

Storage Tank Measurement



Servo Gauges





"The Tank Gauging People"

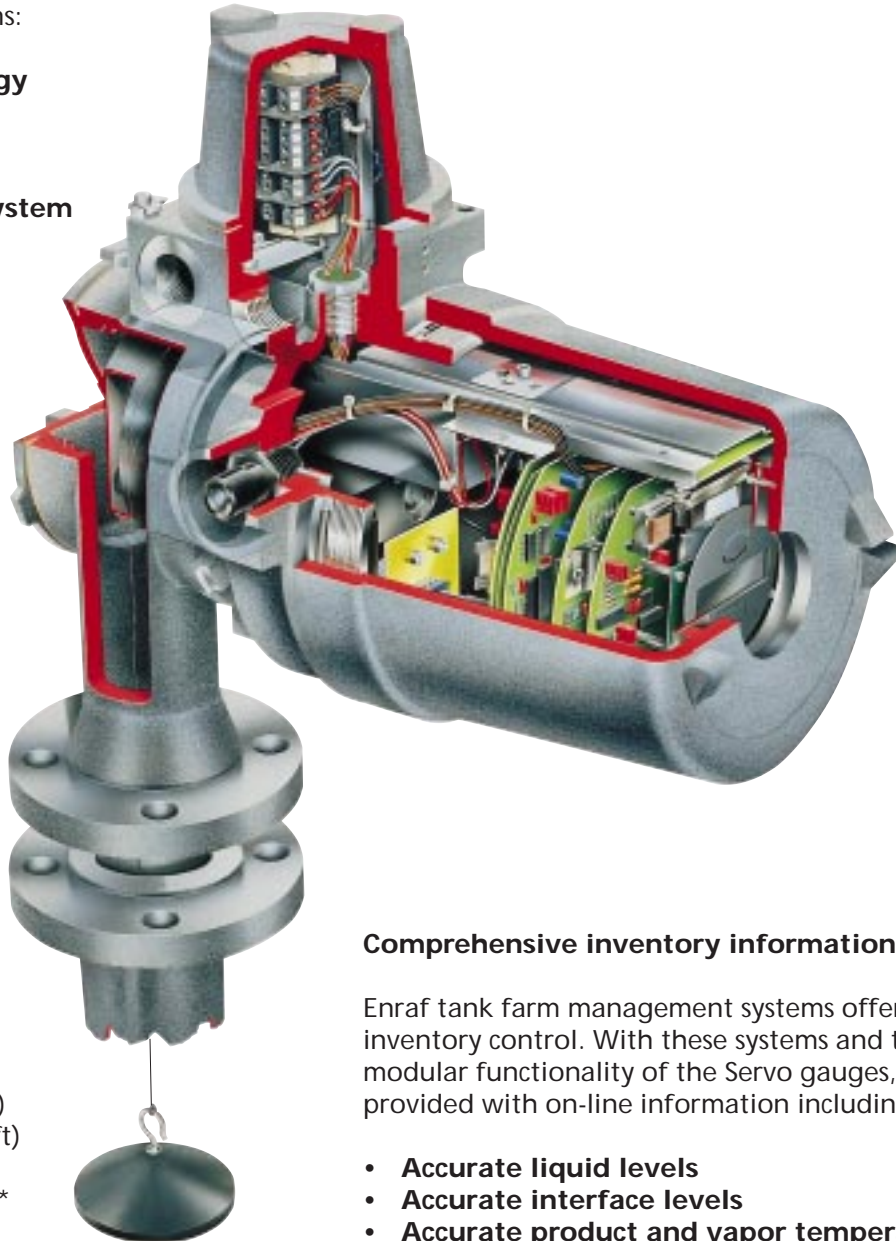
Servo tank gauge - the advanced gauging tool

Enraf introduced the automatic servo level gauging technology in the mid-fifties. Not long afterwards, we introduced the first Servo tank gauge in history to be certified by the leading Weights and Measures authorities.

Innovative ideas are geared towards users satisfaction. After more than 40 years Enraf is still the driving force in tank gauging.

Continuous development means:

- **State of the art technology**
- **Low maintenance**
- **Easy to handle**
- **Flexible use of options**
- **Communication to any system**



Characteristics

Measuring range

0 - 27,000 mm (0 - 88 ft)
0 - 37,000 mm (0 - 121 ft)

Accuracy

Level ± 1 mm (± 0.04 ") *

Housing material

Stainless Steel AISI 316
Cast aluminum

Operating pressure

up to 6 bar / 0.6 MPa (90 psi)
up to 40 bar / 4 MPa (600 psi)

Mounting

2" flange on tank roof
2" flange on stilling well

*) under reference conditions

Comprehensive inventory information

Enraf tank farm management systems offer total inventory control. With these systems and the modular functionality of the Servo gauges, you are provided with on-line information including:

- **Accurate liquid levels**
- **Accurate interface levels**
- **Accurate product and vapor temperature**
- **Volume**
- **Mass**
- **Temperature and density profiles**
- **Alarms**

All measured and calculated data and parameters are available for higher level systems (DCS, MIS, etc.) via an extended number of communication protocols.

