## CERTIFICATIONS
## directive 97/23/ec pressure equipment directive

Overview

The PED came into force on the 29th May 2002, the directive relates to how pressure equipment is designed and tested and from there sold into the member states of the European Economic Area (EEA). For simplicity the changes detailed below will be introduced to all local and overseas markets. The changes will become effective 1st of May 2002.

To comply with this directive we needed to ensure that all our flow meters are manufactured in accordance with the directive and where applicable have CE labels attached before sale. The directive classifies pressure equipment into various categories based on several factors such as nominal size, temperature, rated pressure, internal volume and the type of fluid being transmitted. Pressure equipment is then given a category rating of either SEP (Sound Engineering Practice), Cat1, Cat2 or Cat3. Equipment rated at Cat2 or above requires an external body to have surveillance over all facets of design, production and assessment procedures.

We have de-rated several meter models to reduce the classification category. By reducing the classification we can use our existing in house quality process, along with the Essential Health and Safety Requirements (ESHR) of the directive to self certify our meters.

## directive

89/336/EEC

Both the standard and deluxe displays have CE marking for the above directive.

## SAA flame proof approval

M5, M10, M40, and M50 Stainless Steel and Aluminium pulse version have SAA flame proof approvals for Exd IIB T6 1P66 Class 1 Zone 1

STANDARDS AUSTRALIA
Flameproof Approval

## intrinsically safe approval

Standard Display Ex II 1 G D EEx ia llc T4 T100°C (KEMA 05ATEX 1168X)
Deluxe Display EEx ia 11C T6 (PTB NR.EX- 93.C4033X)

A110 Meter Mount & Remote Units

EEx ia 11B/11C T4 T100oC (KEMA 03ATEX 1074x)

## Flange Technical Information

Macnaught meter flanges are sized to flange requirements in the ASME B31.3 Code of Pressure Piping at the stated meter flange's rated pressure (this may differ from the meter's rated pressure); the sizing is based on the meter material properties taken at ambient temperature. Gasket factors used for stainless steel flanges to develop adequate installation and operation gasket seating force are:

- Raised face type flange ‘m; = 5 and ‘y’ = 15 MPa requiring bolts of grade ASTM A193-B7.
- Flat face type flange ‘m’ = 1 and ‘y’ = 1.4 MPa, typical of soft rubber or neoprene, requiring bolts of grade ASTM A193-B7.

The use of gaskets with factors larger than those stated above for the respective flange face types is the responsibility of the end user/installer. For materials other than stainless steel offered in the Macnaught meter range please consult the Macnaught web site for current technical data on flange size, material specification, and pressure rating.

## calibration certificate

Flow Meter Calibration Report

Report No. 63609 - 0
Model M 50ARP-3
Serial No. C 63609
Version Pulse

Test Method

Master Meter Serial No A150-415299

Test Media Calibration Fluid 6 cps meets ISO 4113 requirements

Pulser Version Pulses / Litre

Calibration Results LPM

| | |
|---|---|
| Test No | 1 |
| Flow Rate | 180.00 |
| KFactor | 6.680 |
| Kpa | 10.30 |
| Actual Volume | 452.61 |
| Registered Volume | 452.57 |
| ±% Accuracy (of reading) | -0.01% |
| Calibration Fluid °C | 25.0°C |

Measurement Uncertainty 0.20%

Calibrated By R.Mantell Signatory LEE DICKINSON

Signature Date Signature Date

Each M Series meter is checked for accuracy after being manufactured, the process is to enter the specific “K Factor” for that meter and to verify using a one point calibration at the mid range of flow rate of the meter against an approved master meter. Although our standard test is at one point, additional points can be done on request and would incur additional costs.

A certificate as illustrated above is included in the documentation package with the meter. Master meters have their accuracy checked and proving certificates are issued by the National National Measurement Institute, on regular basis.

