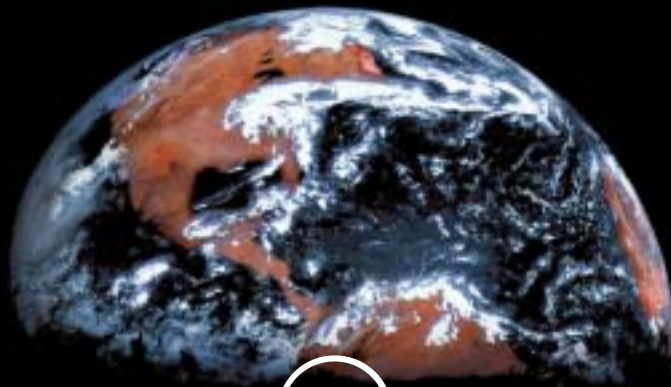


HORIZON



H O R I Z O N™ G U I D E D W A V E R A D A R

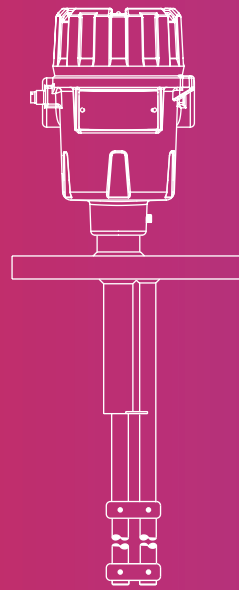
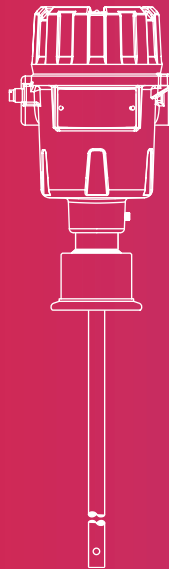
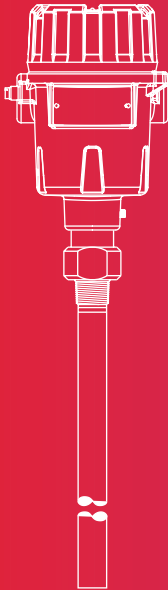


Magnetrol®

Worldwide Level and Flow Solutions™

The Total Spectrum of Solutions ▶

Magnetrol's products employ a number of technologies to meet the challenges of level and flow control. Horizon transmitters utilize Guided Wave Radar for accurate and reliable level control.



HORIZON GUIDED WAVE RADAR
MAGNETROL



Magnetrol International—a world leader in level and flow control technology—designs, manufactures, markets and services level and flow instrumentation worldwide.

Magnetrol's product groups are based upon these technologies:

- Buoyancy
- Contact Ultrasound
- Non-Contact Ultrasound
- Guided Wave Radar
- RF Capacitance
- Thermal Dispersion
- Vibration
- Visual Indication

The industries we serve include:

- Petroleum Production
- Petroleum Refining
- Power Generation
- Petrochemical
- Chemical
- Water & Wastewater
- Pulp & Paper
- Food & Beverage
- Pharmaceutical



• An Introduction to Guided Wave Radar	4
• Horizon Transmitters: Models 703 and 704	6
• Horizon Probes:	
Coaxial Probes: 7XA Standard Coaxial	8
Twin Rod Probes: 7XB Standard Twin Rod	9
Single Rod Probes: 7XF Bare Single Rod	9
7XF-4 Teflon® Coated	10
7XF-E Sanitary	10
7XF-F Corrosion Resistant	11

An Introduction To Horizon Guided Wave Radar

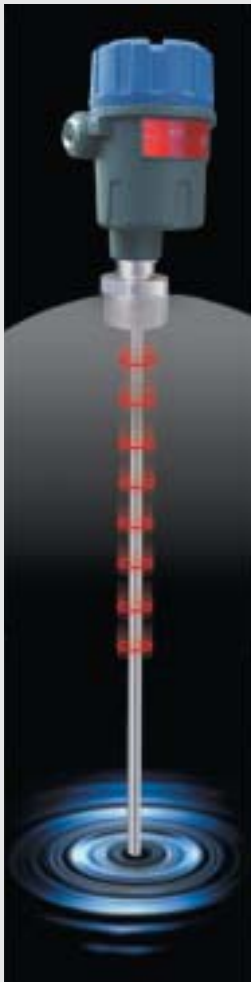
Horizon transmitters utilize Guided Wave Radar (GWR) technology for unsurpassed accuracy and reliability in monitoring liquid levels. Though GWR technology was first employed for the detection of under-

ground cable breaks as early as the 1930s, Magnetrol pioneered its use for liquid level measurement with the introduction of the Eclipse® 705 transmitter in 1998. No other level measurement technology has captured the attention of the process control industry the way Eclipse has in the short time since its introduction. In 2003, Horizon transmitters are being introduced to bring economical, general purpose guided wave radar transmitters to industry.

