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Australia
Stauff Corporation (Pty) Ltd.
P.O. Box 227, 24-26 Doyle Avenue,
Unanderra Wollongong, N.S.W
2526 AUSTRALIA
Tel: +61 2 42 71 18 77
Fax: +61 2 42 71 84 32



Brazil
Stauff Brasil Ltda.
Av. Gupé 10767
Galpão 2 – Bloco A
Barueri – São Paulo – CEP 06422-120, BRAZIL
Tel: +55 (0)11 4772 7200
Fax: +55 (0)11 4772 7210



Canada
Stauff Canada Ltd.
866 Milner Avenue
Scarborough, Ontario M1B 5N7, CANADA
Tel: +1 416 282 46 08
Fax: +1 416 282 30 39



China
Stauff International Trading (Shanghai) Co., Ltd.
Shangdian Mansion, Pudong
331, Binzhou Road
200126 Shanghai, CHINA
Tel: +86 21 58 45 65 60
Fax: +86 21 58 45 66 80



France
Stauff S.A.
Z.I. de Vineuil-Blois Sud
230, Avenue du Grain d'Or
41354 Vineuil-cedex, FRANCE
Tel: +33 2 54 50 55 50
Fax: +33 2 54 42 29 19



Germany
Walter Stauffenberg GmbH & Co. KG
P.O. Box 1745,
D-58777 Werdohl, GERMANY
Tel: +49 (0) 23 92 916-0
Fax: +49 (0) 23 92 25 05



India
Stauff India Pvt. Ltd.
Gat. No. 2340
Pune-Nagar Road, Wagholi
IND-Pune - 412207
Tel: +91 20 705 19 90
Fax: +91 20 705 19 89



Italy
Stauff Italia S.R.L.
Via Pola 21/23
I-20034 Birone di Giussano
Tel: +39 0362 31 21 13
Fax: +39 0362 33 55 36



New Zealand
Stauff Corporation (NZ) Ltd.
Unit J, 150 Harris Road, P.O. Box 58517
Greenmount Auckland-NEW ZEALAND
Tel: +64 9 271 4812
Fax: +64 9 271 4832

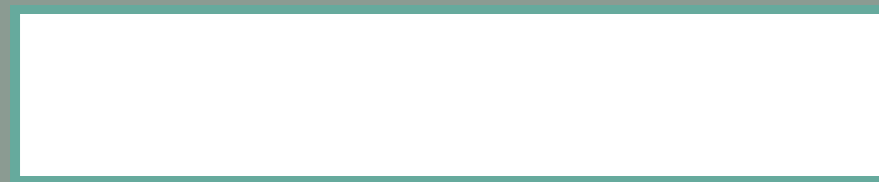


United Kingdom
Stauff UK Ltd.
332, Coleford Road Darnall
Sheffield, S 9 5 P H, ENGLAND
Tel: +44 1142 518 518
Fax: +44 1142 518 519



USA
Stauff Corporation
7 Wm. Demarest Place
Waldwick, NJ – 07463, USA
Tel: +1 201 444 78 00
Fax: +1 201 444 78 52

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Laser Particle Monitor - LPM 1

Local solutions for individual customers worldwide

Australia
 Stauff Corporation Pty. Ltd.
 Postal Office Box 227
 Unanderra Wollongong , NSW, 2526
 24-26 Doyle Avenue
 Unanderra Wollongong , NSW, 2526, AUSTRALIA
 Tel: +61 2 42 71 18 77
 Fax: +61 2 42 71 84 32

Brazil
 Stauff Brasil Ltda.
 Av. Gupê 10767
 Galpão 2 – Bloco A
 Barueri – São Paulo – CEP 06422-120, BRAZIL
 Tel: +55 (0)11 4772 7200
 Fax: +55 (0)11 4772 7210

Canada
 Stauff Canada Ltd.
 866 Milner Avenue
 Scarborough
 Ontario M1B 5N7 , CANADA
 Tel: +1 416 282 46 08
 Fax: +1 416 282 30 39

China
 Stauff International Trading (Shanghai) Co., Ltd.
 Shangdian Mansion, Pudong
 331 , Binzhou Road
 200126 Shanghai, CHINA
 Tel: +86 21 58 45 65 60
 Fax: +86 21 58 45 66 80

