can cause serious problems. For example, where a controlled fan, pulling in fresh air, can be overhauled by a high wind. Because the motor is now being overhauled it will start to act as a generator and can create high voltages within the drive. The FR-F700 can increase the output frequency to compensate and avoid any tripping of the motor.

In addition, the motor can be protected further by wiring its PTC temperature sensor directly to the FR-F700's temperature monitoring system. Thus, if the motor starts to overheat, the inverter can take immediate remedial action.

Multi pump

For even greater economy, and where multiple motors work in the same system, the FR-F700 can automatically operate and control up to four load controlled motors. As each motor is individually brought up to speed it is then switched 'direct-on-line' allowing the next motor in the sequence to be controlled. Slowing is the reverse of the same process.

Advanced control

Each FR-F700 inverter has a local PID control loop that can easily handle typical HVAC demands.

10 year design life

Most importantly, all Mitsubishi inverters have a reputation for reliability and quality. So it's hardly surprising to find that the FR-F700 has a design life of 10 years when used correctly. However, as testament to the quality, many earlier inverters from Mitsubishi (which had a considerably shorter design life) are still running after 15 years or more. The reason for this is simple - high quality design, specially-designed components such as fans and capacitors and treated circuit boards as standard. This plus the built in maintenance functions as well as simple ideas such as removable terminal blocks and "quick change" fans make the FR-F700 maintenance friendly.

Making life easy

We are constantly looking for new ways to help our customers to free up valuable time. Setting up our inverters is simple, using easy to use software. This lets the user save configurations for quick and easy updates or loading into multiple inverters. In addition the built-in parameter unit on the front of the drive provides a handy alternative.

The parameter units offer set-up, configuration and monitoring all from one finger! Mitsubishi's digital dial technology and bright LED displays make life easy for everyone.

At the design stage, users have access to CAD drawings and e-plan files that make integration into building plans quick and efficient. Furthermore, there are easy setup guides, access to local training all over Europe as well as expert assistance from Mitsubishi's support staff and distribution partners.

But there is more

Mitsubishi's FR-F700 inverter drives are available in IP00, IP20, and IP54 configurations. There are also adapter kits for IP20 as well as a range of Floor Standing Units (FSUs) that provide switch isolation and power filters in a solution that removes the need for any additional enclosures or cabinets for (internal) inverter installations. This makes installation quick and easy, with a minimum of floor space, reducing installation costs significantly.

The FR-F700 inverter also has a low harmonic distortion which is due to an integrated dc link choke. In addition, there is also a built in EMC filter that reduces electrical noise to category 2 levels. For installations which require greater protection, there are various ranges of filters available separately or built-in to FSUs.

Integration

In today's internet world, everything is networked and integrated and Mitsubishi inverters are no exception. Basic RS485 networking is built in, offering standard and Modbus RTU protocols. In addition, options are available for LonWorks, Ethernet as well as CC-Link, Profibus, CAN and DeviceNet. For connection to other networks such as BACnet, there are a wide range of readily available network conversion units from third party suppliers.There are also inverter models available with integrated PLC control functions that complement Mitsubishi's range of FX and System Q controllers.

Furthermore, the System Q platform can not only provide a valuable link to Mitsubishi Air Conditioning systems through a G50 network gateway, but also link in to Mitsubishi Air Circuit Breakers (ACBs) and MCBs. System Q brings discrete control, management and coordination as well as access to over 50 different networking and communication technologies. This includes options for a built-in PC as well as a web-server making your application truly visible wherever you may be based.