**applications and fluid viscosities** : Following are examples of the many applications for which the Macnaught M-SERIES™ flowmeter range can be used

| INDUSTRY | USAGE |
|---|---|
| Aviation | Fuel Management - Water & Chemical Loading/UnloadingLoading/Unloading |
| Beverages | Alcoholic Spirits - Fruit Juice - Milk |
| Cement/Ceramic/Glass | Additives - Water |
| Chemical | Ammonia - Caustic Soda - Methyl Chloride - Butane - Acetones - Keytones |
| Cleaning Agents | Detergents - Soaps - Polish |
| Construction | Fuel - Oils |
| Cosmetics | Perfume - Foundation Creams - Alcohol - Shampoo |
| Energy | Fuel - Water - LPG - Freon |
| Food Industry | Sauces - Pastes - Glucose - Chocolate - Yeast - Mayonnaise |
| Gas & Oil | Mecaptans - LPG - Additives - Oils |
| Lubrication | Oils - Coolants - Hydraulic Fluids |
| Marine | Fuel Monitoring - Loading/Unloading |
| **INDUSTRY** | **EXAMPLES** |
| Metal Manufacturing | Release Agents - Acids - Water - Oils |
| Oils & Fats | Vegetable Oils - Cooking Oils - Lards - Tallow |
| Paints / Inks | Automotive Paints - Commercial Paints - Solvents - Printing Inks |
| Petrochemical | Ethylene Oxide - Propylene - Vinyl Chloride Monomers - Styrene |
| Petroleum | Heavy Oil - Gasoline - Bitumen - Kerosene - Naphtha |
| Pharmaceuticals | Alcohol - Water - Syrups - Glycerine - Liquid Sugar |
| Pulp & Paper | Dyes - Acids - Additives |
| Semi-conductors | Acids - Solvents - Chemicals |
| Textiles | Dyes - Bleach - Chemicals |
| Toiletries | Shampoo - Conditioner - Mouth Wash - Alcohol - Tooth Paste - Gels |
| Transport | Fuel Monitoring - Tanker Loading/Unloading |
| Water Treatment | Fluoride - Acid Addition - Chemical Additives |

## fluid viscosities above 1000cps

To achieve the lowest possible pressure drop, a range of special cut high viscosity optional rotors is available for the M2, M4, M6, M7 M10, M40, M50, M80 & M100 meter models. The M-SERIESTM range of oval gear type Positive Displacement meters has a distinct advantage in measuring extremely viscous materials with the pressure drop being the only limiting factor. With fluids above 1000cps, meter sizing and required flow rate become important decisions.

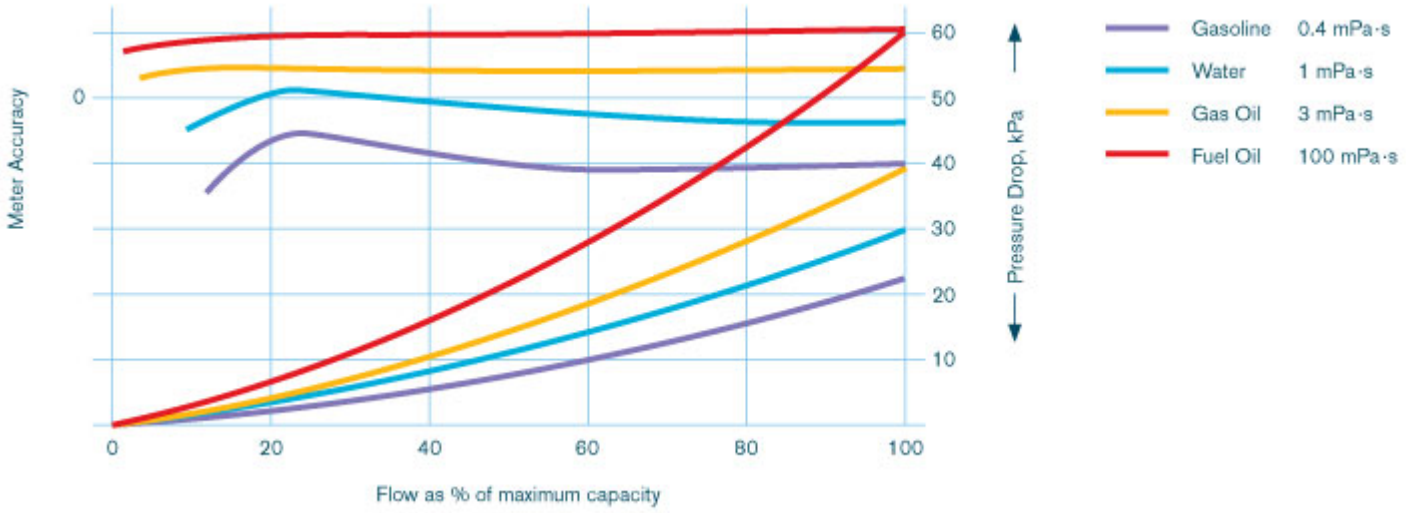
For example:

