Application

The SITRANS LR radar level meter is used to measure the level of liquids and bulk materials. The measuring principle is largely independent of temperature and pressure. The device calculates the filling volume following input of the tank design; the mass can also be displayed if the density of the material is entered in addition.

The main applications of the SITRANS LR are found in:

- Chemical industry
- Petrochemical industry
- Pharmaceutical industry
- Power engineering.

Versions with the following types of protection are available for use in potentially explosive atmospheres (in preparation):

- II 2G EEx dem [ib] IIC T6,
- II 2G EEx d IIC T6 and
- the above types of protection with Ex zone 0 approval.

SITRANS LR is characterized by the following features:

- Level measurement independent of medium permits a wide range of application.
- Minimum maintenance requirements and wear as result of non-contact measurement.
- High long-term stability resulting from self-calibration since the device has a highly stable internal reference.
- High measuring accuracy and repeatability due to 24-GHz technology.
- Nominal diameters from DN 50 to DN 150, or according to customer requirements.
- Antenna extension available for long mounting glands and high temperatures.
- Antenna and flange made of stainless steel or according to customer requirements.
- Modular design.
- Double chamber housing, i.e. separate junction box and electronics area.
- EMC-tested to EN 50 081, EN 50 082 and NAMUR.
- Self-monitoring and diagnosis of all device functions.
- Analog output (4 to 20 mA) and digital output for limits or device status.
- Outputs electrically isolated from the power supply and from one another.
- HART communication.
- Simple menu-based operation with two-line display and four optical input elements; the device can be operated from the outside without opening the housing.

Mode of operation

Microwaves propagate in gases at the speed of light. The device transmits microwave signals from the container cover/gland to the surface of the medium and measures the runtime required for the signal to return to the device. The device has an antenna to generate a directional effect for the microwaves. The horn antennae have a very good directional effect and can be used with a gland diameter of 80 mm or more. A rod antenna made of Teflon is in preparation for more limited mounting conditions.

The frequency modulated continuous wave procedure (FMCW) used transmits a linear, frequency-modulated radar signal.