France
 Stauff S.A.
 230, Avenue du Grain d'Or
 Z.I. de Vineuil-Blois Sud
 41354 Vineuil-cesedex, FRANCE
 Tel: +33 2 54 50 55 50
 Fax: +33 2 54 42 29 19

India
 Stauff India Pvt. Ltd.
 Gat. No. 2340,
 Pune-Nagar Road, Wagholi
 Pune, 412207, INDIA
 Tel: +91 20 705 19 90
 Fax: +91 20 705 19 89

Italy
 Stauff Italia S.R.L.
 Via Pola 21/23,
 20034 Birone di Giussano (MI), ITALY
 Tel: +39 0362 312113
 Fax: +39 0362 335536

New Zealand
 Stauff Corporation (NZ) Ltd.
 Post Office Box 58517
 Greenmount, Auckland
 Unit J, 150 Harris Road
 East Tamaki, Auckland NEW ZEALAND
 Tel: +64 9 271 4812
 Fax: +64 9 271 4832

United Kingdom
 Stauff UK
 332, Coleford Road
 Darnall
 Sheffield, S 9 5PH, ENGLAND
 Tel: +44 114 251 8518
 Fax: +44 114 251 8519

USA
 Stauff Corporation
 7 Wm. Demarest Place
 Waldwick, 07463-1542
 New Jersey, USA
 Tel: +1 201 444 78 00
 Fax: +1 201 444 78 52

Walter Stauffenberg GmbH & Co. KG

P. O. Box 1745 · 58777 Werdohl
 Im Ehrenfeld 4 · 58791 Werdohl
 Tel.: +49 23 92 9160
 Fax: +49 23 92 2505
 E-mail: sales@stauff.com
 Internet: http://www.stauff.com

Stauff Filtration Technology

Stauff Filtration Technology offers a complete range of filtration products and services that will provide the system designer or user with the highest level of contamination control demanded by today's most sophisticated applications. Products include pressure filters, return line filters, elements, spin on filters suction strainers, and filler breathers for various hydraulic, lubrication and fuel oils.

Stauff has the technical expertise to provide superior filter element designs for the Stauff original filter housings and also for the interchange element market. Stauff manufactures more than 10,000 different elements. Many of these are designed to fit into filter housings produced by other companies while maintaining or surpassing the original performance.

The "Stauff Contamination Control Program" includes the diagnostic services including fluid sampling and laser particle counting products needed to monitor the system contamination level.

Stauff, through its global network of wholly owned companies and technically qualified distributors, is ideally placed to assist its customers in the total contamination process providing a well balanced filtration solution.