=> With SAE90 gear oil @ 20°C/68°F with a viscosity of 1000cps, the maximum pressure drop of an M10 at its maximum flow rate (120lpm/32USGM) would be 100kPa/14.5psi/1BAR. However, the pressure drop with the M40 or M50 meters, at the same flow rate would be:
M40: Max 50kPa/7.2psi/0.5BAR
M50: Max 35kPa/5.0psi/0.35BAR
=> To approximately determine the expected maximum flow rate for different high fluid viscosities for each M-SERIES Mmodel at a 100kPa/14.5psi/1BAR pressure drop using high viscosity rotors, the following coefficient factors are applied and Macnaught has created the table at the bottom of this page as a guide:

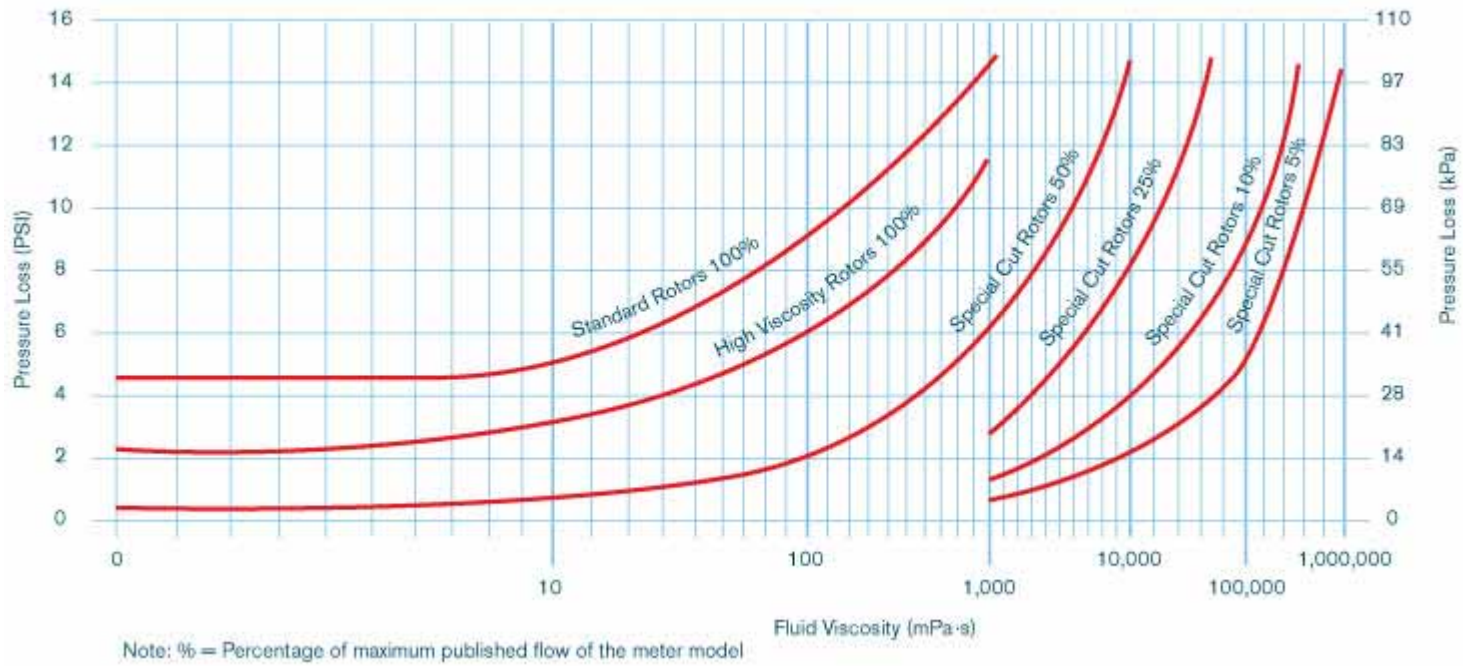
| **Coefficient Viscosity** | | **M2** | | **M4** | | **M6** | | **M7** | |
|---|---|---|---|---|---|---|---|---|---|
| **Factor** | | **Litres/Hr** | **USG/Hr** | **Litres/Min** | **USG/Min** | **Litres/Min** | **USG/Min** | **Litres/Min** | **USG/Min** |
| 1 | <2500cps | 500 | 132.09 | 30 | 7.93 | 80 | 21 | 80 | 21 |
| 0.9 | <3000cps | 450 | 118.88 | 27 | 7.13 | 72 | 19 | 72 | 19 |
| 0.8 | <4000cps | 400 | 105.67 | 24 | 6.34 | 64 | 17 | 64 | 17 |
| 0.7 | <5000cps | 350 | 92.46 | 21 | 5.55 | 48 | 13 | 48 | 13 |
| 0.6 | <8000cps | 300 | 79.25 | 18 | 4.76 | 40 | 11 | 40 | 11 |
| 0.5 | <12000cps | 250 | 66.04 | 15 | 3.96 | 24 | 6.3 | 24 | 6.3 |
| 0.4 | <25000cps | 200 | 52.83 | 12 | 3.17 | 16 | 4.2 | 16 | 4.2 |
| 0.3 | <4000cps | 150 | 39.63 | 9 | 2.38 | 8 | 2.1 | 8 | 2.1 |
| 0.2 | <95000cps | 100 | 26.42 | 6 | 1.59 | 4 | 1.06 | 4 | 1.06 |
| 0.1 | <450000cps | 50 | 13.21 | 3 | 0.79 | | | | |
| 0.05 | <1000000cps | 25 | 6.60 | 1.5 | 0.40 | | | | |