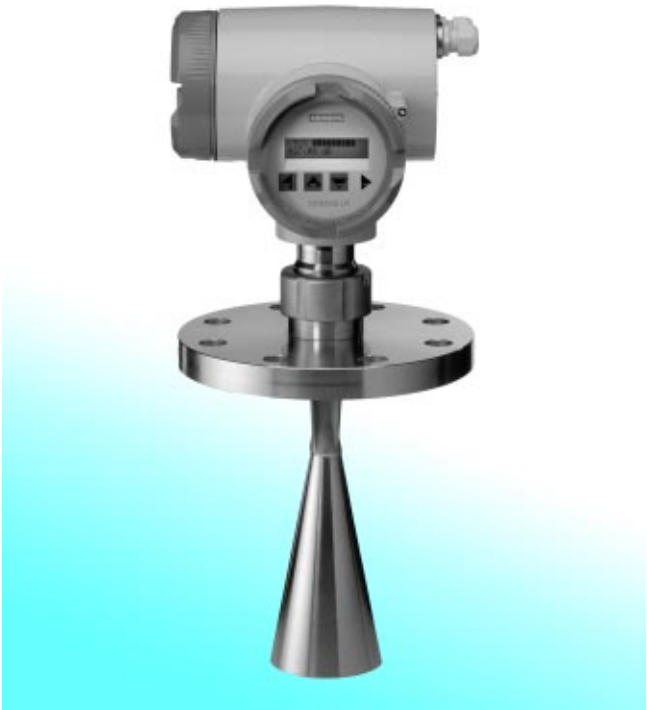

Fig. 1 SITRANS LR microwave level meter, nominal diameter DN 100

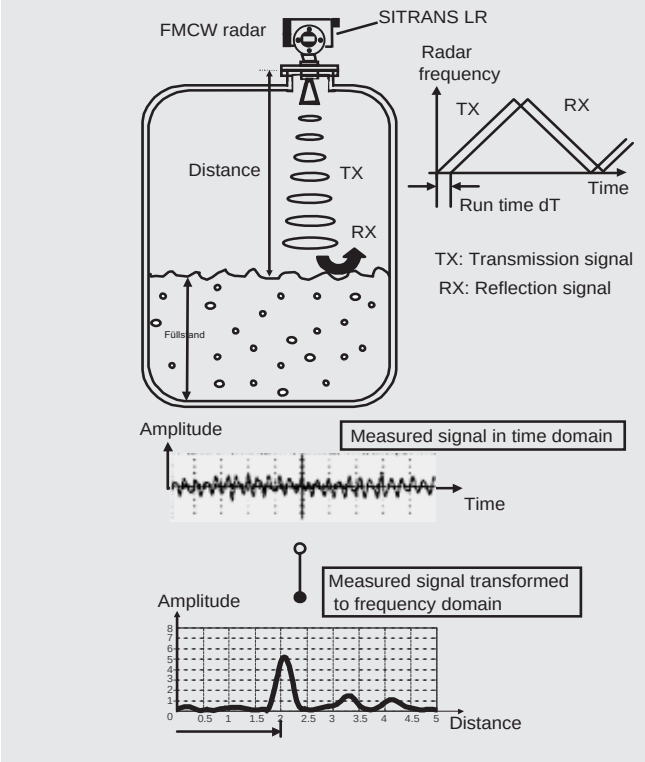

Fig. 2 Measuring principle

The offset frequency of the signal reflected from the surface of the medium is dependent on the runtime and results in an offset in the phase or frequency between the transmitted and received signals. The resulting signal is sinusoidal with a frequency in the kHz range. This frequency is proportional to the distance from the surface of the medium. Using a Fourier transformation, the measured signal is converted into an echo profile (see Fig. 2).

Operation, technical data

Operation

The level meter (Fig. 3) can be operated using:

- Operating and display module or
- HART communicator or
- PC/laptop and software SIMATIC PDM.

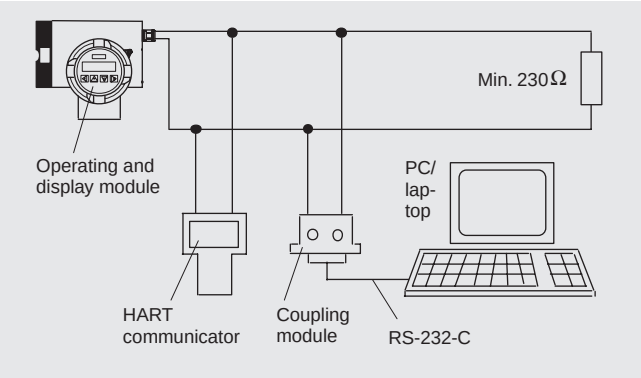

Fig. 3 Operation possibilities

The operating and display module (Fig. 4) permits simple operation without supplementary equipment. It is not necessary to open the housing. The individual functions and parameters are selected using a hierarchical, multi-language menu and four optical input elements. All parameters can then be specifically selected and modified, e.g.:

- Measuring range
- Physical dimensions
- Display parameters (configurable display)
- Display in level, volume or mass units
- Functions of analog output (level, volume, mass)
- Functions of digital output (device status or limit)
- Limits (level, volume, mass)
- Medium reflectivity.

The HART protocol is implemented via the analog output (current output). Using this communication facility, the device can be parameterized with the HART communicator or with a PC and SIMATIC PDM software.