HOW GUIDED WAVE RADAR WORKS

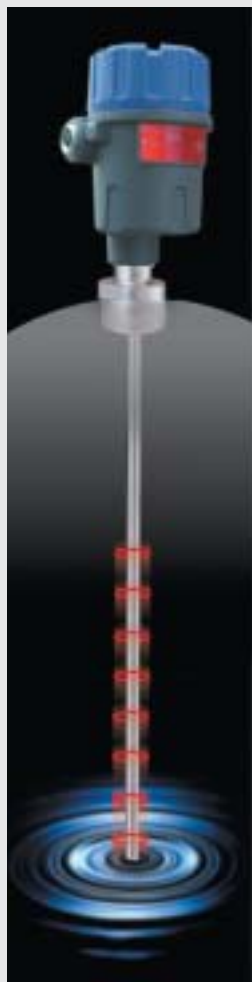
Pulses Generated

Horizon transmitters generate pulses of electromagnetic energy that are transmitted down the probe, or waveguide.



Pulses Reflected

When they reach a liquid surface that has a higher dielectric than the air or vapor in which they travel, the pulses are reflected.



Time converted to Distance

The pulses' transit time is measured, converted to distance, and can be displayed on the LCD as a level reading (Model 704 only).



Principle of Operation

Guided Wave Radar functions according to the principles of Time Domain Reflectometry (TDR) and Equivalent Time Sampling (ETS). As shown at left, a generated pulse of electromagnetic energy travels down the probe. Upon reaching the liquid surface the pulse is reflected. ETS captures these signals in real time (nanoseconds) and reconstructs them in equivalent time (milliseconds) to make level measurement a practical reality.

Unlike conventional radar, which launches its signal into free air, Horizon launches its signals within the sealed path of its probe (wave guide) which is in direct contact with the process media. This direct contact makes the signal less vulnerable to distortion brought on by process conditions that might thwart through-air technologies.

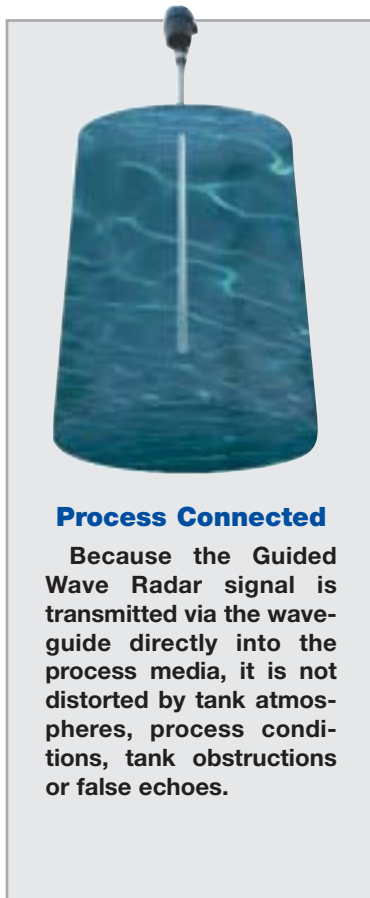
Horizon transmitters have been designed to bring affordable Guided Wave Radar level measurement to the process industry. The Model 703 is available with basic Coaxial, Twin Rod and Single Rod probes. The Model 704 offers additional

features such as the ability to configure the transmitter without a change in level. In addition to the basic probes offered for the 703, the 704 is available with three additional specialty probes. The 704 also offers an easy to read two-line by eight-character LCD, optional HART® communications, and an adjustable diagnostic alarm.

Horizon Transmitters

Guided Wave Radar has demonstrated an ability to provide accurate and repeatable measurement at a performance level that surpasses many traditional technologies. This is due to the efficiency of Guided Wave Radar technology and to Magnetrol's wide range of sensing probes designed to meet the process variables discussed ahead.

