



## **CT/LT Turbine Flow Meters User Manual**

## **CT/LT Durchflussturbinen Bedienungsanleitung**

## **Manuel d'utilisation des débitmètres à turbine CT/LT**

## **Manual de usuario para los caudalímetros de turbina serie CT/LT**



[www.webtec.com](http://www.webtec.com)



## Introduction

Webtec turbine flow meters provide a precision solution to the measurement of flow in hydraulic systems on test stands, machine tools and other fixed or mobile applications. The flow meters can be installed anywhere in the hydraulic circuit for production testing, commissioning, development testing and analysis of control systems. The compact design of the flow meter allows them to be installed where space is limited. The LT turbine flow meter with frequency output provides a precision solution to the flow measurement. The CT turbine flow meter has a built-in microcontroller that conditions the signal from the flow meter to provide an accurate analogue output. This enables you to connect the flow meter directly into your digital display, PLC or custom DAQ system without having to worry about complex calibration factors or lookup tables. Four main versions are available offering 4 - 20 mA current loop, 0 - 5 V or 0 - 3 V (Sensor Recognition) output. The CT flow meter is the ideal tool for monitoring the performance of pumps, motors, valves and hydrostatic transmissions.

### **The range of products can be divided into two families:**

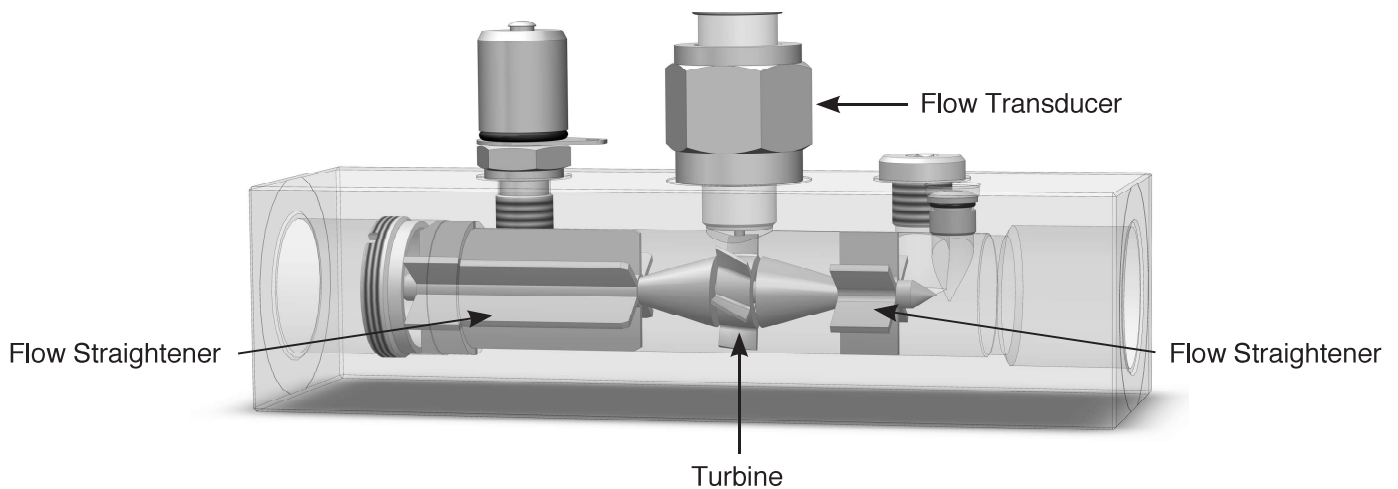
1. Standard CT/LT
2. CTR/LTR, a flow turbine with a built in load valve

### **This manual covers the standard CT/LT range of products.**

Before first operating the equipment read the whole of these instructions. Safety may be impaired if they are not followed.

Webtec have been designing and manufacturing flow meters and hydraulics components for over 50 years. We operate within a Quality Management System that complies with the requirements of BS EN ISO 9001 which is externally audited and certificated each year. Beyond compliance to the standard, Webtec is committed to continually improving in everything we do; with particular emphasis on understanding what matters to our customers and suppliers, and designing our systems and work to meet their needs. We are always keen to hear from customer who may have special requirements not covered by our standard ranges.

