

Pico Technology Flow Meter Kits

These flow meters are designed for intermittent or continuous testing of hydraulic systems on vehicles, mobile machinery, test stands and many other hydraulic circuits. They are the ideal tool to locate hydraulic flow problems and can be used to verify and record repair work. They are used to check system performance, balance system flows and commission of hydraulically powered equipment. Their compact design enables them to be installed where space is limited.

When included, the integral loading valve provides smooth progressive pressure control in both flow directions allowing components such as cylinders or motors to be tested without re-plumbing the test connections.



Hydraulic measurement and control



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Features

- **FLOW:** 1 - 600 lpm, 0.25 - 160 US gpm
- **PRESSURE:** Up to 480 bar, 7000 psi
- **ACCURACY:** Up to 1% of indicated reading
- **LOADING VALVE:** with bi-directional flow and pressure loading capability
- **'INTERPASS'™** safety disc system, bypasses oil internally in the event of the valve being over pressurised
- **BI-DIRECTIONAL** operation** (Model specific)
- **TEMPERATURE:** sensor built-in
- **FLUIDS:** Wide range of hydraulic oil, lubrication oil, and fuels
- **CALIBRATION:** 21 cSt as standard. Special calibrations possible



Certificate No.8242

Specifications

Kit Model Number	Flow Meter	Main ports	Top ports	Flow Range	Maximum pressure
Pico 25 EU	CT25-FB-B-B-6*	1/2" BSPP	1/4" BSPP*	1 - 25 lpm	420 bar
Pico 25 NA	CT25-FB-S-S-6*	3/4" -16UN #8 SAE ORB	7/16" -20UN #4 SAE ORB*	0.25 - 7 US gpm	6000 psi
Pico 300 EU	CT300R-FB-B-B-6	1" BSPP	1/4" BSPP	8 - 300 lpm	420 bar
Pico 300 NA	CT300R-FB-S-S-6	1-5/16" -12UN #16 SAE ORB	7/16" -20UN #4 SAE ORB 2	2 - 80 US gpm	6000 psi
Pico 600 EU	CT600R-FB-S-B-7**	1-7/8" -12UN #24 SAE ORB	1/4" BSPP 20	600 lpm*	480 bar
Pico 600 NA	CT600R-FB-S-S-7**	1-7/8" -12UN #24 SAE ORB	7/16" -20UN #4 SAE ORB	5 - 160 US gpm*	7000 psi

*Only one test port.

**CT600R has limited pressure control below 86 lpm (23 US gpm). The maximum controllable pressure in this region is calculated by: $\text{max pressure (in bar)} = 5 \times \text{flow (lpm)} + 30$

Functional specification

Ambient temperature: 5 to 40°C (41 - 104°F)

Fluid type: Oils, fuels

Fluid temperature: 5 to 90°C (41 - 194°F) continuous use.

Accuracy: CT25 is 1% of full scale

(in preferred direction) CT300/600 - 15 to 100% of range - 1% of indicated reading

Below 15% fixed accuracy of 1% of 15% of full scale

Output: Frequency - 5 - 3000 Hz

Construction material

Flow body: High tensile Aluminium 2014A T6, Aluminium 6082 T6

Internal parts: Aluminium, Steel, Stainless Steel.

Transducer: Aluminium, Steel - electroless nickel plated, Stainless Steel.

Seals: FKM seals as standard.

Operation

As fluid is passed through the flow block it rotates a precision turbine. The flow straighteners and turbine design minimise the effects of turbulence and swirl. The turbine blades are detected by the magnetic reluctance transducer which produces a pulse output. The flow meter block has ports for pressure or temperature sensors which can be supplied as an option.

Where meters include a loading valve the unique designed, pressure balanced poppet ensures low handle effort throughout the full range of the meter. It also provides excellent tactile feedback regardless of pressure, flow and direction. Turning the valve clockwise increases the restriction and hence the load on the circuit. In the event of overpressure, replaceable safety discs (situated within the poppet) rupture to internally by-pass the oil at low pressure. Safety discs with different pressure ranges up to 480 bar are available - please consult sales office.

Reverse flow

The flow block is capable of controlling and measuring flow in either direction. There is a shuttle valve which ensures the pressure port measure the high pressure side of the loading valve. In order to achieve the quoted accuracy figures flow must be in the preferred direction - turbine first then loading valve.

Calibration

All units are calibrated with 21 cSt oil as standard. Calibration certificates are available on request - this is a chargeable option. Other calibration on request - please consult the sales office.

