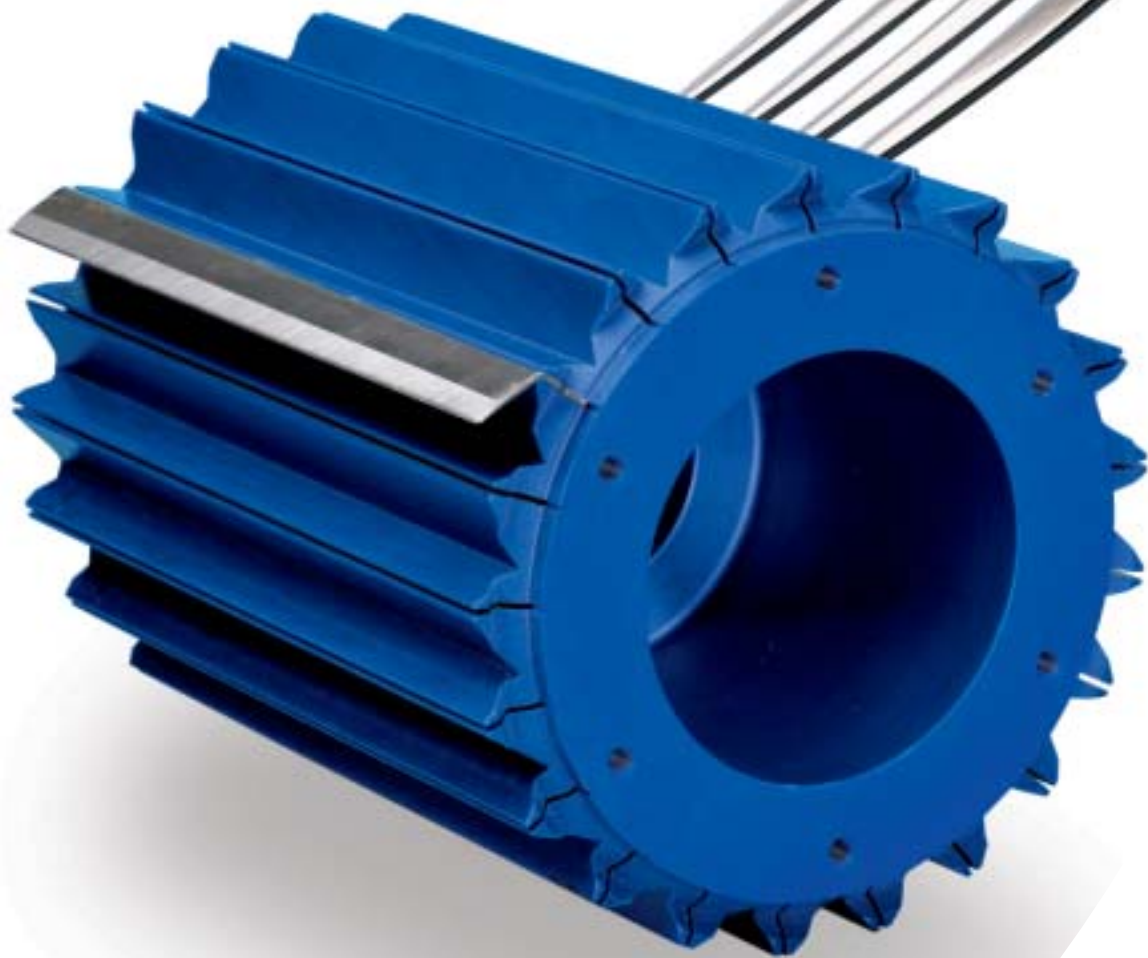


Engineering Plastic Products

Solutions & Applications
for Food Processing &
Handling Industry



ALPERTON ENGINEERING LIMITED

Moyle Road, Dublin Industrial Estate,
Glasnevin, Dublin 11
Phone 01 8306277 Fax 01 8306458
E-Mail info@alperton.ie
Website www.alperton.com



QUADRANT

You inspire ... we materialize®



Food Processing and Handling Industry

Quadrant EPP is the Global leader in Engineering Plastic stock shapes for machining. We have gathered our competence and knowledge in a variety of markets and different applications for over 50 years. Our rapid business expansion in the foodprocessing and handling equipment industry has been realised by providing the most innovative and cost effective solutions to our customers.