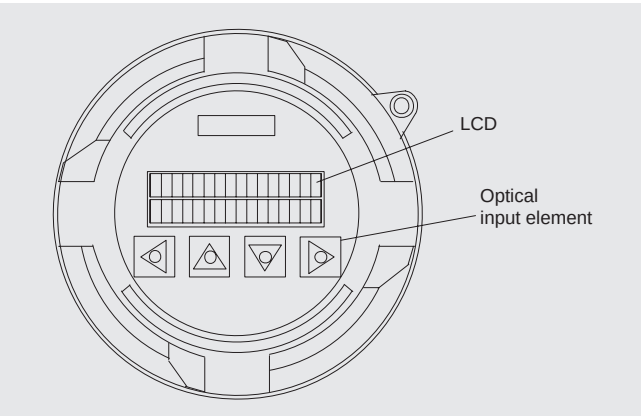

Fig. 4 Operating and display module

Technical data

Input	
Measuring range	From bottom edge of antenna up to 45 m away from flange
Nominal diameters	DN 50/2 inch (only with rod antenna) (in preparation) DN 80/3 inch DN 100/4 inch DN 150/6 inch
Nominal pressure to DIN	PN 64 (in preparation) PN 40
Nominal pressure to ANSI	Class 300 Class 150
Output	
Analog output	
• Signal range	4 to 20 mA
• Upper limit	20 to 22.5 mA, adjustable
• Signal on alarm	3.6 mA, 22 mA, 24 mA or Hold
• Load	Max. 600 Ω; min. 230 Ω for communication
Digital output	Relay, NC or NO function, max. DC 50 V, max. 200 mA, switching capacity max. 5 W, self-resetting fuse, R_i = 9 Ω, configurable for device status or limit (level, volume or mass)
Electrical isolation	Outputs electrically isolated from power supply and from one another
Measurement uncertainty	
Reference conditions	Flange temperature 25 ± 5 °C, ambient temperature 25 ± 5°C, warming-up time 30 min
Local display/HART	See Fig. 5
Analog output	As Fig. 5, plus ± 0.1 % of measured value
Repeatability	±1 mm
Rated operating conditions	
Flange temperature range	-40 °C to +100 °C or -40 °C to +250 °C
Degree of protection	IP 65
Electromagnetic compatibility	
• Emitted interference	To EN 50 081
• Noise immunity	To EN 50 082 and NAMUR
Ambient temperature range	-40 to +65°C LCD: -20 to +55°C Observe temperature classes in potentially explosive atmospheres!
Storage temperature range	-40 to +85 °C LCD: -30 to +80 °C

Technical data (continued)

Design	
Weight (with DIN flange, PN 40)	DN 80: approx. 12 kg DN 100: approx. 14 kg DN 150: approx. 20 kg
Materials	
• Horn antenna	Stainless steel, mat. No. 1.4581
• Flange	Stainless steel, mat. No. 1.4571
• Waveguide bushing - Gasket	PTFE (Teflon) Perbunan, Teflon, Kalrez or Viton
• Housing	Die-cast aluminum
Process connection	Flange to DIN 2527 or ANSI B16.5
Cable inlet	2 x Pg 13.5 or M20 or ½"-14 NPT
Displays and controls	
Operation	4 optical control elements, menu prompting
Display	LCD, two lines with 16 characters each, configurable for following displays: level, volume, mass Multi-display: 2 freely-selectable measured values are displayed simultaneously (level, volume, mass, temperature, ...)

Power supply	AC 120 to 230 V ±15% (50/60 Hz) or AC/DC 19 to 30 V
Power failure	No effect for at least 1 period (> 20 ms)
Power consumption	Approx. 8 VA/9 W
Explosion protection (in preparation)	II 2G EEx dem [ib] IIC T6 II 2G EEx dem IIC T6 II 2G EEx d IIC T6
Communication	PC/Laptop or HART communicator with SITRANS LR level meter
Load with connection of:	
• Coupling module	230 to 500 Ω
• HART communicator	230 to 600 Ω
Cable	2-wire screened: ≤ 3 km, multi-core screened: ≤ 1.5 km
Protocol	HART, version 5.1
PC/laptop requirements	IBM-compatible, main memory ≥ 64 Mbyte, hard disk > 100 Mbyte, RS 232 C interface, VGA graphics
Software for PC/laptop	Windows 95/98 or NT and SIMATIC PDM