Installation

The flow blocks 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. 90-degree bends are permitted on the loading valve end of the block, but should always be of a similar bore size to that of the flowmeter to prevent venturi or constriction effects. The range of flow meters can be used for intermittent or continuous testing of flow in either direction. The flow block can be mounted in any orientation.

Filtration

It is recommended that a 25-micron (10 micron for CT25) filter is installed in the circuit prior to the flow block.

Top ports

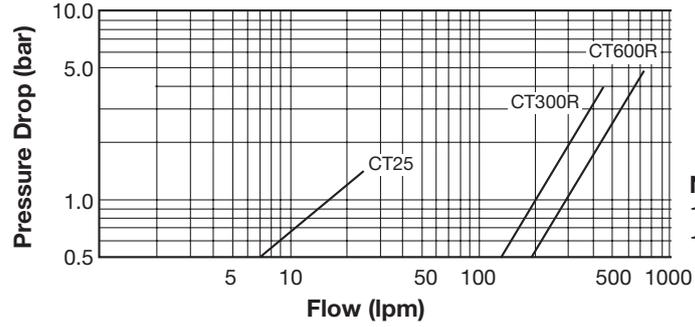
All flow meters have two additional ports (see table for configuration) in the top face to enable the user to connect both a temperature and pressure sensor. All flow meters come with one M16 x 2 test point fitted as standard.

Ordering

Flow meters are only available in the kits listed in the specifications table, ie. "Pico AM300 EU."

Pressure Drop Chart

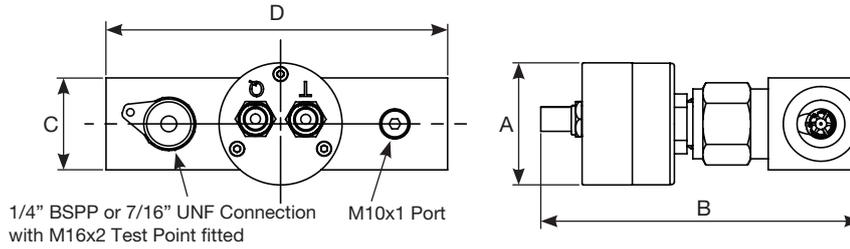
Hydraulic Oil Viscosity 21 Centistokes (Fully open load valve)



Note:

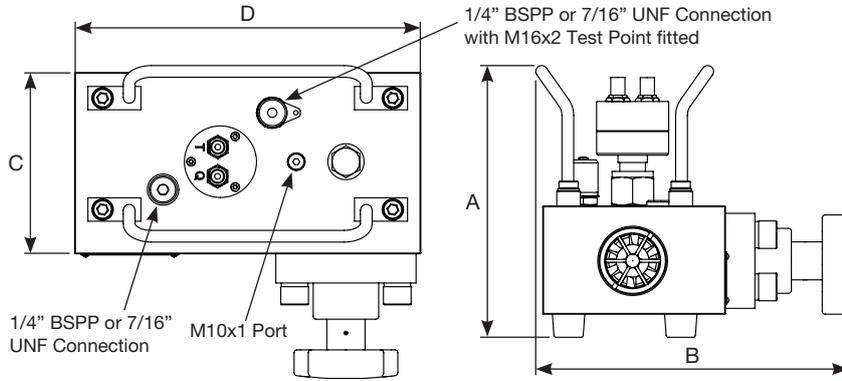
1 UK gallon = 4.546 litres
1 US gallon = 3.785 litres

Pico Kit No.	Webtec Model No.	A	B	C	D	Weight kg (lbs)
PICO 25 EU	CT25-FB-B-B-6	49	127.5	37	136	0.7 (1.5)
PICO 25 NA	CT25-FB-S-S-6	49	127.5	37	136	0.7 (1.5)



Pico Kit No.	Webtec Model No.	A	B	C	D	Weight kg (lbs)
PICO 300 EU	CT300R-FB-B-B-6	161	193	100	222	3.7 (8.1)
PICO 600 EU	CT600R-FB-S-B-7	186	214	125	235	8.0 (17.6)
PICO 300 NA	CT300R-FB-S-S-6	161	193	100	222	3.7 (8.1)
PICO 600 NA	CT600R-FB-S-S-7	186	214	125	235	8.0 (17.6)