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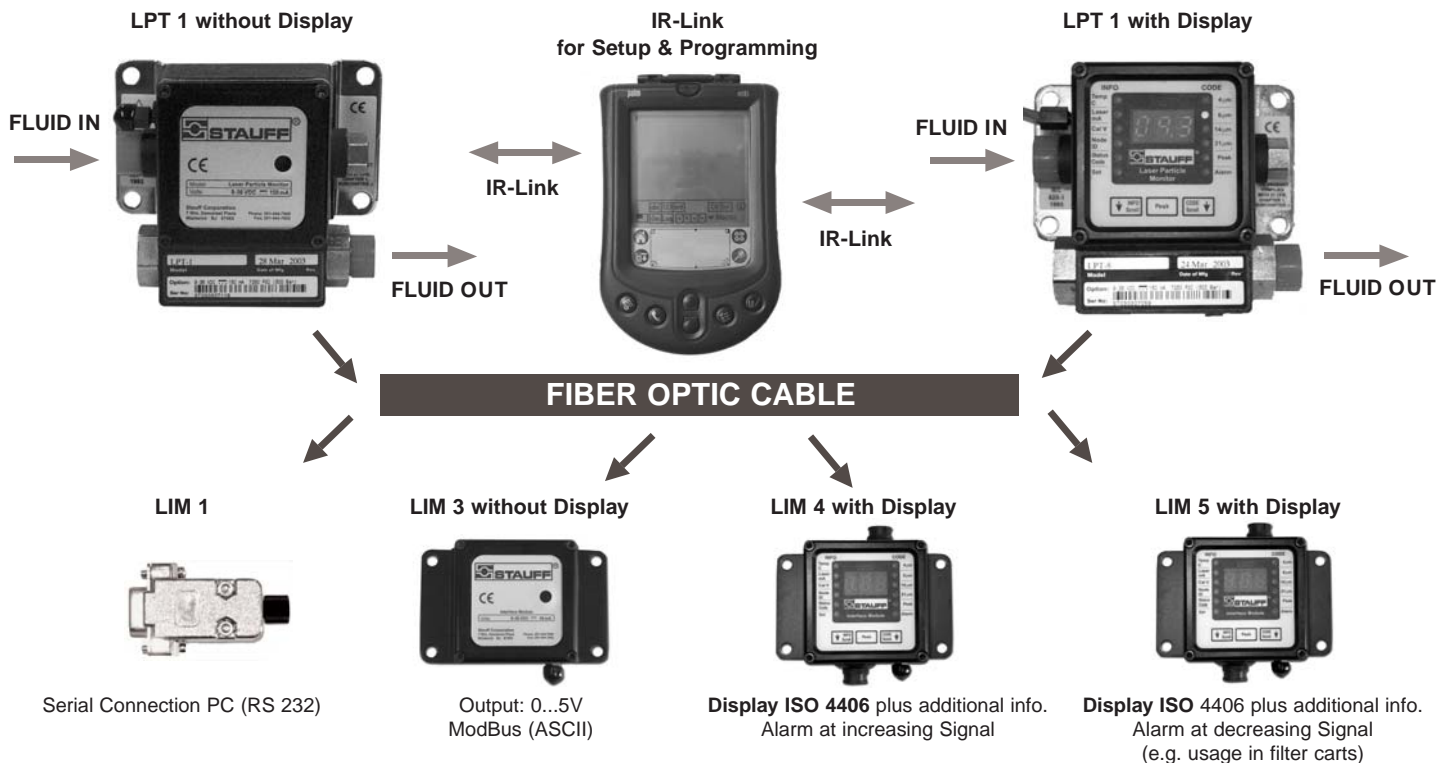
Distributors and warehouses in all industrial countries.

Description

The STAUFF Laser Particle Monitor System LPM 1 is a laser based 4-channel inline particle monitor designed for the continuous monitoring of particle contamination. The LPM 1 provides cumulative particle concentration information at $>4 \mu\text{m}_{(c)}$, $>6 \mu\text{m}_{(c)}$ and $>14 \mu\text{m}_{(c)}$ sizes applicable to the ISO 4406, ISO 11943 und ISO 11171 requirements for optical particle counters. A $> 21 \mu\text{m}_{(c)}$ channel is also provided for larger particle concentration information. Machine operators are alerted to changes in particle contamination levels in a machine's fluid by the indications provided from the LPM 1. The contamination level will be shown on the display or can be transmitted via the RS-232 serial port into a personal computer. With the ModBus-serial port the data can be transferred into a computer network or to an external display. It is also necessary to configure the LPT particle sensor via an IR-port on a Palm or Pocket Computer. The LPM 1 system consists of a Laser Particle Transducer LPT and a Laser Interface Module LIM (see functional diagram).