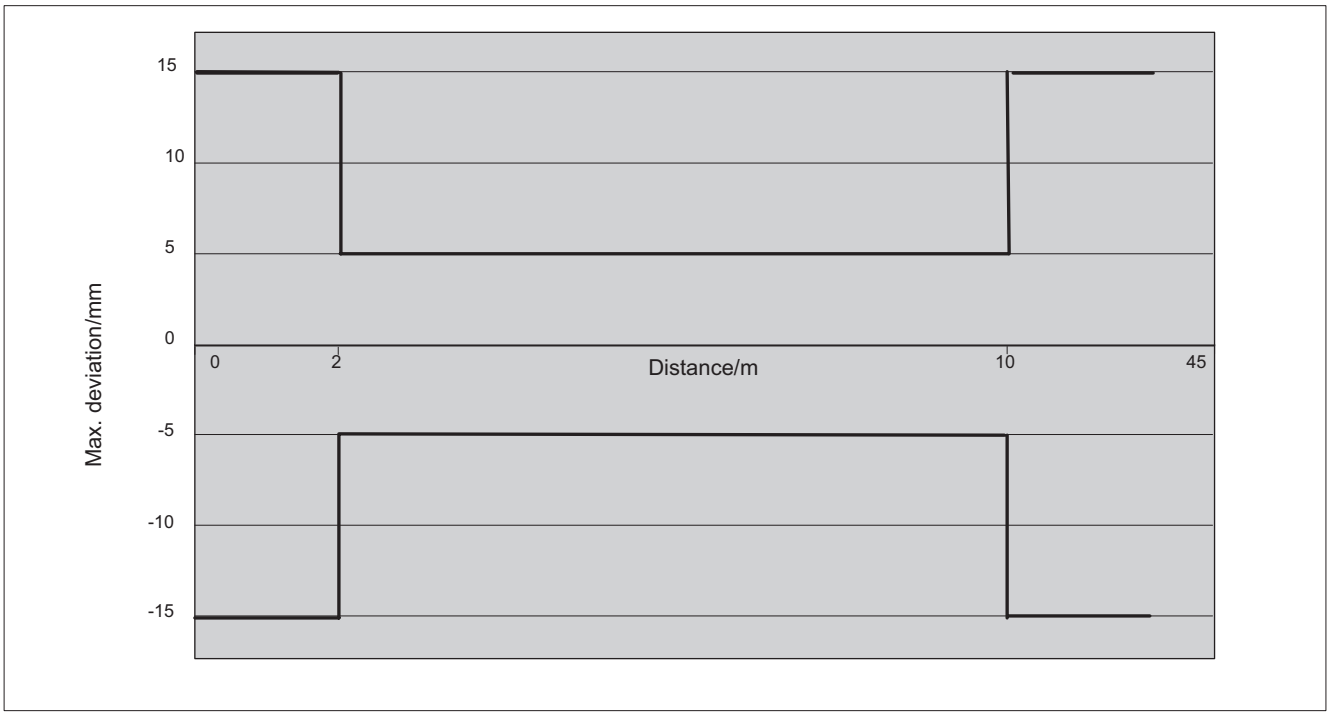

Fig. 5 Measurement uncertainty

Installation instructions

The radar level meter must be installed into the vessel taking into consideration the following guidelines.

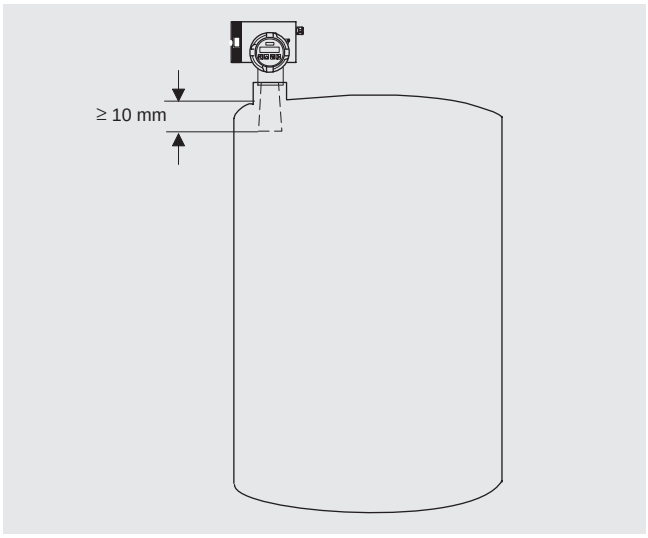

Fig. 6 Assembly on a pipe coupling

When assembling on a pipe coupling (Fig. 6), ensure that the bottom edge of the antenna projects at least 10 mm into the vessel. Antenna extensions must be used if necessary.

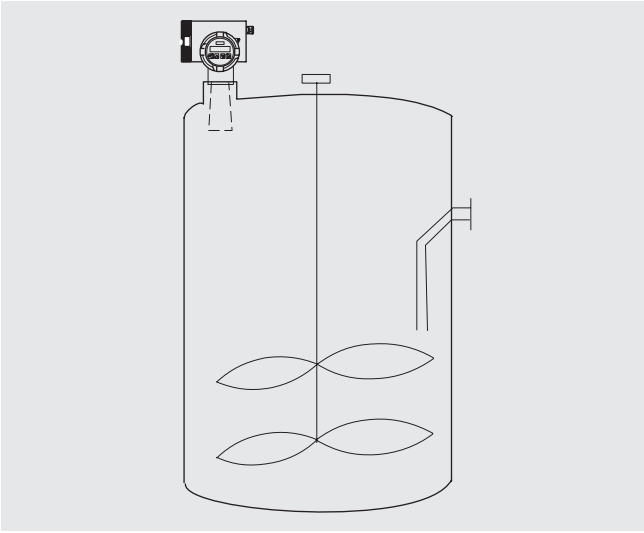

Fig. 8 Observe installation conditions

Do not install the device directly above fittings in the vessel (struts, pipes etc.) or above filling holes (Fig. 8). These result in interfering reflections which may affect the measurement value.