## Basic operation



All turbine flow meters work on the same basic theory - the fluid flow is used to rotate a turbine, the speed at which the turbine rotates is proportional to the flow rate. This rotational speed is measured by a magnetic transducer counting the axial turbine blades as they pass. The turbine blade is designed to minimise the effects of variations in temperature and viscosity and built-in flow straighteners eliminate flow swirl and allow flow measurement in both directions.

All flow meters are calibrated at 21 cSt as standard. Special calibration is available over a custom flow range or at a different viscosity, please contact sales to discuss your application.

The flow transducer must not be removed from the flow meter body, the whole device is calibrated as an assembly and will not function if dis-assembled. If the transducer has been accidentally unscrewed and replaced, the calibration will have been affected and it is recommended the flow meter is returned for re-calibration.

## Specification

### Functional specification

<b>Ambient temperature:</b>	-10 to 50 °C (14 to 122 °F)
<b>Fluid type:</b>	Mineral oil to ISO 11158 category HM (for other fluid types please contact Sales).
<b>Fluid temperature:</b>	-20 to 90 °C (-4 to 194 °F) continuous use
<b>Accuracy:</b>	15 to 100% of range - 1% of indicated reading Below 15% fixed accuracy of 1% of 15% of full scale (CT15 is 1% of full scale)
<b>Degree of protection*:</b>	CT-SR – IP54 (EN60529) CT-mA, CT-5V, LT – IP66 (EN60529) *With cable connected

### CT Electrical specification

<b>Supply voltage (VS):</b>	mA & 5V = 12 - 32 VDC, SR = 7 - 15 VDC
<b>Current output:</b>	4 - 20 mA, 3 wire, max loop resistance = (VS x 50) - 200 ohms
<b>Voltage output:</b>	0 - 5 VDC, current consumption = 10 mA, minimum load 20K ohms
<b>SR output:</b>	0 - 3 VDC
<b>EMC Environment:</b>	This equipment is intended for use within industrial and residential environments and does not suffer any degradation in operation when subjected to test conditions according to the requisite standards.

### LT Electrical specification

<b>Output:</b>	Frequency - 20 -2000 Hz
<b>Impedance:</b>	3700 Ohm,
<b>Inductance:</b>	1kHz: 1.55H