Functional diagram

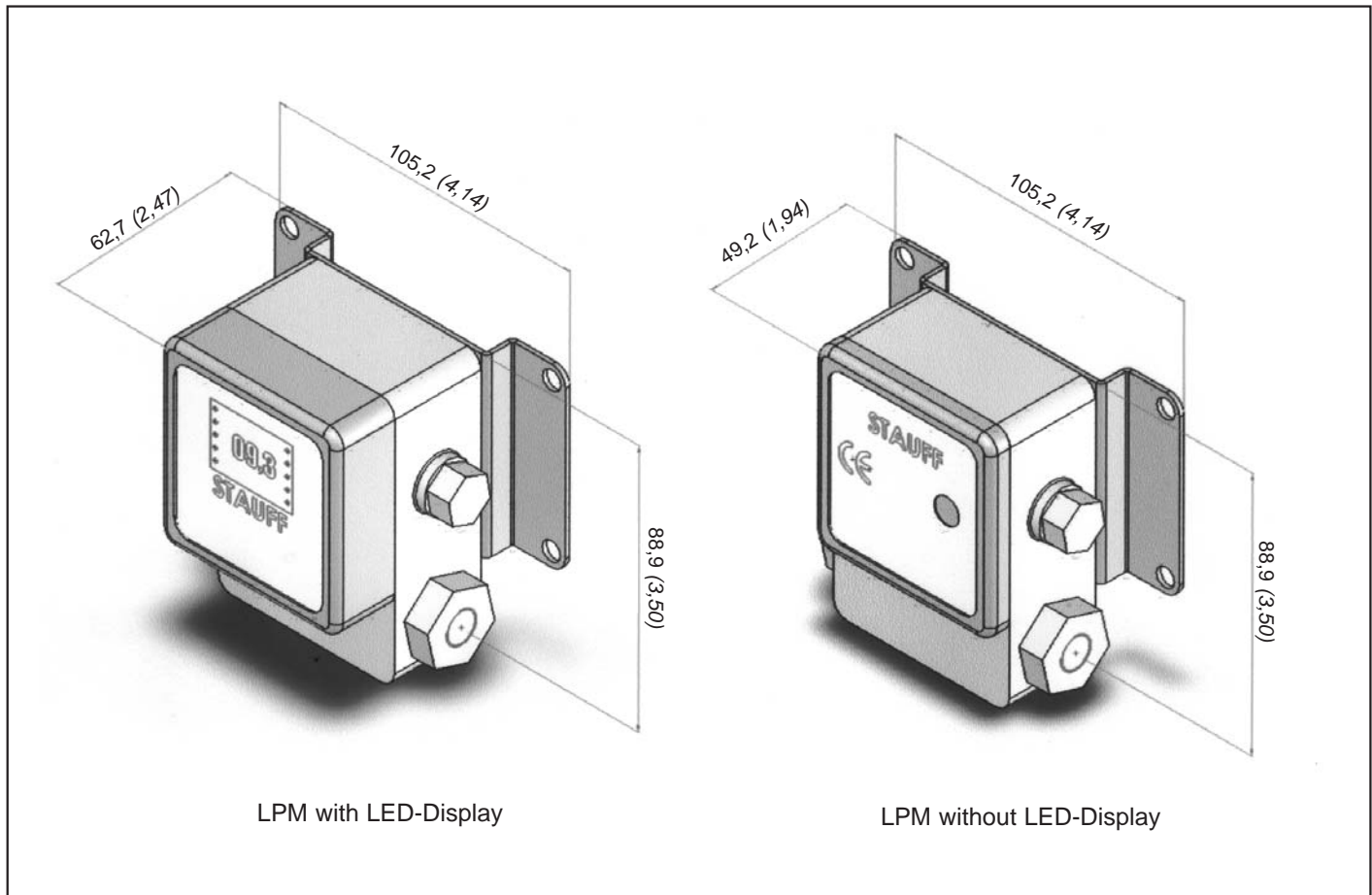


Technical Specification

Channel Sizes	4, 6, 14 and 21 $\mu\text{m}_{(c)}$ (ISO MTD/ISO 11171)
Light Source	Laser Diode
Verification	Optional certification available
Sampling	Online continuous monitoring
Reproducibility	± 0.5 ISO code (ISO 4406)
Display	Optional local display presents ISO codes and alarms
Power supply	9 to 36 volts DC
Output	RS-232, RS-485, 0 to 5 volts, Modbus, alarm contacts, local display
Reports	Particles/ml, ISO 4406 codes 4, 6, 14 and additional 21 $\mu\text{m}_{(c)}$ (ISO MTD/ISO 11171)

Connections	SAE – 4 (7/16-20 UNF)
Flow Rate	50 to 500 ml/min through the viewing area. All units offer integrated flow rate monitoring with alarms.
Fluid compatibility	Mineral based hydraulic and lubrication oils. Phosphate Esters optional
Viscosity	2 cSt (32 SUS) minimum
Operating Pressure	1.4 to 500 bar (20 to 7250 PSI)
Operation Temperature	-20 to 60 °C (-4 to 140°F) ambient, -20 to 85 °C (-4 to 185°F) fluid
IP	Rating 67
Accessories Included	DDE Software, 6m (20 ft.) fiber optic cable, operators manual

Dimensions



All dimensions in mm (inch)

Description

The LPM 1 system consists of two parts: a LPT Particle Transducer and a LIM Interface module.

Laser Particle Transducer LPT

The LPT Particle transducer contains the sensing device and electronics for detecting the level of contamination.