| **Coefficient Viscosity** | | **M10** | | **M40** | | **M50** | |
|---|---|---|---|---|---|---|---|
| **Factor** | | **Litres/Min** | **USG/Min** | **Litres/Min** | **USG/Min** | **Litres/Min** | **USG/Min** |
| 1 | <2500cps | 120 | 31.7 | 250 | 66.04 | 350 | 92.5 |
| 0.9 | <3000cps | 108 | 28.53 | 225 | 59.44 | 324 | 86 |
| 0.8 | <4000cps | 96 | 25.36 | 200 | 52.83 | 280 | 74 |
| 0.7 | <5000cps | 84 | 22.19 | 175 | 46.23 | 245 | 65 |
| 0.6 | <8000cps | 72 | 19.02 | 150 | 39.63 | 210 | 56 |
| 0.5 | <12000cps | 60 | 15.85 | 125 | 33.02 | 175 | 46 |
| 0.4 | <25000cps | 48 | 12.68 | 100 | 26.42 | 140 | 37 |
| 0.3 | <4000cps | 36 | 9.51 | 75 | 19.81 | 105 | 28 |
| 0.2 | <95000cps | 24 | 6.34 | 50 | 13.21 | 70 | 18.5 |
| 0.1 | <450000cps | 12 | 3.17 | 25 | 6.60 | 36 | 9.25 |
| 0.05 | <1000000cps | 6 | 1.59 | 12.5 | 3.30 | 17.5 | 4.6 |