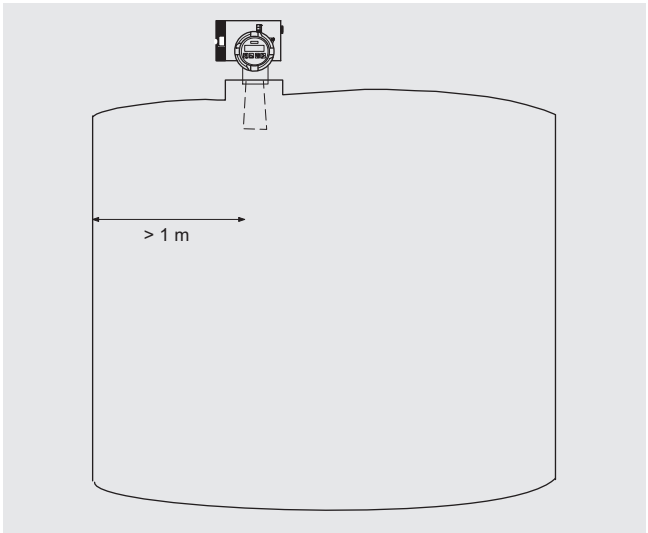

Fig. 7 Distance from wall of vessel

A minimum distance of 1 m from the wall of the vessel (Fig. 7) must be observed. A smaller distance results in less accurate measurements.

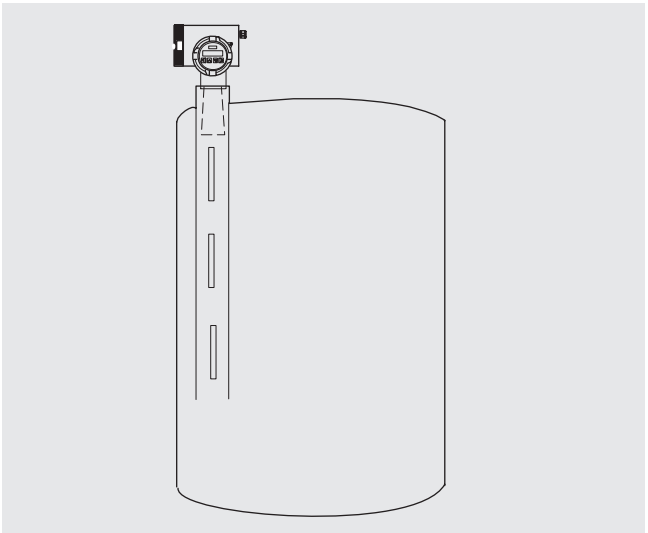

Fig. 9 Washing pipe assembly

Using the short horn antenna, the device can be fitted on a washing pipe above DN 80 (Fig. 9), or with the long horn antenna above DN 100. Interfering reflections resulting from holes and slots in the washing pipe can be minimized by rotating the device.

Ordering data

Ordering data

Order No.

SITRANS LR microwave level meter — 7ME4000- ■■■■■ - ■■■■ -Z

Flange temperature range	
-40 °C to +100 °C	0
-40 °C to +250 °C	1
Nominal diam. DN 50 / 2 inch [1]	
Flange design — Nom. press.	
DIN 2527 — DIN PN 40	A
ANSI B16.5 — lb 150	B
Nominal diam. DN 80 / 3 inch	
Flange design — Nom. press.	
DIN 2527 — DIN PN 40	C
DIN PN 64	D
ANSI B16.5 — lb 150	E
lb 300	F
Nominal diam. DN 100 / 4 inch	
Flange design — Nom. press.	
DIN 2527 — DIN PN 40	G
DIN PN 64	H
ANSI B16.5 — lb 150	J
lb 300	K
Nominal diam. DN 150 / 6 inch	
Flange design — Nom. press.	
DIN 2527 — DIN PN 40	L
DIN PN 64	M
ANSI B16.5 — lb 150	N
lb 300	P
Version of rod antenna [1] [3]	
Extension — Material	
Without — PTFE	A
100 mm — PTFE	B
200 mm — PTFE	C
Version of horn antenna, long [4]	
Extension — Material [2]	
Without — 1.4581/ flange 1.4571	D
100 mm — 1.4581/ flange 1.4571	E
200 mm — 1.4581/ flange 1.4571	F
Without — Hastelloy [6]	G
100 mm — Hastelloy [6]	H
200 mm — Hastelloy [6]	J
Version of horn antenna, short [5]	
Extension — Material [2]	
Without — 1.4581/ flange 1.4571	K
100 mm — 1.4581/ flange 1.4571	L
200 mm — 1.4581/ flange 1.4571	M
Without — Hastelloy [6]	N
100 mm — Hastelloy [6]	P
200 mm — Hastelloy [6]	R

Ordering data

Order No.