Horizon accurately measures liquids and slurries with a dielectric range of 1.7 to 100, from hydrocarbons to water-based media. The transmitters perform in all conventional process and storage vessels, bridles and bypass chambers whose temperatures and pressures are rated to the capabili-



Process Connected

Because the Guided Wave Radar signal is transmitted via the waveguide directly into the process media, it is not distorted by tank atmospheres, process conditions, tank obstructions or false echoes.

ties of the particular probe used.

Horizon transmitters offer sensor probes for routine storage vessels, as well as those exhibiting corrosive vapors, foam, coating and buildup, surface agitation, bubbling or boiling, high fill/empty rates, low level and varying dielectric or specific gravity.

Affordable Guided Wave

Horizon transmitters are designed to work in applications that include those in petroleum refining, chemical manufacturing, water and wastewater, pulp & paper, food & beverage, and pharmaceutical processing. Horizon transmitters also serve as ideal retrofit transmitters made possible by Magnetrol's wide range of adaptation hardware for easy and affordable replacement of antiquated level measurement technology.

Horizon transmitters have been engineered to provide users with the basic range of measurement solutions in Guided Wave Radar. With its probe-specific transmitters, Horizon has emerged as the affordable alternative in Guided Wave Radar measurement for today's liquid level challenges. ■

HORIZON 703

A basic Guided Wave Radar transmitter which utilizes coaxial, single rod and twin rod probes.



703

HORIZON 704

An intermediate transmitter which utilizes coaxial, single rod and twin rod probes, as

well as Teflon-coated, 3-A Sanitary and corrosion-resistant specialty probes.



704

HORIZON Transmitters 703 & 704

Economical GWR Transmitters for Liquid Level Measurement



ABOVE: Horizon transmitters showing the user interfaces within the compartments of Models 703 (top) and 704 (bottom)

Basic, Affordable GWR

Horizon transmitters bring affordable Guided Wave Radar to liquid level measurement. Horizon is a two-wire, 24 VDC, loop-powered transmitter providing a 4-20 mA output proportional to level.

As a Guided Wave Radar instrument, Horizon's measurement performance is not process-dependent. Changing specific gravity and dielectric have little or no effect on its accuracy, and the measurement engine of Horizon is optimized under software control to provide continuous and reliable level detection. Even significant amounts of media build-up on a single rod probe will not affect the accurate detection of liquid level.

Horizon's coaxial, single and twin rod probes include those for process temperatures reaching +400° F (+200° C), pressures to 1000 psig (70 bar), and low dielectric (≥ 1.7). Horizon transmitters have received Intrinsically-Safe, Explosion-Proof, and Non-Incendive approvals.

Single Compartment Design

Horizon's compact, single-compartment enclosure, available in plastic or aluminum, houses the Guided Wave Radar electronics. A three-button keypad provides the user interface for both models, with optional HART communications available for the 704 only. Additional Model 704 features include a two-line by eight-character LCD, an adjustable diagnostic alarm, and the convenience of not requiring field calibration.

The Horizon 703 transmitter is designed to serve OEM markets, water and wastewater industries, skid and platform builders and other economy transmitter users.

The Horizon 704 transmitter is designed to serve the chemical and petrochemical, food and beverage, semiconductor, pharmaceutical and biotechnology industries. ■

703•704 GENERAL SPECIFICATIONS ^①

Measured Variable	Liquid level	
Signal Output	4-20 mA or 4-20 mA with HART on Model 704 only	
	3.8 to 20.5 mA useable (meets NAMUR NE 43)	
Span	6 to 192 inches (15 to 488 cm)	
Resolution	Analog:	0.01 mA
	Digital:	0.15 inch
Loop Resistance	550 Ω @ 24 VDC (20.5 mA)	
Damping	703:	Fixed 2 seconds
	704:	Adjustable 0-10 seconds
Diagnostic Alarm	703:	Fixed 22 mA
	704:	Adjustable 3.6 mA, 22 mA, HOLD
User Interface	703:	3-button keypad
	704:	3-button keypad and/or HART communications (optional)
Display	703:	None, 3 LEDs
	704:	2-line × 8-character LCD
Power (at terminals)	12 to 28.6 VDC	
Menu Language	704:	English, German, French or Spanish
Housing Material	Aluminum A356T6 (< .25% copper) Valox®, UL94-V0 rating	
Net and Gross Weight	Aluminum: 3.5 lbs. (1.59 kgs) / Plastic: 1.5 lbs. (.68 kgs)	
Overall Dimensions	H 6.5" × W 4.5" (H 165 mm × W 114 mm)	

① Please consult Horizon product bulletins for specific hazardous location approvals.