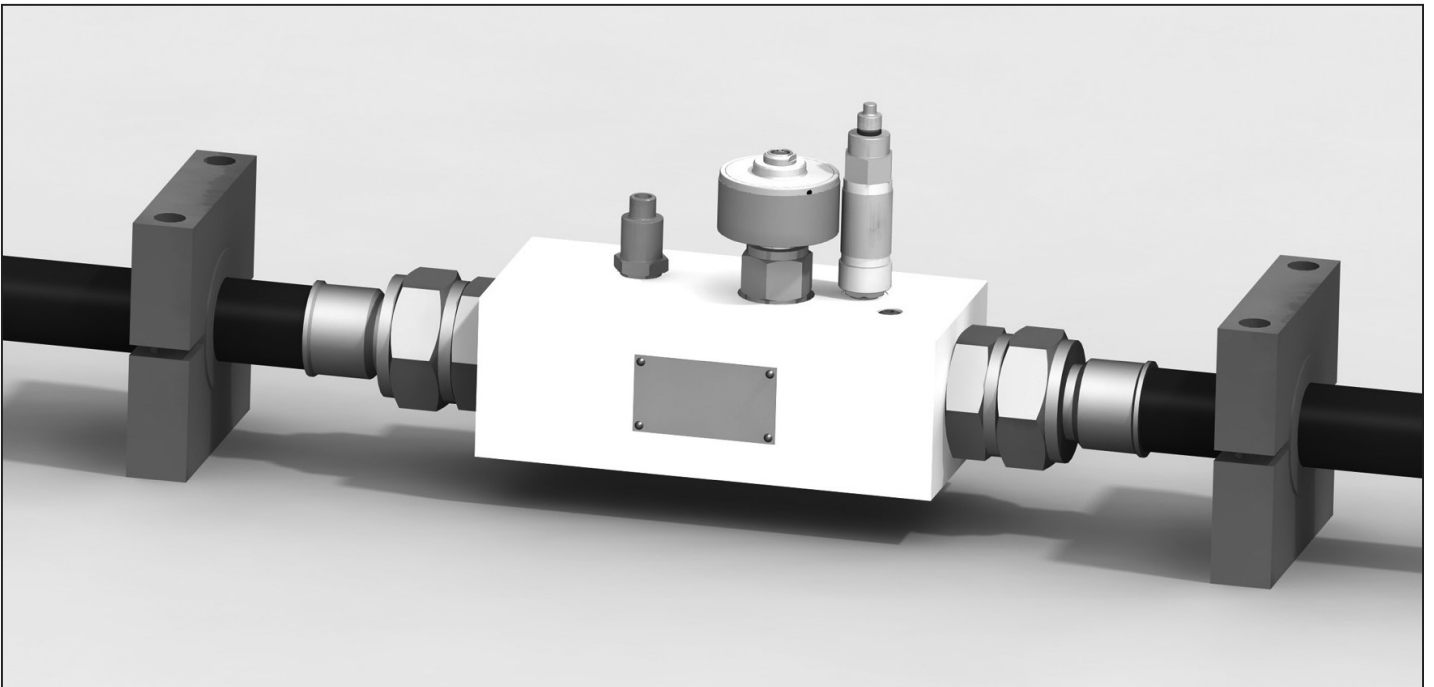
### Construction material

<b>Flow body:</b>	600/750/800/1500 High tensile Aluminium 2014A T6 15/60/150/300/400 High tensile Aluminium 2011 T6
<b>Internal parts:</b>	Aluminium, Steel, Stainless Steel
<b>Transducer:</b>	Body and nut -steel 212A42 electroless nickel plated, Lid and housing - Aluminium 2011 T3
<b>Seals:</b>	FKM seals as standard EPDM are available - please consult sales office

**For Flow and Pressure ratings see model table**

## Installation guidance

All hydraulic connections should be made by suitably qualified personnel. Inlet and outlet connections should always have a similar bore size to that of the flow meter to prevent venturi or constriction effects.



*CT flow meter shown in typical mounting with optional temperature and pressure transducers fitted.*

- The flow meter should be connected using flexible hoses. The flexible hoses should be 'strain relived' (clamped). Ensure the clamps are at least one pipe diameter wide and positioned close to the fittings.
- Consideration should be given to the effects of cavitation erosion as this could damage the unit.
- Although the unit is bi-directional greater accuracy is achieved by ensuring the flow is passed in the direction shown on the serial plate.
- When using this type of flow block to measure low pressure systems, such as case drain leakage, it is recommended that a relief valve or check valve is fitted to protect against excessive pressure caused by surge flows.
- Care should be taken to ensure that the flow block is installed in a position which is not subjected to excessive pulsation as this can cause incorrect readings.
- Check IP rating before installing in wet areas. If installed in wet areas use a M12 cap to protect connector when no cable is present. IP rating only applies if unit is fully connected.
- The flow block can be mounted in any orientation.
- All flow meters have built-in flow straighteners so the normal recommended length of 10 Ø of straight tube can be reduced to 8 Ø where space is limited.
- Most flow meters have three additional ports in the top face of the flow meter to enable the user to connect both a temperature and pressure sensor.
- There are two 1/4" BSP or #4 SAE O ring ports and one M10x1 port. As standard one 1/4" BSP or #4 SAE is fitted with a test point (M16x2) and both other ports are blanked. See model table for more details and ports configuration.
- It is recommended that a 25 micron filter is installed in the hydraulic circuit prior to the flow meter. For heavy-duty applications, for example installation close to a piston pump, or for advice on installation please consult the sales office.