SITRANS LR microwave level meter (continued) — 7ME4000- ■■■■■ - ■■■■ -Z

Gasket process flange/bushing	
NBR (Perbunan)	
-40 °C to +100 °C	0 0
PTFE (Teflon)	
-40 °C to +250 °C	0 1
FFPM (Kalrez)	
-15 °C to +250 °C	0 2
FKM (Viton)	
-20 °C to +250 °C	0 3
Output/communication	
4 to 20 mA HART	0
Power supply	
AC 115/230 V	
• 2 x Pg 13.5 (not with EEx d)	A
• 2 x M20 x 1.5	B
• 2 x 1/2"-NPT	C
AC/DC 24 V	
• 2 x Pg 13.5 (not with EEx d)	D
• 2 x M20 x 1.5	E
• 2 x 1/2"-NPT	F
Degree of protection	
Without explosion protection	A
With explosion protection [1]	
• EEx d	C
• EEx dem	D
• EEx dem (ib) (only with 4 to 20 mA, only with AC/DC 24 V)	F
With explosion protection and zone 0 [1]	
• EEx d	H
• EEx dem	J
• EEx dem (ib) (only with 4 to 20 mA, only with AC/DC 24 V)	K
Local operation	
Without operating panel	0
With operating panel	1

Further designs Please add "**-Z**" and specify Order code(s)	Order code
Rating plate inscription:	
- English	**B11**
- French	**B12**
- Spanish	**B13**
- Italian	**B14**
Acceptance test certificate B to DIN 50049 Section 3.1 and EN 10204	**C12**

[1] In preparation
[2] Material of parts in contact with the process (flange, antenna, antenna extension)
[3] From DN 50 / 2 inch upward
[4] From DN 100 / 4 inch upward
[5] From DN 80 / 3 inch upward
[6] On request

SITRANS LR Microwave Level Meter

Your Local Siemens Partner

Africa

Egypt
Siemens Ltd.
E+A Div.
P.O. Box 775/11511
26, El Batal Ahmed Abdel Aziz Str.
Mohandessin
Tel. (2) 3 42 03 71
Fax (2) 3 42 03 76

Morocco
SETEL S.A.
Société électrotechnique et de Télécommunications
S.A., km1, Route de Rabat,
Ain Sebaa
20250 Casablanca
Tel. (2) 2 35 10 25
Fax (2) 2 34 01 51

Republic of South Africa
Siemens Ltd.
Automation & Drives
Private Bag X71
Halfway House 1685
Tel. (0 11) 6 52 36 77
Fax (0 11) 6 52 36 97

Asia

China
Siemens Ltd. China
Automation Group
No. 7, Wangjing Zhonghuan Nanlu
Chaoyang District
Beijing 100015
P.R. China
Tel. (0 10) 64 36 18 88,
Ext. 39 04
Fax (0 10) 64 36 32 13

India
Siemens Ltd.
Automation Systems
Plot 2, Sector 2 Khargar Node
Navi Mumbai 410208
India
Tel. (0 22) 7 57 70 98
Fax (0 22) 7 57 71 06

Indonesia
PT Siemens Indonesia
Automation Dept.
Jl. Jend. A. Yani -Pulo Mas
Jakarta 13210
Tel. (0 21) 4 72 94 32
Fax (0 21) 4 71 94 36

Korea
Siemens Ltd.
Automation Dept.
12th Floor, PMK Building
746-28, Yeoksam-dong,
Kangnam-Ku,
Seoul 135-080
Tel. (02) 34 20 47 69
Fax (02) 34 20 48 19

Malaysia
Siemens Electrical Eng. Sdn. Bhd., Automation Dept.
CP Tower, 11 Section 16/11
Jalan Damansara
46350 Petaling Jaya
Selangor Darul Ehsan
Malaysia
Tel. (03) 7 51 37 97
Fax (03) 7 51 31 80

Singapore
Siemens Advanced Eng. Pte. Ltd., Automation Dept.
2 Kallang Sector
Singapore 349277
Tel. 7 40 78 16
Process-devices
Tel. 7 40 77 27
Process-analytics
Fax 7 40 78 17