The laser based sensor uses light blocking technology for particle detection whereby particles passing through an optical flow cell block an amount of laser light proportional to the particle size.

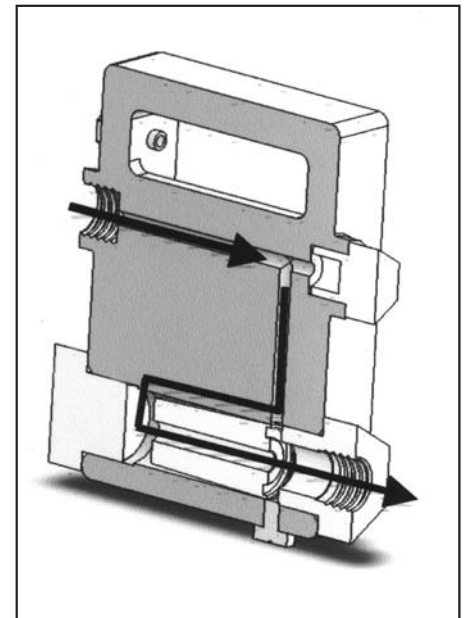
The resultant particle concentration data from the LPT are sent to the LIM interface module via a fiber optic cable. The configuration of the LPT has to be done through the IrDA port of any PDA with IRA capabilities.



The LPT Particle transducers have a flow inhibitor downstream of the sensor that restricts and controls fluid flow from variable pressure sources.

The pressure is reduced to near atmospheric for return to the hydraulic reservoir. The inlet pressure ranges from 1.4 to 500 bar (20 to 7250 PSI) in three models are listed below.

The LPT's are available with or without a LED display. The three digit display shows the selected ISO code value or other function parameters.



Flow Pattern

Available types of LPT

LPT-1	28 to 500 bar (400 to 7250 PSI), without LED-display
LPT-4	28 to 500 bar (400 to 7250 PSI), with LED-display
LPT-7	3.4 to 83 bar (50 to 1200 PSI), without LED-display
LPT-8	3.4 to 83 bar (50 to 1200 PSI), with LED-display
LPT-9	1.4 to 13.8 bar (20 to 200 PSI), without LED-display
LPT-0	1.4 to 13.8 bar (20 to 200 PSI), with LED-display

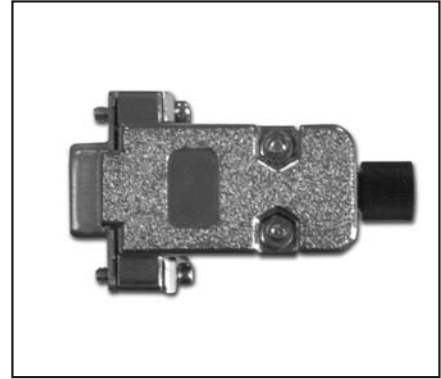
Interface Module LIM

The LIM interface module converts the raw count data from the LPT for display or use in acquisition, logging or control systems. A terminal emulation program can be used to read the ASCII data string. The LIM interface modules are available in four types to meet a wide variety of applications. The LPT is connected to the LIM via a fiber optic cable with a length up to 50 meters (175 ft.).

LIM-1

The LIM-1 interface module has a DCE configuration (9-pin female) for attachment directly to a computer's RS-232 serial port. Power for the LIM-1 is supplied by the computer serial port.

The LIM-1 receives the raw serial data from the LPT transducer via a fiber optic cable and transmits them directly to the computer.



LIM-3

The LIM-3 receives raw serial data input from the LPT transducer via a fiber optic cable. This data string is analyzed and converted into 0 to +5 VDC analog output voltages proportional to the ISO codes and also into ModBus ASCII device protocol for interface to a PLC or computer via RS-485 and RS-232 serial port.

Special adapters also allow the integration into an ethernet-computer network.

All signal outputs, as well as the input supply voltage (9 to 36 VDC), are connected to the LIM-3 through a DB-15 connector.



LIM-4 and LIM-5

The LIM-4 and LIM-5 receive the raw serial data input from the LPT transducer via a fiber optic cable. Results are displayed on the front panel 3-digit LED display.

The ISO 4406 code number displayed is categorized in four size channels (>4, >6, >14 and >21 $\mu\text{m}_{(c)}$). The ISO number represents the number of particles counts per ml fluid. The user also can select internal information about the transducer (Temperature C, laser mA, Cal V, Node ID status code).