Further products that may be of interest in building/HVAC applications

■ Building automation
Alpha2
FR-S500 inverters
FR-A700 inverters
FX family PLCs
System Q Automation Platform
ACBs
MCBs
MCCBs
GOT1000 touch screens
IPCs - PC technology integrated directly in to a touch screen for surface mounting

■ Air conditioning
Multicassette Air conditioning
Lossnay Ground heat pump

■ Others
Lifts and escalators
Security systems
Time lapse recorders
Photovoltaic solutions
Jet towels - hot air hand drying systems

For more information on Mitsubishi Electric's automation products, please see the European factory automation portal **www.mitsubishi-automation.com**

For all other products, please see Mitsubishi Electric's European product portal **europe.mitsubishielectric.com**

Global Partner. Local Friend.

EUROPEAN BRANCHES

MITSUBISHI ELECTRIC EUROPE B.V. **FRANCE**
25, Boulevard des Bouvets
F-92741 Nanterre Cedex
Phone: +33 (0)1 / 55 68 55 68

MITSUBISHI ELECTRIC EUROPE B.V. **GERMANY**
Gothaer Straße 8
D-40880 Ratingen
Phone: +49 (0) 2102 / 486-0

MITSUBISHI ELECTRIC EUROPE B.V. **IRELAND**
Westgate Business Park, Ballymount
IRL-Dublin 24
Phone: +353 (0)1 419 88 00

MITSUBISHI ELECTRIC EUROPE B.V. **ITALY**
Viale Colleoni 7
I-20041 Agrate Brianza (MI)
Phone: +39 039 / 60 53 1

MITSUBISHI ELECTRIC EUROPE B.V **SPAIN**
Carretera de Rubí 76-80
E-08190 Sant Cugat del Vallés (Barcelona)
Phone: +34 93 / 565 3131

MITSUBISHI ELECTRIC EUROPE B.V. **UK**
Travellers Lane
UK-Hatfield Herts. AL10 8 XB
Phone: +44 (0)1707 / 27 61 00

EUROPEAN REPRESENTATIVES

GEVA **AUSTRIA**
Wiener Straße 89
AT-2500 Baden
Phone: +43 (0)2252 / 85 55 20

TEHNIKON **BELARUS**
Oktyabrskaya 16/5, Off. 704
BY-220030 Minsk
Phone: +375 (0)17 / 210 46 26

Koning & Hartman b.v. **BELGIUM**
Woluwelaan 31
BE-1800 Vilvoorde
Phone: +32 (0)2 / 257 02 40

AKHNATON **BULGARIA**
4 Andrej Ljapchev Blvd. Pb 21
BG-1756 Sofia
Phone: +359 (0)2 / 97 44 05 8

INEA CR d.o.o. **CROATIA**
Losinjska 4 a
HR-10000 Zagreb
Phone: +385 (0)1 / 36 940 - 01/ -02/ -03

AutoCont C. S. s.r.o. **CZECH REPUBLIC**
Jelinkova 59/3
CZ-721 00 Ostrava Svinov
Phone: +420 (0)59 / 5691 150

B:TECH A.S. **CZECH REPUBLIC**
Na Ostrove 84
CZ - 58001 Havlickuv Brod
Phone: +420 (0)569 / 408 841

Beijer Electronics A/S **DENMARK**
LAUTRUPHOJ 1-3
DK-2750 Ballerup
Phone: +45 (0)70 / 26 46 46

Beijer Electronics Eesti OÜ **ESTONIA**
Pärnu mnt.160i
EE-11317 Tallinn
Phone: +372 (0)6 / 51 81 40

Beijer Electronics OY **FINLAND**
Jaakonkatu 2
FIN-01620 Vantaa
Phone: +358 (0)207 / 463 500

UTECO A.B.E.E. **GREECE**
5, Mavrogenous Str.
GR-18542 Piraeus
Phone: +30 211 / 1206 900

Meltrade Ltd. **HUNGARY**
Fertõ utca 14.
HU-1107 Budapest
Phone: +36 (0)1 / 431-9726

Ilan & Gavish Ltd. **ISRAEL**
24 Shenkar St., Kiryat Arie
IL-49001 Petah-Tiqva
Phone: +972 (0)3 / 922 18 24