Taiwan
Siemens Ltd.
Automation Dept.
19th Floor, No. 333
Tun-Hwa S. Road
Sec. 2
Taipei
Tel. (0 22) 3 76 18 57
Fax (0 22) 3 78 89 59

Thailand
Siemens Ltd.
Automation Dept.
Charn Issara Tower II, 31st Floor
2922/283 New Petchburi Road
Bangkapi, Huay Kwang
Bangkok 10320
Tel. (02) 7 16 40 00,
Ext. 48 60
Fax (02) 7 16 48 41

Australia

Siemens Ltd. Sydney Office
Industrial Automation
383 Pacific Highway
Artarmon, N.S.W.2064
Tel. (02) 4 36 87 11
Fax (02) 4 36 86 24

Latin America

Argentina
Siemens S.A.
Automation Dept.
Gral. Roca 1865 - Ruta 8 Km 18
C.C. 32 - 1650 San Martin
Pcia. de Buenos Aires
Tel. (011) 47 38 71 74
Fax (011) 47 38 72 71

Brazil
Siemens PSI
Rua Coronel ento Bicudo, 111
Pirituba
05069-900 - São Paulo
Tel. (0 11) 8 33 49 05
Fax (0 11) 8 33 49 59

Chile
Siemens S.A.
Av. Holanda 64
Casilla de Correo 242-V
Santiago de Chile
Tel. (02) 3 61 43 88
Fax (02) 3 61 42 93

Columbia
Siemens S.A.
Automation Dept.
Carrera 65 No. 11-50
Apartado 80 150
Santafé de Bogotá, D.C.
Tel. (1) 2 94 26 82
Fax (1) 4 25 38 80

Costa Rica
Siemens S.A.
La Uruca
Apartado Postal 10022-100
San José
Tel. 2 87 51 15
Fax 2 33 54 22

Mexico
Siemens S.A. de C.V.
Automation Dept.
Poniente 116 No. 590
Col. Ind. Vallejo
02300 Mexico D.F.
Tel. (5) 3 28 21 12
Fax (5) 3 28 21 05

Venezuela
Siemens S.A.
Automation Dept.
Avenida Don Diego Cisnero 5
Urbanización Los Ruices
Apartado 3616
Caracas 1071
Tel. (02) 2 03 88 08
Fax (02) 2 03 89 12

USA

Siemens Energy & Automation
Process Instruments
1007 B Mansell Rd
Roswell, GA 30076
Tel. (7 70) 5 21-45 31
Fax (7 70) 5 21-45 35

Middle East

Iran
Siemens S.S.K.
Automation Systems
Khiabane Ayatollah Taleghani 32
Siemenshouse
Teheran 15
P.O. Box 15875-4773
Tel. (0 21) 6 14 22 39
Fax (0 21) 6 40 23 89

Israel
I. Ziegler Elec. Eng. Co. Ltd.
9, Kehilat Saloniki Street
Tel Aviv 69513
Tel. (03) 49 11 40
Fax (03) 49 11 45

Eastern Europe

Bulgaria
Siemens AD
Blvd. Dragan Zankov 36
BG-1113 Sofia

Czech Republic
Siemens s.r.o.
Na Strzi 40
CZ-140 00 Praha 4

Hungary
Siemens Rt.
Lajos u. 103
H-1036 Budapest

Poland
Siemens Sp.z.o.o.
ul. Zupnicza 11
PL-03-821 Warszawa

Siemens Sp.z.o.o.
ul. Francuska 70
PL-03-331 Katowice

Romania
Siemens birou de consultatii tehnice
Strada Zarii 2
RO-76440 Bucuresti

Russia
Siemens A/O
Malaja Kaluzskaja, 17
117071 Moskau

Yugoslavia
Siemens d.o.o.
Knez Mihailova 30
YU-11000 Beograd

Western Europe

Austria
Siemens AG Österreich
Automatisierungstechnik
Siemensstr. 88-92
A-1211 Wien
Tel. (1) 17 07-2 25 43
Fax (1) 17 07-5 31 32

Belgium
Siemens S.A.
IS 2
Demeurslaan
B-1654 Huizingen
Tel. (02) 5 36 29 13
Fax (02) 5 36 35 55

Denmark
Siemens A/S
Borupvang 3
DK-2750 Ballerup
Tel. 44 77 43 90
Fax 44 77 40 19