Quadrant EPP is able to provide its customers with an unmatched engineering support through its regional business development engineers, global technical service network, technical sales organisation and its qualified distribution and fabrication partners. This enables our customers to obtain the best solutions and bring their products faster to the market.

Quadrant EPP is also present in other market segments with the best cost / performance solutions e.g. pharmaceutical, medical and cosmetic industries.

Our product offering includes highly chemical resistant materials like CESTILENE, KETRON®, TECHTRON®, SYMALIT® PVDF and FLUOROSINT®, but also internally lubricated grades such as NYLATRON® LFG, ERTALYTE® TX, KETRON® PEEK™-TX and TECHTRON® HPV PPS. Furthermore we can offer a wide range of standard colours in POM (ERTACETAL® C), PE-(U)HMW (CESTICOLOR), and PEEK™ (KETRON® PEEK™-1000).

The key assets of our product offering are:

broad range of materials

Extensive range of shapes in a broad portfolio of materials produced and stocked in sizes chosen in cooperation with the main players in the market, and available through our global distribution network. This assures quick response, resulting in less cost and shorter lead times to both the OEM and fabricator.

food contact compliant composition

Materials with a food contact compliant composition, meeting a variety of regulations that apply for plastic materials used for the fabrication of finished articles intended to come into contact with foodstuffs (EC, FDA, NSF, 3A Dairy, ...).

self-lubricating grades

Self-lubricating grades are available for applications where little or no external lubrication can or should be applied. These internally lubricated grades with food contact compliant composition, are available in a wide range of shapes and sizes, and offer lower maintenance costs and good environmental performance.

chemical resistance

Chemical resistance to a wide range of aggressive substances that are used on foodprocessing equipment during processing, cleaning & sanitizing.

colours

Different colours in order to secure traceability in the processed foodstuff in case of damage to the plastic parts, but also as component signal colour. The colour "blue" is predominantly positioned, but other colours are also available.





Main application areas in Food Processing & Handling

• bakeries

tunnel ovens; forming, kneading, cake filling machinery, bread mills, dough depositors

• dairy processing & packaging

separators; milk, ice-cream, butter & cheese manufacturing & filling machinery; homogenizers

• meat & sausages processing

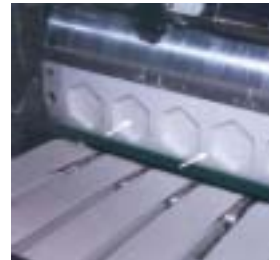
cutters; grinders; deboning, conveying, sausage filling, shashlik preparation machinery; mixers; cookers

• confectionary industry

forming, blister forming, sealing & box packaging equipment

• beverage processing & filling

centrifuges, separators, bottling & canning lines, decanters, heat exchangers



ERTALYTE® paste portioning mould and ejector on a bakery machine



Separation disk in meat mixing & cutting equipment made from ERTALON® 6 PLA



TECHTRON® HPV PPS mold for paper bag packaging equipment



Dosing head made of ERTALYTE® TX in bottle & glass filling equipment





Food contact compliant materials

Compliance of the raw materials used for the manufacture of the Quadrant EPP “Food Programme” Stock Shapes with respect to their composition as set out in the regulations that apply in the European Union, Germany and the USA for plastic materials used for the fabrication of finished articles intended to come into contact with foodstuffs.