Kazpromautomatics Ltd. **KAZAKHSTAN**
2, Scladskaya str.
KAZ-470046 Karaganda
Phone: +7 3212 / 50 11 50

Beijer Electronics SIA **LATVIA**
Vestienas iela 2
LV-1035 Riga
Phone: +371 (0)784 / 2280

Beijer Electronics UAB **LITHUANIA**
Savanoriu Pr. 187
LT-02300 Vilnius
Phone: +370 (0)5 / 232 3101

Intehsis srl **MOLDOVA**
bld. Traian 23/1
MD-2060 Kishinev
Phone: +373 (0)22 / 66 4242

Koning & Hartman b.v. **NETHERLANDS**
Haarlerbergweg 21-23
NL-1101 CH Amsterdam
Phone: +31 (0)20 / 587 76 00

Beijer Electronics AS **NORWAY**
Postboks 487
NO-3002 Drammen
Phone: +47 (0)32 / 24 30 00

MPL Technology Sp. z o.o. **POLAND**
Ul. Krakowska 50
PL-32-083 Balice
Phone: +48 (0)12 / 630 47 00

Sirius Trading & Services srl **ROMANIA**
Str. Biharia nr. 67-77
RO-013981 Bucuresti 1
Phone: +40 (0)21 / 201 1147

ELEKTROSTILY **RUSSIA**
Rubzowskaja nab. 4-3, No. 8
RU-105082 Moscow
Phone: +7 495 / 545 3419

ICOS **RUSSIA**
Ryazanskij Prospekt, 8A, Office 100
RU-109428 Moscow
Phone: +7 495 / 232 0207

NPP "URALELEKTRA" **RUSSIA**
Sverdlova 11A
RU-620027 Ekaterinburg
Phone: +7 343 / 353 2745

CRAFT C. & E. d.o.o. **SERBIA**
Toplicina str.4 lok 6
SER-1800 Nis
Phone: +381 (0)18 / 292-24-4/5, 523 962

INEA SR d.o.o. **SERBIA**
Karadjordjeva 12/260
SER-113000 Smederevo
Phone: +381 (0)26 / 617 163

AutoCont Control s.r.o. **SLOVAKIA**
Radlinského 47
SK - 02601 Dolný Kubín
Phone: +421 (0)43 / 5868 210

CS Mtrade Slovensko, s.r.o. **SLOVAKIA**
Vajanskeho 58
SK - 92101 Piestany
Phone: +421 (0)33 / 7742 760

INEA d.o.o. **SLOVENIA**
Stegne 11
SI-1000 Ljubljana
Phone: +386 (0)1 / 513 8100

Beijer Electronics AB **SWEDEN**
Box 426
SE-20124 Malmö
Phone: +46 (0)40 / 35 86 00

ECONOTEC AG **SWITZERLAND**
Hinterdorfstr. 12
CH-8309 Nürensdorf
Phone: +41 (0)44 / 838 48 11

GTS **TURKEY**
Darulaceze Cad. No. 43 KAT. 2
TR-34384 Okmeydani-Istanbul
Phone: +90 (0)212 / 320 1640

CSC Automation Ltd. **UKRAINE**
15, M. Raskova St., Fl. 10, Office 1010
UA-02002 Kiev
Phone: +380 (0)44 / 494 33 55

CBI Ltd. **SOUTH AFRICA**
Private Bag 2016
ZA-1600 Isando
Phone: + 27 (0)11 / 928 2000

MITSUBISHI ELECTRIC
FACTORY AUTOMATION

Mitsubishi Electric Europe B.V. /// FA - European Business Group /// Gothaer Strasse 8 /// D-40880 Ratingen /// Germany
Tel: +49 (0) 2102 4860 /// Fax: +49 (0) 2102 4861120 /// info@mitsubishi-automation.com /// www.mitsubishi-automation.com

Specifications subject to change without notice /// Art. no. 209201-A /// 07.2007