Finland
Siemens Osakeyhtiö
Perkkaa, Majurinkatu 6
FIN-02601 Espoo
Tel. (9) 51 05 38 64
Fax (9) 51 05 38 77

Siemens Metering Oy
Process Instruments
Masalantie 330
FIN-02430 Masala
Tel. (9) 297 3430
Fax (9) 297 5531

France
Siemens S.A.
Département Instrumentation
39-47, boulevard Ornano
F-93527 Saint-Denis
CEDEX 2
Tel. (1) 49 22 34 37
Fax (1) 49 22 30 62

Greece
Siemens A.E.
Artemidos 8
P.O.B. 61011
GR-15110 Amaroussio
Athen
Tel. (01) 68 64-5 17
Fax (01) 68 64-7 04

Iceland
Smith & NorlandNoatuni 4
P.O.B. 519
IS-121 Reykjavik
Tel. 5 20 30 25
Fax 5 20 30 11

Ireland
Siemens Ltd.
Power & Automation Div.
8 -11 Slaney Road
Dublin Industrial Estate
Dublin 11
Tel. (01) 30 28 55
Fax (01) 30 31 51

Italy
Siemens S.p.A.
Settore automazione
Automazione di processo
Viale Piero e Alberto Pirelli, 10
I-20126 Milano
Tel. (02) 66 76 27 31
Fax (02) 66 76 27 50

Luxemburg
Siemens S.A.
20, rue des Peupliers
L-1017 Luxembourg-Hamm
Tel. 43 84 34 21
Fax 43 84 34 49

Netherlands
Siemens Nederland N.V.
Prinses Beatrixlaan 26
NL-2500 BB Den Haag
Tel. (0 70) 3 33 31 99
Fax (0 70) 3 33 33 43

Norway
Siemens A/S
Oestre Aker vei 90
Postboks 10, Veitvet
N-0518 Oslo 5
Tel. 22 63 34 09
Fax 22 63 33 90

Fagerberg Norge A.S.
Process Instruments
P.O.Box 536
N-1522 Moss
Tel. 69 26 48 79
Fax 69 26 73 33

Portugal
Siemens S.A.
Rua Irmaos Siemens 1
Apartado 60300
P-2720-093 Amadora
Tel. (01) 4 17 85 70
Fax (01) 4 17 80 50

Spain
Siemens S.A.
Dpto. Automatizacion
Ronda de Europa, 5
E-28760 Tres Cantos
(Madrid)
Tel. (91) 5 14-71 39
Fax (91) 5 14-70 19

Sweden
Siemens AB
Johannes Lundsvaegen 12-14
S-19487 Upplands Väsby
Tel. (08) 7 28 14 64
Fax (08) 7 28 10 34

Fagerberg
Process Instruments
Klangfärgsgatan 25-27,
P.O.Box 12105
S-402 41 Gothenburg
Tel. (31) 69 37 00
Fax (31) 69 38 00

Switzerland
Siemens Schweiz AG
Automatisierungstechnik
Viaduktstr. 40
CH-4051 Basel
Tel. (08 48) 82 28 44
Fax (08 48) 82 28 55

Turkey
SIMKO Ticaret ve Sanayi A.S.
Kartal Tesisleri - A&D PA
Yakacik Yolu 111
TR-81430 Kartal-Istanbul
Tel. (02 16) 4 59 31 57
Fax (02 16) 4 59 30 89

United Kingdom
Siemens plc
Sir William Siemens House
Princess Road
Manchester M20 2UR
Tel. (01 61) 4 46 52 77
Fax (01 61) 4 46 52 62

Orbital Gas Systems Ltd.
Process Analyzers
Cold Meece
Swynnerton, Near Stone
Staffordshire. ST15 0QN
Tel. (0 17 85) 85 70 00
Fax (0 17 85) 85 70 01

WE Instrumentation Limited
Process Instruments
Unit 15 Chamberlayne Road
Bury St Edmunds, Suffolk
IP32 7EY England
Tel. (0 12 84) 70 48 05
Fax (0 12 84) 76 29 32

15/09/99

http://www.fielddevices.com

Siemens AG
Automation and Drives Group (A&D)
Process Automation and Instrumentation
D-76181 Karlsruhe
Tel.: (07 21) 5 95-69 97
Fax: (07 21) 5 95-22 39

Siemens Aktiengesellschaft

Order No. E86060-K6201-B101-A1-7600
Printed in the Federal Republic of Germany
KB 1099 2.0 SR 6 En 015043

Excellence in Automation & Drives: Siemens