Alarm levels can be programmed for any of the four particle size channels. When set, an alarm indicator will flash if the alarm level is reached. For the LIM-4 the alarm is activated if the measured ISO numbers exceed the set alarm level and for the LIM-5 the alarm is activated if the ISO number falls below the set level.

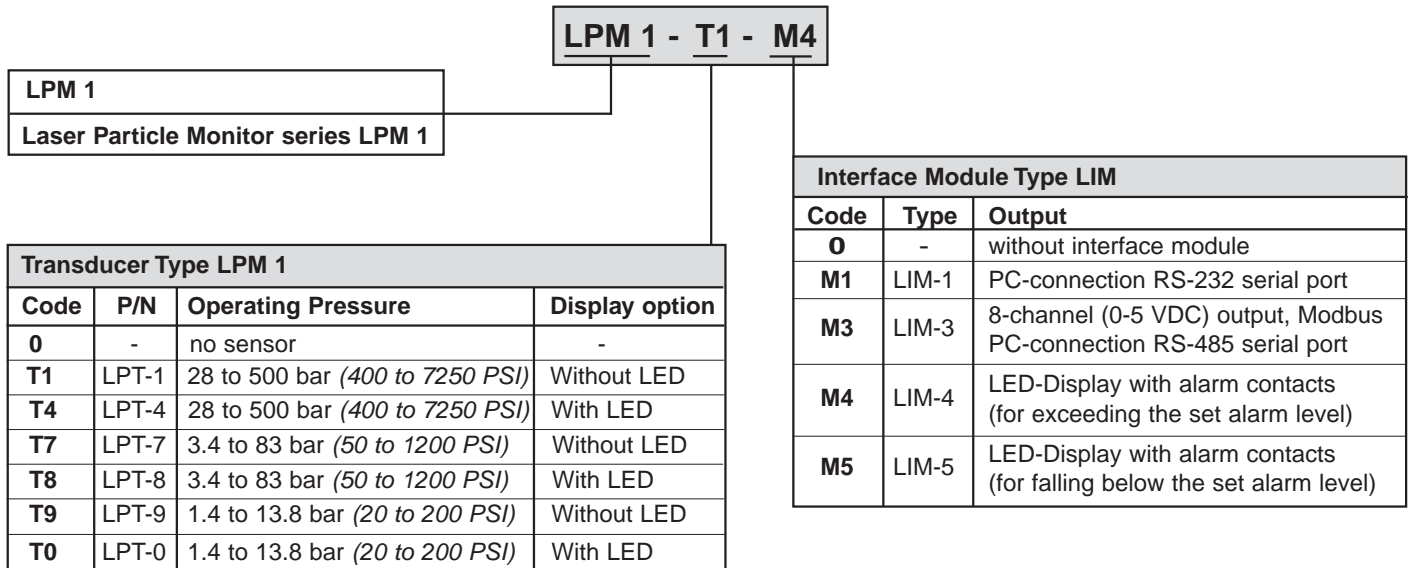
Alarms on the LIM-4 and LIM-5 may be deactivated by pressing any button. Supply voltage is external and can be from a 9 to 36 VDC source.



Software (optional)

The standard software allows the download and the visualization of the measured particle distribution. On request a special software is available that allows the customer to control, monitor and analyse more than one LPM which are connected in a network. To achieve the required individual configuration please contact your local STAUFF partner.

Ordering Code



Each LPM 1-Kit includes:

- 1 x LPT Laser Particle Transducer
 - includes 3 m (10 ft.) flying lead power cable (9 to 36 VDC required, not supplied)
- 1 x LIM Interface module
 - LIM-1, includes 6 m (20 ft.) interconnecting fiber optic cable
 - LIM-3, includes 6 m (20 ft.) interconnecting fiber optic cable and two 3 m (10 ft.) power cable with 3 pin connector.
 - LIM-4, includes 6 m (20 ft.) interconnecting fiber optic cable and one breakout cable with 15 pin connector
 - LIM-5, includes 6 m (20 ft.) interconnecting fiber optic cable and one breakout cable with 15 pin connector
- 1 x Quick Start Guide
- 1 x Operators Manual
- 1 x Software
 - Includes DDE server
 - Hex and terminal logger for RS-232
 - PDA Shareware