**Dimensions:** millimeters (inches). **Weight:** kg (lbs)

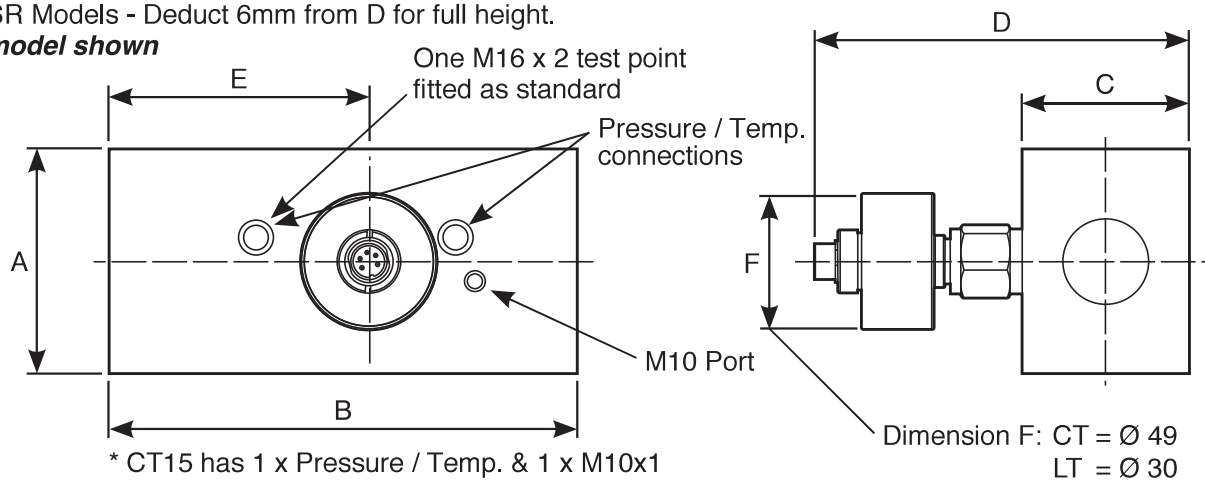
Model No.	A	B	C	D	E	Weight
CT/LT15	37 (1-1/2")	136 (5-3/8")	37 (1-1/2")	115 (4-1/2")	69.5 (2-3/4")	0.7 (1.5)
CT/LT60	62 (2-1/2")	190 (7-1/2")	50 (2")	130 (5-1/8")	103 (4")	1.6 (3.5)
CT/LT150	62 (2-1/2")	190 (7-1/2")	50 (2")	130 (5-1/8")	103 (4")	1.6 (3.5)
CT/LT300	62 (2-1/2")	190 (7-1/2")	50 (2")	134 (5-1/4")	103 (4")	1.7 (3.7)
CT/LT400	62 (2-1/2")	190 (7-1/2")	50 (2")	134 (5-1/4")	103 (4")	1.7 (3.7)
CT/LT600	62 (2-1/2")	212 (8-3/8")	75 (3")	149 (5-7/8")	127 (5")	2.7 (6)
CT/LT600-**-F-**-*	100 (4")	212 (8-3/8")	75 (3")	152 (6")	126 (5")	5.0 (11)
CT750	100 (4")	212 (8-3/8")	75 (3")	152 (6")	126 (5")	5.0 (11)
CT/LT800	100 (4")	212 (8-3/8")	75 (3")	152 (6")	126 (5")	5.0 (11)
CT800 (code 62)	113 (4-1/2")	212 (8-3/8")	100 (4")	165 (6 1/2")	126 (5")	6.0(13.2)
CT/LT1500	140 (5-1/2")	260 (10-1/4")	100 (4")	169 (6-5/8")	130 (5-1/8")	10.0 (22)

CT/LT1500 includes 4 feet on base, add 20 mm (3/4") to D for full height.

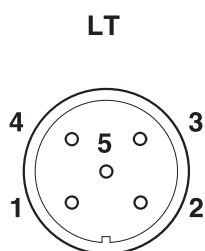
CT/LT1500 is fitted with carry handles.

CT-SR Models - Deduct 6mm from D for full height.

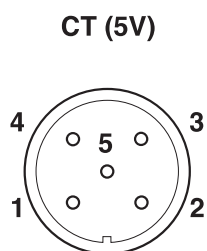
**CT model shown**



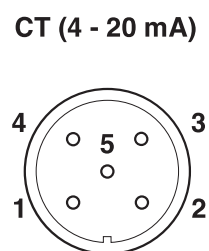
## CT/LT Connection Details



**Pins**  
**1** = Freq +ve  
**2** = Freq -ve  
**3** = Temp  
**4** = Temp  
**5** = N/C

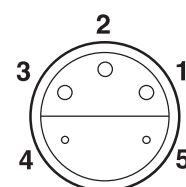


**Pins**  
**1** = +In  
**2** = N/C  
**3** = 0 - 5V out  
**4** = N/C  
**5** = GND



**Pins**  
**1** = +In  
**2** = N/C  
**3** = 4 - 20mA out  
**4** = N/C  
**5** = GND

### Sensor Recognition (3V)



**Pins**  
**1** - V Out  
**2** - N/C  
**3** - +In  
**4** - GND  
**5** - Sensor Recognition

N.B. N/C = Do not connect

<b>Connecting cable</b> (5m)	FT10228-05
<b>Extension cable</b> (5m)	FT10229-05
<b>Connector</b> (M12x1)	FT9880

FT9788
FT9789
N/A

**Note:** For CT (5V) and CT (4-20mA):

- Use a shielded three core cable. Connect the shield to the transducer case.
- Use a UL class 2 or equivalent power supply.
- Use a 250mA, quick-blow fuse on Supply +In.