## General performance characteristics

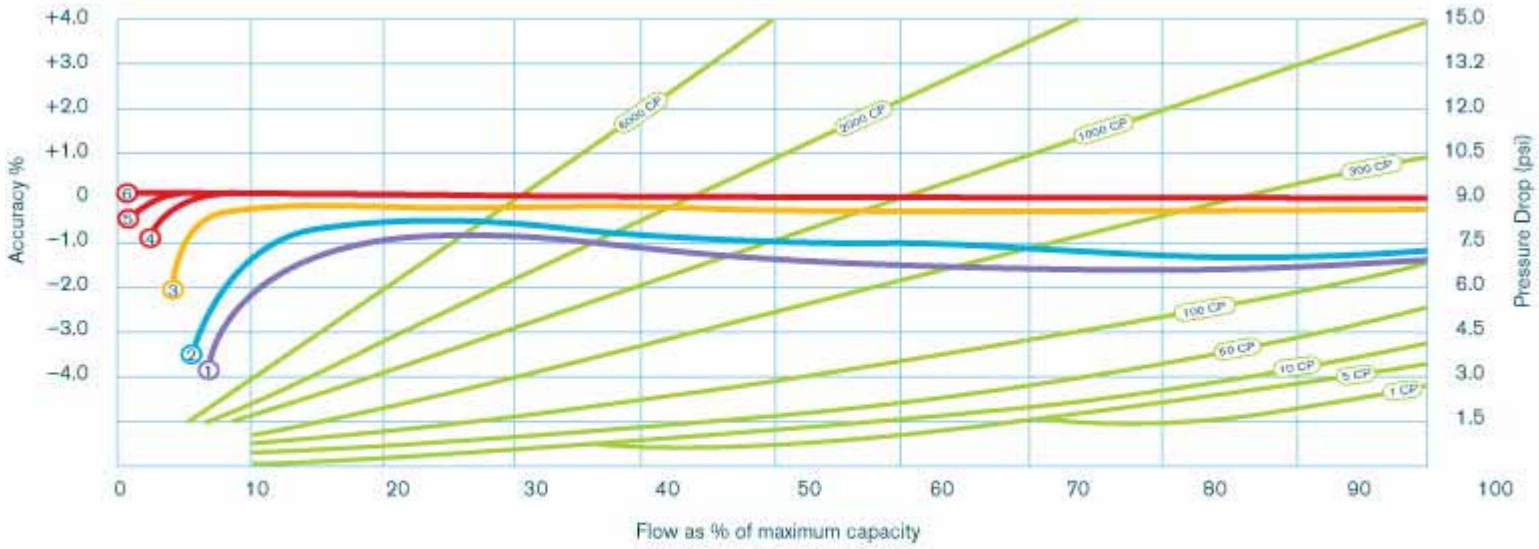



## High viscosity fluids pressure loss and maximum flows



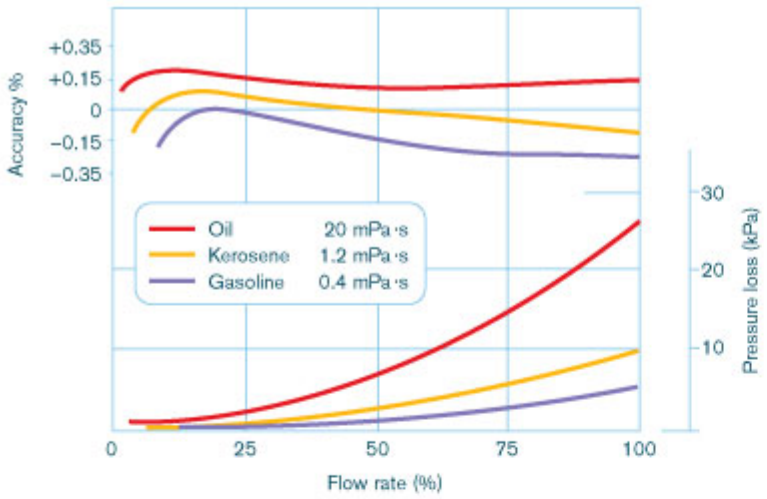

Note: % = Percentage of maximum published flow of the meter model