703•704 PERFORMANCE SPECIFICATIONS

Reference Conditions	Reflection from liquid at +70° F (+20° C) with a 72" coaxial probe	
Probes	703:	7XA, 7XB, 7XF
	704:	7XA, 7XB, 7XF, 7XF-4, 7XF-E, 7XF-F
Linearity	7XA Probe:	±0.25 inch (6.3 mm)
	7XB Probe:	±0.50 inch (12.7 mm)
	7XF Probes:	±0.75 inch (19 mm)
Resolution	±0.15 inch (4 mm)	
Repeatability	0.15 inch (4 mm)	
Hysteresis	0.15 inch (4 mm)	
Warm-up Time	< 5 seconds	
Operating Temperature Range		
	Aluminum Housing:	-40° to +175° F (-40° to +80° C)
	Plastic Housing:	-40° to +160° F (-40° to +70° C)
LCD Temp. Range, Model 704	-5° to +160° F (-20° to +70° C)	
Operating Temp. Effect	Approximately ±0.03% of probe length/°C	
Process Dielectric Effect	< 0.5 inch (12.7 mm)	
Humidity	0-99%, non-condensing	
Electromagnetic Compatibility	Meets CE requirements (EN-50081-2, EN 50082-2) (Single and Twin Rod probes must be used in metallic vessel or stillwell to maintain CE requirement)	



Probe/Transmitter Correspondence

		703	704
• COAXIAL			
7XA	Standard	●	●
• TWIN ROD			
7XB	Rigid	●	●
• SINGLE ROD			
7XF	Bare	●	●
7XF-4	Non-Stick		●
7XF-E	Sanitary		●
7XF-F	Corrosion Resistant		●



COAXIAL
7XA
STANDARD COAXIAL



- Coaxial design is the most efficient probe in the guided wave radar line
- Recommended for general purpose applications with clean, low-viscosity liquids
- Suitable for media with dielectric as low as 1.7
- FM, CSA and ATEX safety approvals



FOR TRANSMITTERS:
Horizon 703, 704

Model 7XA Standard Coaxial Probe

Materials/Wetted Parts	316/316L SS (Hastelloy C and Monel optional), TFE spacers, Viton O-rings
Diameter	.3125" (8 mm) \varnothing rod .875" (22 mm) \varnothing tube
Process Connection	$\frac{3}{4}$ " NPT and 1" BSP (Various ANSI or DIN flanges)
Length	24 to 192 inches (60 to 488 cm)
Transition Zone	Top: 1" $\epsilon_r = 1.4$; 6" $\epsilon_r = 80$ Bottom: 6" $\epsilon_r = 1.4$; 1" $\epsilon_r = 80$
Max. Process Temp.	+300° F @ 300 psig (+150° C @ 20 bar)
Max. Process Pressure	1000 psig @ +70° F (70 bar @ +20° C)
Max. Viscosity	500 cp
Dielectric Range	≥ 1.7
Mounting Effects	None
Media Coating	Not recommended

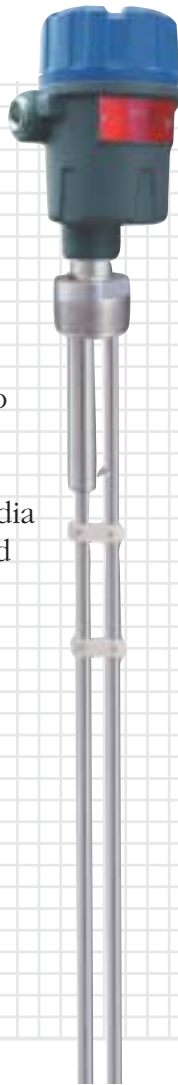
TWIN ROD 7XB

STANDARD TWIN ROD

- A general purpose probe recommended for higher viscosity applications of up to 1500 cp
- Build-up of thick or dirty media on the probe is well managed by the twin-rod design
- Available in threaded or flanged connections
- For dielectric ≥ 2.5