## Model Table

Model No.	Outputs	Main ports	Top ports*	Flow range	Max. pressure
CT/LT15-**-B-B-6	SR, 5V, mA, FM	1/2" BSPP	1/4" BSPP	1 - 15 lpm	420 bar
CT/LT15-**-S-S-6	SR, 5V, mA, FM	3/4" -16UN #8 SAE ORB	7/16" -20UN #4 SAE ORB	0.25 - 4 US gpm	6000 psi
CT/LT60-**-B-B-6	SR, 5V, mA, FM	3/4" BSPP	1/4" BSPP	3 - 60 lpm	420 bar
CT/LT60-**-S-S-6	SR, 5V, mA, FM	1-1/16" -12UN #12 SAE ORB	7/16" -20UN #4 SAE ORB	0.8 - 16 US gpm	6000 psi
CT/LT150-**-B-B-6	SR, 5V, mA, FM	3/4" BSPP	1/4" BSPP	5 - 150 lpm	420 bar
CT/LT150-**-S-S-6	SR, 5V, mA, FM	1-1/16" -12UN #12 SAE ORB	7/16" -20UN #4 SAE ORB	1.3 - 40 US gpm	6000 psi
CT/LT300-**-B-B-6	SR, 5V, mA, FM	1" BSPP	1/4" BSPP	8 - 300 lpm	420 bar
CT/LT300-**-S-S-6	SR, 5V, mA, FM	1-5/16" -12UN #16 SAE ORB	7/16" -20UN #4 SAE ORB	2 - 80 US gpm	6000 psi
CT/LT400-**-B-B-6	5V, mA, FM	1" BSPP	1/4" BSPP	10 - 400 lpm	420 bar
CT/LT400-**-S-S-6	5V, mA, FM	1-5/16" -12UN #16 SAE ORB	7/16" -20UN #4 SAE ORB	2.5 - 100 US gpm	6000 psi
CT/LT600-**-B-B-5	SR, 5V, mA, FM	1-1/4" BSPP	1/4" BSPP	15 - 600 lpm	350 bar
CT/LT600-**-F-S-3	5V, mA, FM	1-1/2" #24 SAE Code 61 4-bolt flange	7/16" -20UN #4 SAE ORB	5 - 160 US gpm	3000 psi
CT/LT600-**-S-S-5	SR, 5V, mA, FM	1-5/8" -12UN #20 SAE ORB	7/16" -20UN #4 SAE ORB	4 - 160 US gpm	5000 psi
CT/LT750-SR-F-B-3	SR	1-1/2" #24 SAE Code 61 4-bolt flange	1/4" BSPP	20 - 750 lpm	210 bar
CT/LT750-SR-F-S-3	SR	1-1/2" #24 SAE Code 61 4-bolt flange	7/16" -20UN #4 SAE ORB	5 - 200 US gpm	3000 psi
CT/LT750-SR-S-B-7	SR	1-7/8" -12UN #24 SAE ORB	1/4" BSPP	20 - 750 lpm	480 bar
CT/LT750-SR-S-S-7	SR	1-7/8" -12UN #24 SAE ORB	7/16" -20UN #4 SAE ORB	5 - 200 US gpm	7000 psi
CT/LT800-**-S-B-7	5V, mA, FM	1-7/8" -12UN #24 SAE ORB	1/4" BSPP	20 - 800 lpm	480 bar
CT/LT800-**-S-S-7	5V, mA, FM	1-7/8" -12UN #24 SAE ORB	7/16" -20UN #4 SAE ORB	5 - 210 US gpm	7000 psi
CT/LT800-**-F-B-3	5V, mA, FM	1-1/2" #24 SAE Code 61 4-bolt flange	1/4" BSPP	20 - 800 lpm	210 bar
CT/LT800-**-F-S-3	5V, mA, FM	1-1/2" #24 SAE Code 61 4-bolt flange	7/16" -20UN #4 SAE ORB	5 - 210 US gpm	3000 psi
CT800-mA-F-B-6	mA	1-1/2" #24 SAE Code 62 4-bolt flange	1/4" BSPP	20 - 800 lpm	420 bar
CT/LT1500-**-F-S-6	5V, mA, FM	2" #32 SAE Code 62 4-bolt flange	7/16" -20UN #4 SAE ORB	12.5 - 400 US gpm	6000 psi
CT/LT1500-**-F-S-6-L	5V, mA, FM	2" #32 SAE Code 62 4-bolt flange	7/16" -20UN #4 SAE ORB	50 - 1500 lpm	420 bar