QUADRANT EPP STOCK SHAPES	BASE POLYMERS	EUROPEAN UNION Directive 2002/72/EC	GERMANY BfR	USA FDA Code of Federal Regulations (21 CFR)
ERTALON® 6 SA natural	Polyamide	+	+	+
ERTALON® 6 SA blue		+	+	+
ERTALON® 66 SA natural		+	+	+
ERTALON® 6 PLA natural		+	+	+
ERTALON® 6 PLA blue		+	+	+
NYLATRON® LFG natural		-	+	+
NYLATRON® LFG blue		-	+	+
ERTACETAL® C natural	Polyacetal	+	+	+
ERTACETAL® C blue 50		+	+	+
ERTALYTE® natural	Polyethylene terephthalate	+	+	+
ERTALYTE® TX		+	+	+
PC 1000 natural	Polycarbonate	+	+	+
CESTILENE HD 500 natural	Polyethylene	+	+	+
CESTILENE HD 1000 natural		+	+	+
CESTICOLOR HD 500 & HD 1000		+	+	+ or - (*)
KETRON® PEEK™-1000 natural	Polyetheretherketone	+	P	+
KETRON® PEEK™-1000 black		+	P (+)	+
KETRON® PEEK™-TX		+	P (+)	+
TECHTRON® HPV PPS	Polyphenylene sulphide	+	P (+)	±
RADEL® PPSU 1000 black	Polyphenylsulphone	+	P (+)	+ (**)
ULTEM® PEI 1000 natural	Polyetherimide	+	P	+
PSU 1000 natural	Polysulphone	+	P	+
SYMALIT® PVDF 1000 natural	Polyvinylidene fluoride	+	P	+
FLUOROSINT® 207	Polytetrafluoroethylene	+	+	+



- + : complies with the requirements of the legislation
- : does not comply with the requirements of the legislation
- ± : FDA compliance pending
- p : there is no specific BfR recommendation for this polymer
- p (+) : there is no specific BfR recommendation for the base polymer; the additives used (colorants and fillers) comply with the relevant BfR recommendations.
- (*) : depends on the respective colour
- (**) : refers to the FDA Food Contact Notification (FCN), No. 83 “Poly (oxy(1,1'-biphenyl) - 4,4'-diioxy - 1,4-phenylenesulfonyl - 1,4-phenylene)”, and FDA regulation 21 CFR 178.3297 “Colorants for polymers.”

Note: The above information, based on raw material supplier data, corresponds with our actual knowledge and is believed to be a valuable help in the choice of a Quadrant EPP material. However, Quadrant Engineering Plastic Products makes no guarantees as to the suitability of its materials for any given application, and thus assumes no obligation or liability whatsoever in connection with the information provided above. It remains the customer's sole responsibility to assess the final suitability of the chosen Quadrant EPP material for the intended food contact application.



New product offering

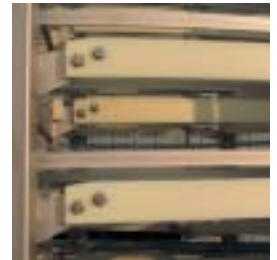


NYLATRON® LFG [natural (ivory) / blue]

(PA6 + oil)

This internally lubricated cast nylon 6, is available in both natural and Quadrant blue colour. NYLATRON® LFG (Lubricated Food Grade) is self-lubricating in the real meaning of the word, and has an FDA food contact compliant composition. The NYLATRON® LFG has been specially developed for non-lubricated, highly loaded and slowly moving parts in food contact applications. It yields a considerable enlargement of the application opportunities compared to standard cast nylons, because of its reduced coefficient of friction (up to 50% lower) and vastly improved wear resistance (up to 10 times better). This provides lower maintenance costs and longer life in service.

Main applications: packaging equipment, automatic handling, milk/cheese processing.



NYLATRON® LFG wearstrips in food drying towers

ERTALYTE® TX [pale-grey]

(PET + solid lubricant)

ERTALYTE® TX is a thermoplastic polyester (polyethylene terephthalate) stock shape which incorporates a uniformly dispersed solid lubricant. This material has a food contact compliant composition and is available in a pale grey colour only. Its specific formulation makes it a premium internally lubricated bearing-grade. ERTALYTE® TX has outstanding wear resistance and offers even lower coefficient of friction and higher Pressure-Velocity capabilities than the standard ERTALYTE® grade.

Main applications: cutters and grinders, beverage filling, butter packaging equipment.



ERTALYTE® TX in dough dosing equipment

TECHTRON® HPV PPS [deep blue]

(PPS + solid lubricant)

This reinforced, internally lubricated polyphenylene sulphide grade demonstrates an excellent combination of properties, including wear resistance, load-bearing capabilities and dimensional stability, when exposed to chemicals and high temperature environments.