FOR TRANSMITTERS:
Horizon 703, 704



Model 7XB Standard Twin Rod Probe

Materials/Wetted Parts	316/316L SS (Hastelloy C and Monel optional), TFE spacers, Viton GFLT O-rings
Diameter	Two .5" (13 mm) \varnothing rods .875" (22 mm) \varnothing to \varnothing
Process Connection	2" NPT (Various ANSI or DIN flanges)
Length	24 to 192 inches (60 to 488 cm)
Transition Zone	Top: 8" (+4" inactive) $\epsilon_r \geq 2.0$ Bottom: 6" $\epsilon_r = 2.0$; 1" $\epsilon_r = 80$
Max. Process Temp.	+400° F @ 200 psig (+200° C @ 13 bar)
Max. Process Pressure	750 psig @ +70° F (50 bar @ +20° C)
Max. Viscosity	1500 cp
Dielectric Range	≥ 2.5
Mounting Effects	Active Rod > 1" from any surface or obstruction
Media Coating	Film: 3% max. error of coated length with conductive media Bridging: Not recommended

SINGLE ROD 7XF

BARE SINGLE ROD

- Ideal for water-based media such as paints or slurries with a dielectric greater than 10
- Bare probe design tolerates significant probe coating and build-up
- Designed for use in applications that include plant tanks, sumps, pits, wells and open channels



FOR TRANSMITTERS:
Horizon 703, 704



Model 7XF Single Rod Probe

Materials/Wetted Parts	316/316L SS (Hastelloy C and Monel optional), TFE spacers, Viton GFLT O-rings
Diameter	.5" (13 mm) \varnothing rod
Process Connection	2" NPT or larger (Various ANSI or DIN flanges)
Length	24 to 192 inches (60 to 488 cm)
Transition Zone	Top: Not applicable Bottom: 1" $\epsilon_r > 10$
Deadband	Top: 12" (30 cm) minimum
Max. Process Temp.	+300° F @ 400 psig (+150° C @ 27 bar)
Max. Process Pressure	1000 psig @ +70° F (70 bar @ +20° C)
Max. Viscosity	Not applicable
Dielectric Range	≥ 10
Media Coating	Maximum error 10% of coated length; % error related to dielectric of media, thickness of coating, and coated probe length above level

SINGLE ROD 7XF-4 NON-STICK PROBE



- PFA “self-lubricating” Teflon insulation covers the 316 SS probe
- Recommended for high-viscosity liquids such as latex paints and adhesives
- Suitable for a broad range of water-based media applications



FOR TRANSMITTER:
Horizon 704

Model 7XF-4 Non-Stick Single Rod Probe

Materials/Wetted Parts	Teflon coated 316/316L SS (Hastelloy C and Monel optional), TFE spacers, Viton GFLT O-rings
Diameter	.5" (13 mm) Ø rod
Process Connection	2" NPT or larger (Various ANSI or DIN flanges)
Length	24 to 192 inches (60 to 488 cm)
Transition Zone	Top: Not applicable Bottom: 1" $\epsilon_r > 10$
Deadband	Top: 12" (30 cm) minimum
Max. Process Temp.	+300° F @ 400 psig (+150° C @ 27 bar)
Max. Process Pressure	1000 psig @ +70° F (70 bar @ +20° C)
Max. Viscosity	Not applicable
Dielectric Range	≥ 10
Media Coating	Maximum error 10% of coated length; error related to media dielectric, thickness of coating, coated probe length above level

SINGLE ROD 7XF-E SANITARY PROBE



- Engineered for the food & beverage, pharmaceutical, biotech and semiconductor industries
- Probe and Tri-Clover® process connection are free of crevices and structural intricacies where bacteria may harbor and grow
- All wetted surfaces are polished to a 20 Ra rating
- 3-A Authorized for sanitary use