## Viscosity versus maximum flowrate - general viscosity/accuracy curves

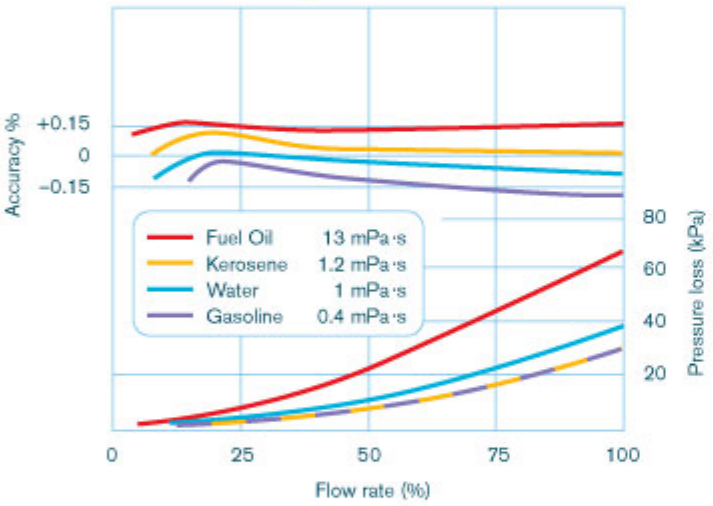


## Meter Errors and Pressure Losses

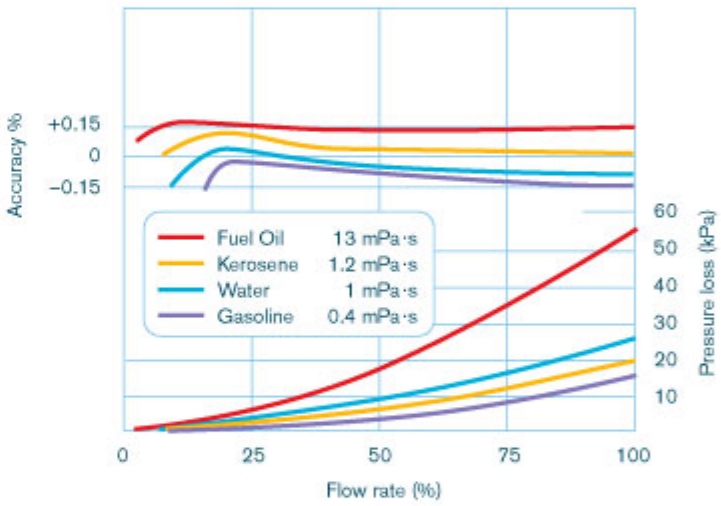
### Meter sizes M05, M1 & M2



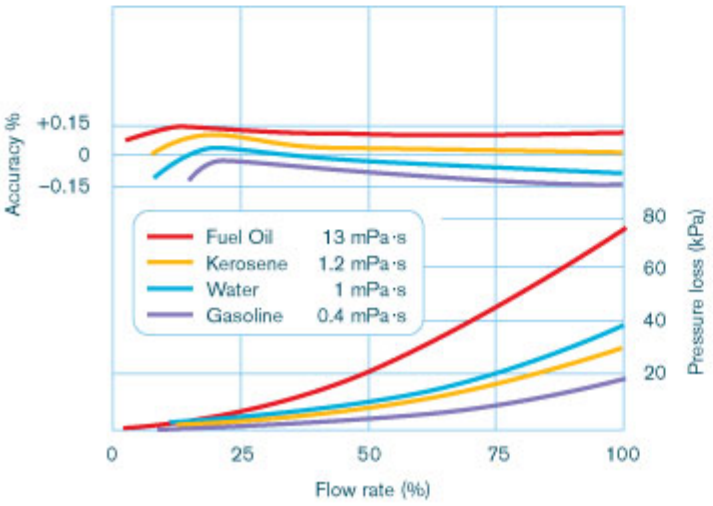