Thanks to the uniformly dispersed internal lubricant, TECHTRON® HPV PPS exhibits excellent wear resistance and a low coefficient of friction. Without basically changing the composition and hence the physical properties of the material, the formulation of TECHTRON® HPV PPS has now been fine-tuned to also offer food contact compliance, in this way substantially broadening its application possibilities.

Main applications: filtering drums, meat & dairy forming equipment, extraction installations, cheese processing, heating & drying equipment.



Shaft holder made of TECHTRON® HPV PPS in cheese packaging equipment

KETRON® PEEK™-TX [blue]

(PEEK™ + solid lubricant)

KETRON® PEEK™-TX is a new member of the KETRON® PEEK™ family of materials which is based on genuine VICTREX® PEEK™ polymers. This semi-crystalline PEEK™ exhibits a unique combination of high mechanical properties, temperature resistance and excellent chemical resistance making it the most popular advanced plastics material.

Like KETRON® PEEK™-1000, this new internally lubricated material has a food contact compliant composition, but offers far superior wear and frictional performance, making it especially suitable for a wide variety of wear applications in the 100 to 200°C service temperature range.

Main applications: cooking equipment, heat exchangers, fermentation & brewery equipment, high speed big cutters.



Scraper in a vacuum cooker made of KETRON® PEEK™-TX



Cleaning and sanitizing

To safeguard public health, cleaning and sanitizing procedures are very important in the foodprocessing and handling industries. Detailed procedures are developed and rigorously established for foodproduct contact surfaces (equipment, utensils, etc.) and for non foodproduct contact surfaces (shields, walls, ceilings, etc.).

The goal of these surface cleaning and sanitizing procedures is to remove nutrient sources which bacteria need for growth, and to kill those bacteria that are already present.

- **Cleaning** aims at complete removal of unwanted matter (food soils) from the surface, at the same time removing part of the bacteria present.
- **Sanitizing** aims at killing residual bacteria that are capable of causing diseases (pathogenic organisms). Most of the bacteria that remain after cleaning can be destroyed by sanitizing with hot water, steam or chemicals under specific conditions with respect to temperature, concentration and contact time.

Quadrant EPP has products that can withstand different cleaning and sanitizing procedures applied by means of systems such as CIP (Clean-In-Place), COP (Clean-Out-of-Place) and SIP (Sterilization-In-Place) – see table below. The choice of the most suitable plastics material depends on available chemical resistance data and practical experience, but often preliminary testing of the finished plastics part under actual service conditions (correct chemical, concentration, temperature and contact time, as well as loading

conditions) is required to assess its final suitability for the given application.

Some basic requirements for plastic food contact parts used on food-processing and -handling equipment:

- suitable physical properties for the given application in terms of strength, stiffness, impact resistance, dimensional stability, temperature resistance, tribological properties (wear and friction),
- food contact compliance,
- chemical resistance against the particular foodstuff(s) and cleaning/sanitizing agents,
- smooth surfaces that are free of cracks, pin holes or other surface imperfections that may impair cleaning and sanitizing effectiveness.

The table below gives the resistance ratings of the Quadrant EPP materials against some cleaning agents that are commonly used in the foodprocessing and handling industries.