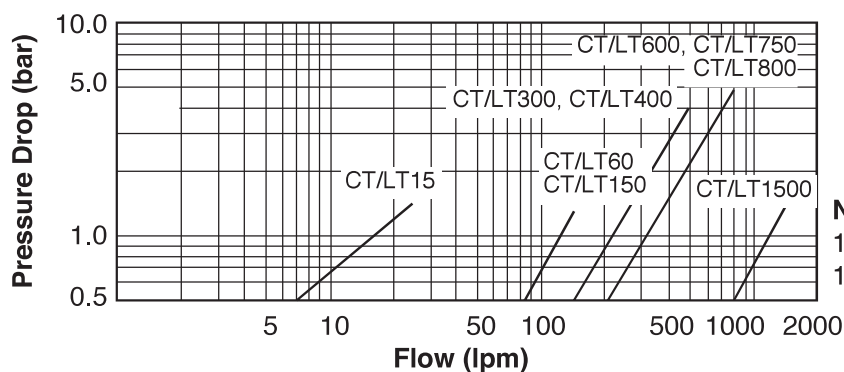
Replace \*\* with SR, mA, 5V or FM (LT only) to give complete model number. \*CT/LT15 has one of the specified top ports.

## Technical information

All flow meters are calibrated at a mean viscosity of 21 cSt using ISO32 hydraulic mineral oil to ISO11158 category HM. Special calibration is available over a custom flow range or at a different viscosity, please contact sales to discuss your application.

### Pressure Drop Chart

Hydraulic Oil Viscosity 21 Centistokes



**Note:**

1 UK gallon = 4.546 litres  
1 US gallon = 3.785 litres

### Fluid viscosity

The performance of a turbine flow meter can be affected by the viscosity of the fluid measured. The kinematic viscosity of all hydraulic fluids is related to the fluid temperature and the table on the next page shows the affect of temperature on the kinematic viscosity of a range of typical grades of hydraulic oil.

The shaded area of the table shows the range of viscosities that can be measured by a flow meter with standard calibration with minimal effect on the accuracy (less than  $\pm 1\%$  FS).

Flow meters can be specially calibrated at a different viscosity to the standard or we can advise on the expected error when the flow meter is used at other viscosities, please contact sales for further information.

Table showing kinematic viscosity (cSt) of different mineral oils at specific temperatures

Temp °C	Fluid type					
	ISO15	ISO22	ISO32	ISO37	ISO46	ISO68
0	85.9	165.6	309.3	449.9	527.6	894.3
10	49.0	87.0	150.8	204.7	244.9	393.3
20	30.4	50.5	82.2	105.5	127.9	196.1
30	20.1	31.6	48.8	59.8	73.1	107.7
40	14.0	21.0	31.0	36.6	44.9	63.9
50	10.2	14.7	20.8	23.9	29.4	40.5
60	7.7	10.7	14.7	16.5	20.2	27.2
70	6.0	8.1	10.9	12.0	14.6	19.2
80	4.8	6.4	8.4	9.1	11.1	14.3
90	4.0	5.2	6.6	7.2	8.7	11.1
100	3.3	4.3	5.5	6.0	7.1	8.9

ISO 15, 22, 32, 46 and 68 based on typical figures for the Esso Nuto range of HM oils. ISO 37 based on Shell Tellus HM oil.

### Calibration

Recommended period between calibrations is 12 months. Maximum period between calibrations is 36 months. Unit accuracy may be affected by operating cycle, fluid condition or extended periods between recalibrations.

### Accessories

A range wide range of accessories are available from Webtec or your local distributor. These include pressure transducers, high pressure temperature sensors adaptors, cables and remote displays.