Dimensions in Millimetres



Turbine Flow Meters

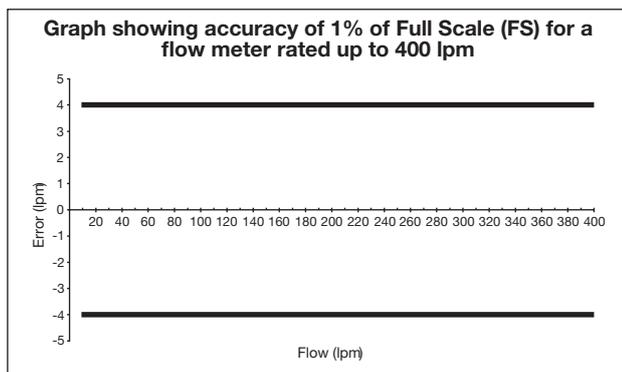
Accuracy

The accuracy is better described as the uncertainty of the flow reading compared to a known reference. Every flow measurement has an error associated with it, caused by the combination of a large number of factors that affect the operation of the flow meter, these include bearing friction, temperature, viscosity, magnetic drag and the signal strength to name but a few.

All our flow meters are calibrated at 10 points over the flow range and its performance measured against a flow reference that is traceable to International standards. Accuracy is typically quoted in one of two ways: as a percentage of full scale (the maximum calibrated flow) or as a percentage of the indicated reading (the actual flow).

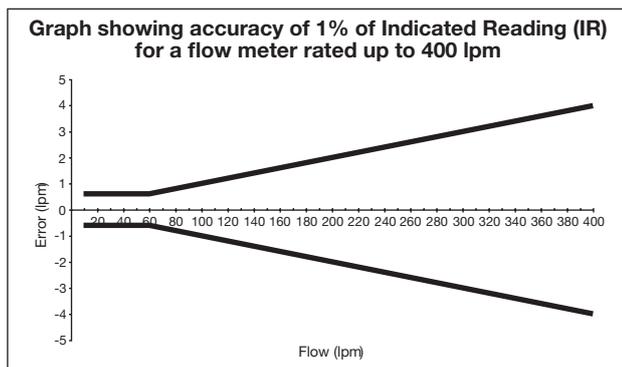
Full scale (FS) or full scale deflection (FSD)

A term that was originally used for analogue displays where a needle pointed to a number on a scale, hence FSD. The flow accuracy is a fixed amount regardless of the actual flow you are measuring. For example 1% FS for a flow meter with a maximum calibrated flow of 400 lpm is ± 4 lpm whether you are measuring 40 lpm, 200 lpm or 400 lpm (see graph below). If you need to measure flows of 40 and 400 lpm with same flow meter then it is important to check the allowable error at all flows.



Indicated reading (IR)

Accuracy is quoted as a percentage of the actual value measured. So if the accuracy of a 400 lpm flow meter is 1% IR then the error at 400 lpm is ± 4 lpm. As the actual flow measured reduces, so does the error in lpm. When measuring a flow of 60 lpm with an accuracy of 1% IR, the possible error is ± 0.6 lpm. At very low flows, the possible errors are no longer proportional to the flow rate, but actually a fixed amount in lpm (see graph below). For example if the accuracy is quoted as 1% IR (>60 lpm) for a flow meter with the range 10 - 400 lpm, then the accuracy is 1% of the actual flow in the range 60 to 400 lpm and a fixed flow error in the range 10 to < 60 lpm.



Repeatability

The repeatability is the variation in the performance of the flow meter when used under the same conditions. Our range of flow meters has excellent repeatability of better than $\pm 0.2\%$. This is just as important as the accuracy since in many applications the flow readings from the same flow meter will be compared at regular intervals to look for any change in performance of the system.

Flow range (Turndown ratio)

A turbine flow meter has a minimum and a maximum calibrated flow which together describe the range of flows that can be accurately measured. Through the addition of signal conditioning either mounted on the flow meter or built into the readout, the flow range of our flow meters has been extended considerably compared to other models on the market; the ratio of the maximum to the minimum calibrated flow (turndown ratio) is between 15 and 40 across all models. Particular effort has been made to extend the flow range by calibrating down to lower flows enabling one flow meter to be used where two may have been required in the past. This makes the flow meter both a more economical and easier to install solution.

Fluid viscosity

The performance of a turbine flow meter can be affected by the viscosity of the fluid measured. Our turbine flow meters are calibrated at between 18 and 26 cSt as standard (a mean viscosity of 21 cSt), which is the typical kinematic viscosity for a hydraulic fluid operating at 50 °C. The kinematic viscosity of all hydraulic fluids is related to the fluid temperature and the table below 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.