CHEMICALS		Concentration (%)	Temperature (°C)	ERTALON®/NYLATRON® (PA)	ERTALON®/NYLATRON® (PA)	ERTALON®/NYLATRON® (PA)	ERTALON®/NYLATRON® (PA)	ERTALON®/NYLATRON® (PA)	ERTALON®/NYLATRON® (PA)	ERTALON®/NYLATRON® (PA)	ERTALON®/NYLATRON® (PA)	ERTALON®/NYLATRON® (PA)	ERTALON®/NYLATRON® (PA)	ERTALON®/NYLATRON® (PA)	ERTALON®/NYLATRON® (PA)
Hydrogen peroxide	1	RT	C	A	A	A	A	A	A	A	A	A	A	A	A
Nitric acid	1	RT	B	C	A	A	A	A	A	A	A	A	A	A	A
Nitric acid	5	80	C	C	C	C	B	B	B	A	B	A	A	A	A
Phosphoric acid	1	RT	B	C	A	A	A	A	A	A	A	A	A	A	A
Phosphoric acid	5	80	C	C	B	C	B	A	A	A	A	A	A	A	A
Sodium hydroxide	1	RT	A	A	A	B	A	A	A	A	A	A	A	A	A
Sodium hydroxide	5	80	C	A	C	C	B	A	A	A	B	A	C	A	A
Sodium hypochlorite (300 ppm active chlorine)		20	B	B	A	A	A	A	A	A	A	A	A	A	A
Steam sterilisation (single autoclaving)	UD	134	A	A	A	A(*)	NA	A	A	A	A	A	A	A	A
Steam sterilisation (repeated autoclaving) - (***)	UD	134	C	C	C	C	NA	A	A	A	A	A	A	A	A
Sulphuric acid	1	RT	B	A	A	A	A	A	A	A	A	A	A	A	A
Sulphuric acid	3	60	C	C	A	A	A	B	A	A	A	A	A	A	A
Water	UD	60	A	A	A	A	A	A	A	A	A	A	A	A	A
Water	UD	80	B	A	B	B	B	A	A	A	A	A	A	A	A
Water	UD	95	C	B	C	C	C	A	B	A	A	A	A	A	A

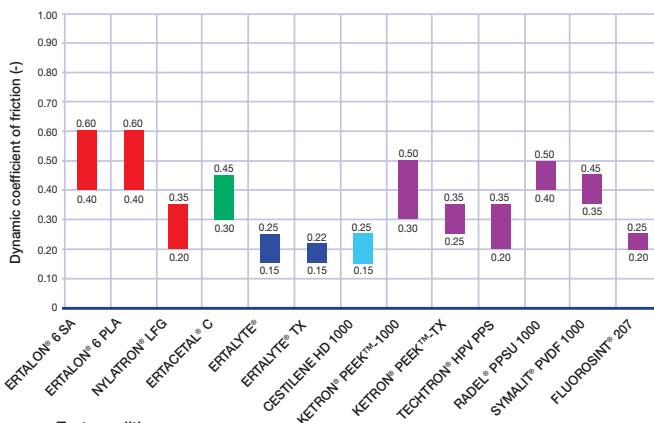
Legend to the table:
Resistance ratings:
 A: Resistant. Little or no change in weight. Small effect on mechanical properties. In general acceptable service life.
 B: Partially resistant. In course of time, there is a distinct deterioration in mechanical properties and a change in weight. In many cases a short term exposure or limited number of cleaning cycles may be considered allowable (to be evaluated by practical testing).
 C: Non-resistant. After a short time, the material is seriously affected (considerable reduction of the mechanical strength and changes in weight). Using the material under these conditions is not recommended.
 NA: Not applicable for this material
Concentration (%):
 A number, e.g. 5, indicates "5 g of solute per 100 g of aqueous solution" (5 % by weight).
 UD: Undiluted (technically pure chemical)
Temperature (°C):
 RT: Room temperature (15 – 25°C)

(*): for this material, the max. sterilisation temperature is limited to 121°C
 (**): it has to be pointed out that stress cracking can occur on SYMALIT® PVDF 1000 parts when simultaneously exposed to mechanical stress and to an environment with pH ≥ 12, or when operating in a medium which is likely to generate atomic chlorine.
 (***): considering the different inherent properties of these plastics, the influence of design of the plastic parts, cycle times and chemical environment (boiler feed water additives, etc.), the allowable number of sterilisation cycles is to be determined by the user under practical operating conditions.
 Note: The ratings given in the table above - derived from raw material supplier data, literature related to the chemical resistance of plastics, and own experience - are intended as a guide only and refer to unstressed parts. It has to be pointed out that particularly the amorphous thermoplastics (PC, PSU, PEI and PPSU) are sensitive to "stress cracking", meaning that environments which are completely harmless to unstressed parts, may cause stress cracking when in contact with stressed parts.