### Meter sizes M4, M10 & M40



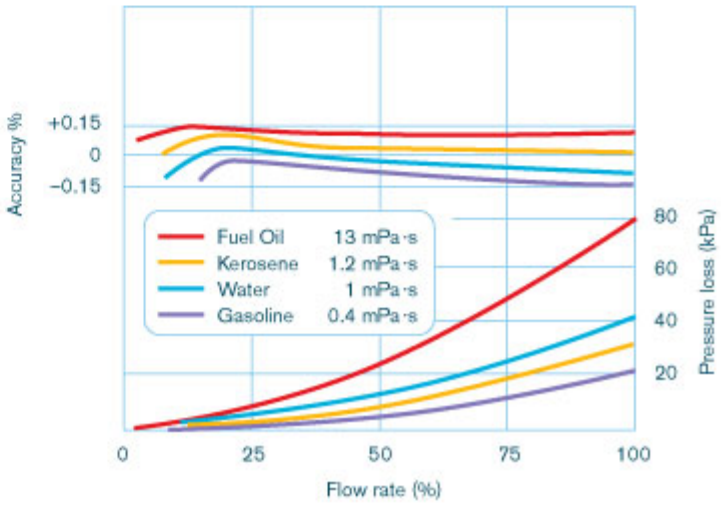

### Meter sizes M50



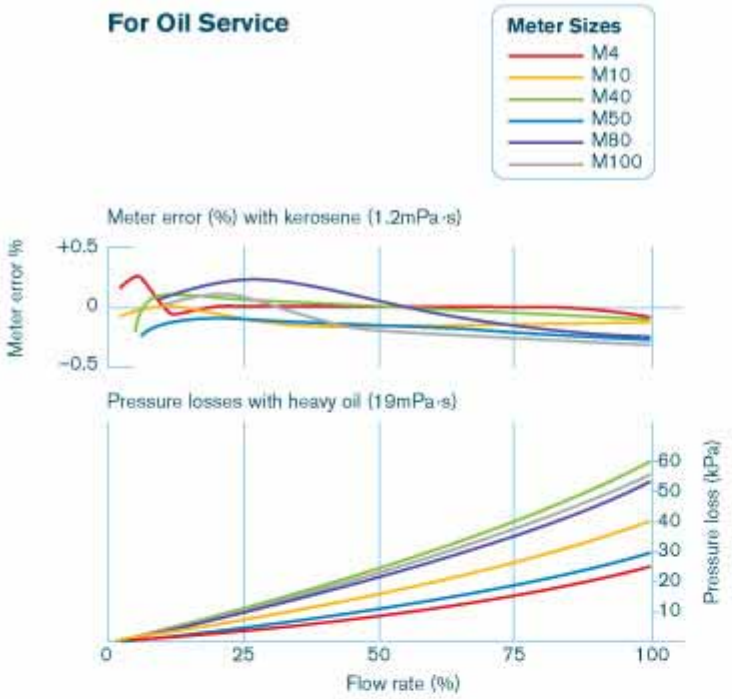

### Meter sizes M80



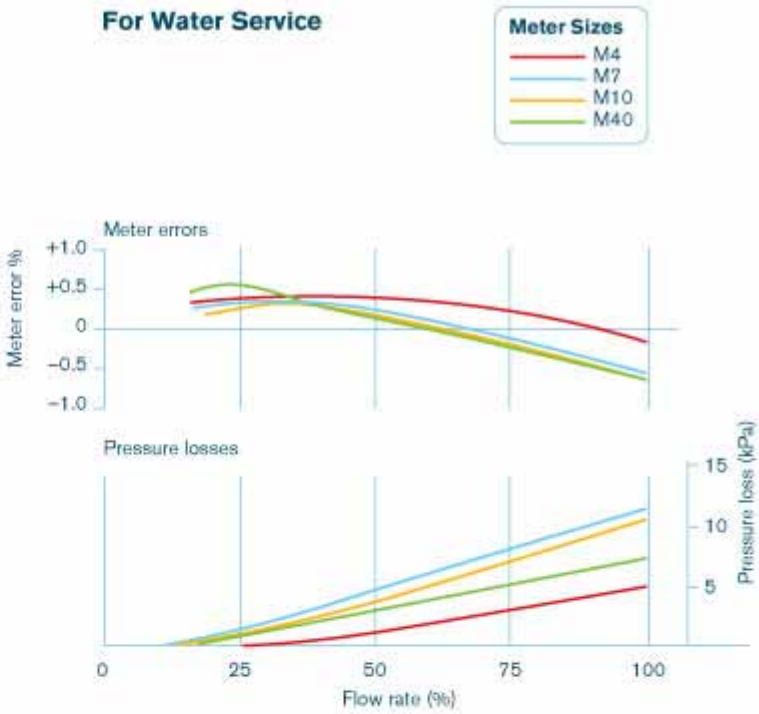

### Meter sizes M100



## For Oil Service




## For Water Service




## General Chemical Liquids Service