Horizon 704 with Valox housing

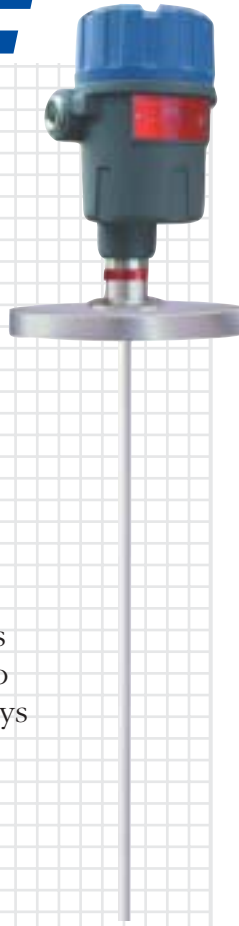


FOR TRANSMITTER:
Horizon 704

Model 7XF-E Sanitary Single Rod Probe

Materials/Wetted Parts	316/316L SS with a 20 Ra surface finish (Hastelloy C, Monel optional), TFE spacers, Viton O-rings
Diameter	.5" (13 mm) Ø rod
Process Connection	2", 3" and 4" Tri-Clover style, 16 AMP sanitary fitting
Length	24 to 192 inches (60 to 488 cm)
Transition Zone	Top: Not applicable Bottom: 1" $\epsilon_r > 10$
Deadband	Top: 12" (30 cm) minimum
Max. Process Temp.	+300° F @ 75 psig (+150° C @ 5 bar)
Max. Process Pressure	75 psig @ +70° F (5 bar @ +20° C)
Max. Viscosity	Not suitable for vacuum
Dielectric Range	≥ 10
Media Coating	Maximum error 10% of coated length; % error related to dielectric of media, thickness of coating, and coated probe length above level

SINGLE ROD 7XF-F CORROSION RESISTANT



- Measures acids, caustics and other aggressive media cost-effectively
- Faced-flange design creates a vapor barrier that protects the metal process connection and all wetted parts
- PFA Teflon-covered probe is a cost-effective alternative to expensive acid-resistant alloys



FOR TRANSMITTER:
Horizon 704

Model 7XF-F Corrosion Resistant Single Rod Probe

Materials/Wetted Parts	PFA Teflon coated 316/316L SS (Hastelloy C and Monel optional), TFE spacers, Viton O-rings
Diameter	.5" (13 mm) \varnothing rod
Process Connection	2" NPT or larger (Various ANSI or DIN flanges)
Length	24 to 192 inches (60 to 488 cm)
Transition Zone	Top: Not applicable Bottom: 1" $\epsilon_r > 10$
Deadband	Top: 12" (30 cm) minimum
Max. Process Temp.	+300° F @ 400 psig (+150° C @ 27 bar)
Max. Process Pressure	1000 psig @ +70° F (70 bar @ +20° C)
Max. Viscosity	Not applicable
Dielectric Range	≥ 10
Media Coating	Maximum error 10% of coated length; % error related to dielectric of media, thickness of coating, and coated probe length above level

Looking for the *ultimate* in Guided Wave Radar?



If the capabilities you want in Guided Wave Radar exceed those found within Horizon's product line, you should look into **Eclipse** for the ultimate in Guided Wave Radar capabilities and performance:

- Eclipse offers thirteen different coaxial, twin rod and single rod probes for tackling extremes in temperatures, pressures, saturated steam, extended lengths and other demanding process conditions
- Eclipse offers the safety and convenience of a dual-compartment housing
- New Model 707 transmitter is engineered *exclusively* for interface measurement
- Capabilities-expanding accessories include Foundation Fieldbus®, local remote, external chambers and retrofit flanges

Ask your Magnetrol Representative about the expanded capabilities of

ECLIPSE
GUIDED WAVE RADAR



Magnetrol®

Worldwide Level and Flow Solutions™

CORPORATE HEADQUARTERS

5300 Belmont Road • Downers Grove, Illinois 60515-4499 USA
Phone: 630-969-4000 • Fax: 630-969-9489
www.magnetrol.com • info@magnetrol.com

EUROPEAN HEADQUARTERS

Heikensstraat 6 • 9240 Zele, Belgium
Phone: 052 45.11.11 • Fax: 052 45.09.93

BRAZIL: Av. Luis Stamatis • 620-Jacana • Sao Paulo CEP 02260-001

CANADA: 145 Jardin Drive, Units 1 & 2 • Concord, Ontario L4K 1X7

CHINA: Room #8008 • Overseas Chinese Mansion • 129 Yan An Road (W) • Shanghai 200040

DEUTSCHLAND: Schloßstraße 76 • D-51429 Bergisch-Gladbach 1 (Bensberg)

DUBAI: Suite 1F1 Hamarain Centre • Abu Baker Al Siddique Road • P. O. Box-10984 • Dubai, United Arab Emirates

FRANCE: Le Vinci 6 – Parc d'Activities • de mitry Compans • 1 rue Becquerel • 77290 Mitry Mory

INDIA: B4/115 Safdurjung Enclave • New Delhi 110 029

ITALIA: Via Arese, 12 • 20159 Milano

SINGAPORE: 23 Woodlands Industrial Park E1 #04-01 • Singapore 757741

UNITED KINGDOM: Regent Business Centre • Jubilee Road • Burgess Hill, West Sussex RH15 9TL