Technical information

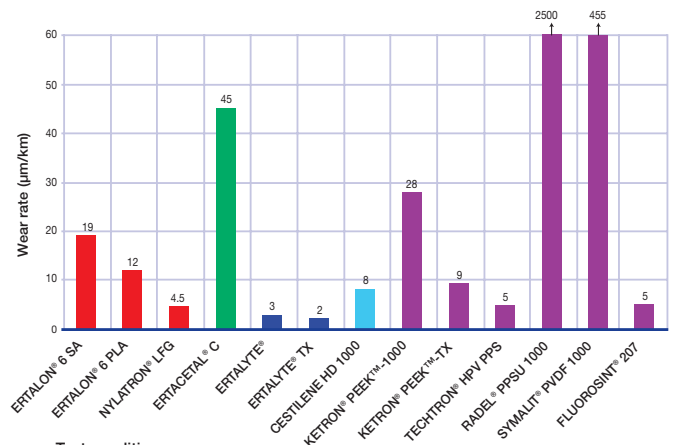
DYNAMIC COEFFICIENT OF FRICTION (measured on a "plastics pin on rotating steel" disk - tribo system)



Test conditions:

- pressure: 3 MPa
- sliding velocity: 0.33 m/s
- surface roughness of the C35 steel mating surface: Ra = 0.70 - 0.90 µm
- total distance run: 28 km
- normal environment (air, 23°C/50% RH)
- unlubricated operation

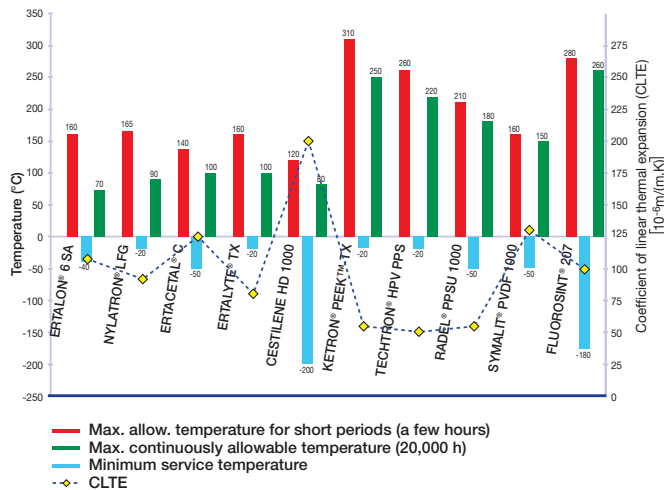
WEAR RESISTANCE (measured on a "plastics pin on rotating steel disk" - tribo system)



Test conditions:

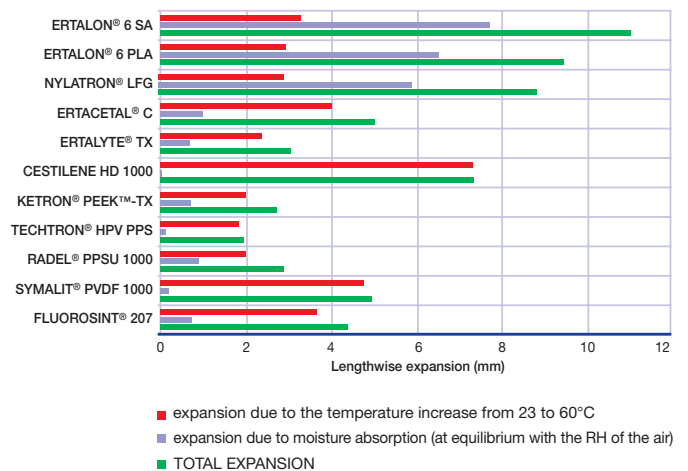
- pressure: 3 MPa
- sliding velocity: 0.33 m/s
- surface roughness of the C35 steel mating surface: Ra = 0.70 - 0.90 µm
- total distance run: 28 km
- normal environment (air, 23°C/50% RH)
- unlubricated operation

MINIMUM AND MAXIMUM SERVICE TEMPERATURE IN AIR COEFF. OF LINEAR THERMAL EXPANSION (average value between 23 and 100°C)



DIMENSIONAL STABILITY (influence of moisture absorption and temperature increase)

Expansion of a 1000 mm long strip (dry, 23°C) when stored in air of 60°C/50% RH



For more information, please call your local business development engineer.

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www.quadrantplastics.com

Regional headquarters

ASIA-PACIFIC

108 Tai To Tsuen, Ping Shan
YUEN LONG - N.T. Hong Kong
 Tel +852 (0) 24702683
 Fax +852 (0) 24789966
epp.asia@qplas.com

EUROPE

I.P. Noord - R. Tavernierlaan 2
8700 TIELT - Belgium
 Tel +32 (0) 51 42 35 11
 Fax +32 (0) 51 42 33 00
contact@qplas.com

NORTH AMERICA

2120 Fairmont Avenue
PO Box 14235 - READING, PA 19612-4235
 Tel (800) 366 0300 / +1 610 320 6600
 Fax (800) 366 0301 / +1 610 320 6868
epp.americas@qplas.com

Quadrant Engineering Plastics Products worldwide

BELGIUM

I.P. Noord - Szamotulystraat 14
 8700 TIELT
 Tel. +32 (0) 51 42 32 24
 Fax +32 (0) 51 42 33 40

HONG KONG

108 Tai To Tsuen, Ping Shan
YUEN LONG,
 N.T. Hong Kong
 Tel +852 (0) 2 470 26 83
 Fax +852 (0) 2 478 99 66

KOREA

97 Samjung-Dong
 Ohjung-Ku, BUCHEON-CITY
 Tel +82 (0) 32 673 9901
 Fax +82 (0) 32 673 6322

THE NETHERLANDS

Anthony Fokkerweg 2
 7602 PK ALMELO
 Tel +31 (0) 546 877 777
 Fax +31 (0) 546 860 796

CANADA

495 Laird Road
 GUELPH, Ontario - N1G 3M1
 Tel (800) 567 7659 / +1 519 837 1500
 Fax (800) 265 7329 / +1 519 837 3770

HUNGARY

Sikert str 2-4
 1108 BUDAPEST
 Tel +36 (0) 1 264 4206
 Fax +36 (0) 1 262 0145

MEXICO

Apartado Postal 13
 52000 Lerma,
 EDO DE MÉXICO
 Tel +52 (728) 753 10
 Fax +52 (728) 753 17

UNITED KINGDOM

83 Bridge Road East
WELWYN GARDEN CITY
 Hertfordshire AL7 1LA
 Tel +44 (0) 1707 361 843
 Fax +44 (0) 1707 361 838

FRANCE

ZAC de Satolas Green
 69330 PUSIGNAN
 Tel +33 (0) 4 72 93 18 00
 Fax +33 (0) 4 72 93 18 96

INDIA

B 166 Yojnavihar,
 DELHI 92
 Tel +91 (0) 11 214 49 17
 Fax +91 (0) 11 216 45 41

POLAND

Ul. Dziegielowa 7
 61-680 POZNAŃ
 Tel +48 (0) 61 822 70 49 / 825 70 45
 Fax +48 (0) 61 820 57 51

U.S.A.

2120 Fairmont Avenue - PO Box 14235
 READING, PA 19612-4235
 Tel (800) 366 0300 / +1 610 320 6600
 Fax (800) 366 0301 / +1 610 320 6868

Z.I. Front de Bandière

BP 26
 01360 BALAN
 Tel. +33 (0) 4 72 25 17 87
 Fax +33 (0) 4 72 25 91 35

ITALY

Via Trento 39,
 20017 Passirana di Rho,
 MILANO
 Tel +39 02 93 26 131
 Fax +39 02 93 50 8451

SOUTH AFRICA

25 Nickel Street, Technicon
 P.O. Box 63
 ROODEPOORT 1725
 Tel +27 (0) 11 760-3100
 Fax +27 (0) 11 763-2811

GERMANY

Am Leitzelbach 11
 74889 SINSHEIM
 Tel + 49 (0) 7261 15 50
 Fax + 49 (0) 7261 15 51 55

JAPAN

5-2, Marunouchi 2-chome
 Chiyoda-K,
 TOKYO 100
 Tel +81 (0) 33 2834 267
 Fax +81 (0) 33 2834 087

Distributed by:

Alperton Engineering Ltd
 Unit 48 Moyle Road,
 Dublin Industrial Estate
 Glasnevin, Dublin 11
 Phone 01 8306277
 Fax 01 8306458
 e-mail info@alperton.ie
 Website www.alperton.com



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