Outstanding Accuracy

Always exact on level

Enraf Servo gauges series ATG and XTG are microprocessor controlled tank level gauges. The measuring accuracy is superior to what has been available up to now.

Weights & Measures

Enraf Servo gauges meet the international requirements for custody transfer, confirmed by certification from Custody & Excise and official Weights & Measures authorities.

Increased Safety

Enraf Servo gauges are approved for use in hazardous areas. The gauges are also provided with a unique lightning protection system to avoid damage by thunderstorms.



Features	Your Benefits !
Modular design	<i>Solutions for any application</i>
Compact and light weight	<i>Easy to install</i>
Density measurement	<i>Average density and density profile by the same gauge</i>
Galvanic lightning protection	<i>Safe and reliable under all weather conditions</i>
User-friendly programming	<i>Quick start-up & programming</i>
Hydrostatic tank deformation compensation	<i>Improved accuracy without standpipe</i>
Multiple interface/level set points	<i>Sediment level, water/product interface level and product interface level from only one gauge</i>
Turbulence integrator	<i>No need for stilling well</i>
Extended test function and diagnostics	<i>Easy verification of accuracy, repeatability, etc.</i>
Few moving parts	<i>High MTBF</i>
Option slot	<i>Easy to upgrade</i>



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The smart measuring principle

Level measurement

The displacer is suspended from a very strong and flexible measuring wire stored on a measuring drum. The density of the displacer is higher than the density of the liquid. The displacer on level is partly immersed in the liquid.

The basic idea is that the displacer in a liquid produces an upward force equal to the weight of the displaced product (Archimedes principle).

The apparent weight is the weight of the displacer minus the weight of the displaced product.

The heart of the servo gauge is an advanced and very accurate force transducer that continuously measures the apparent weight of the displacer.

A weight corresponding with the apparent weight of the displacer on level is programmed by software settings.

In equilibrium condition, the weight of the partly immersed displacer balances against the weight programmed to be measured by the force transducer.

When emptying the tank, the liquid level starts moving downwards. The force transducer will experience an increasing weight, as upward force is no longer acting on the displacer.

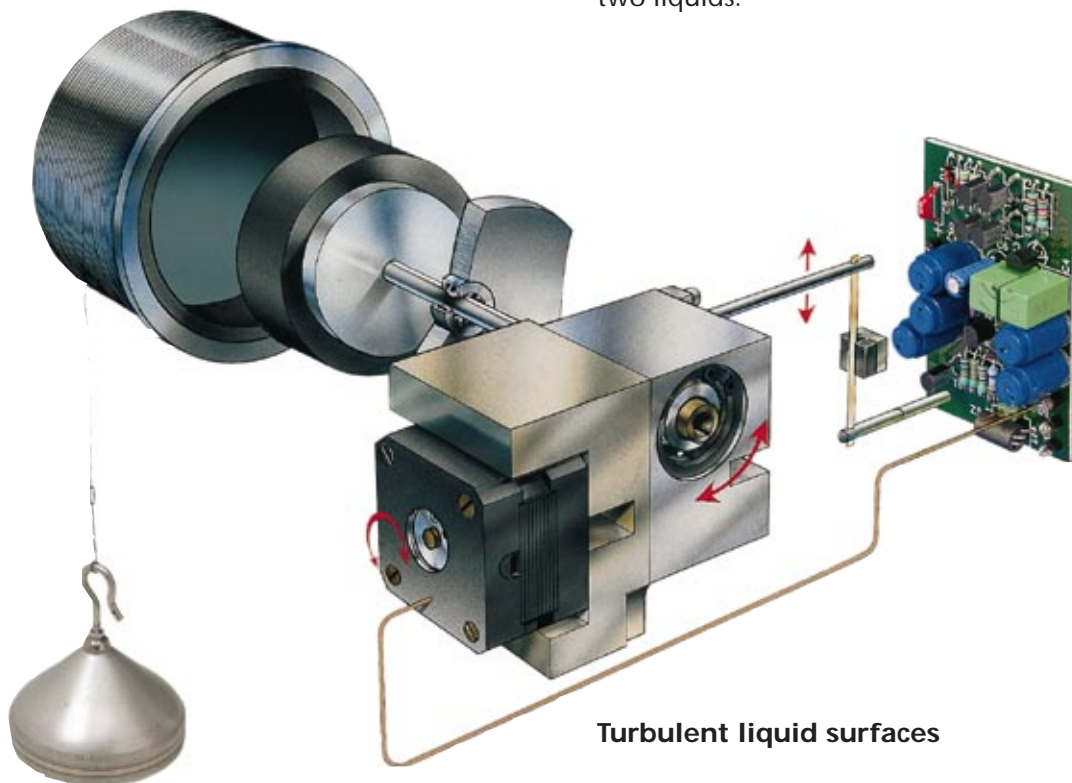
Smart communication between the force transducer and the servo controller will ensure that the displacer is lowered. The servo motor drives the measuring drum to unwind measuring wire until the displacer is partly immersed in liquid again until the measured or apparent weight equals the programmed weight.

The process is reversed when filling the tank.

Interface level measurement

Measuring the interface level between two liquids is achieved by sending an interface command to the gauge. This causes the servo motor to move the displacer through the liquid to a position where the apparent weight of the displacer balances against the programmed interface set point.

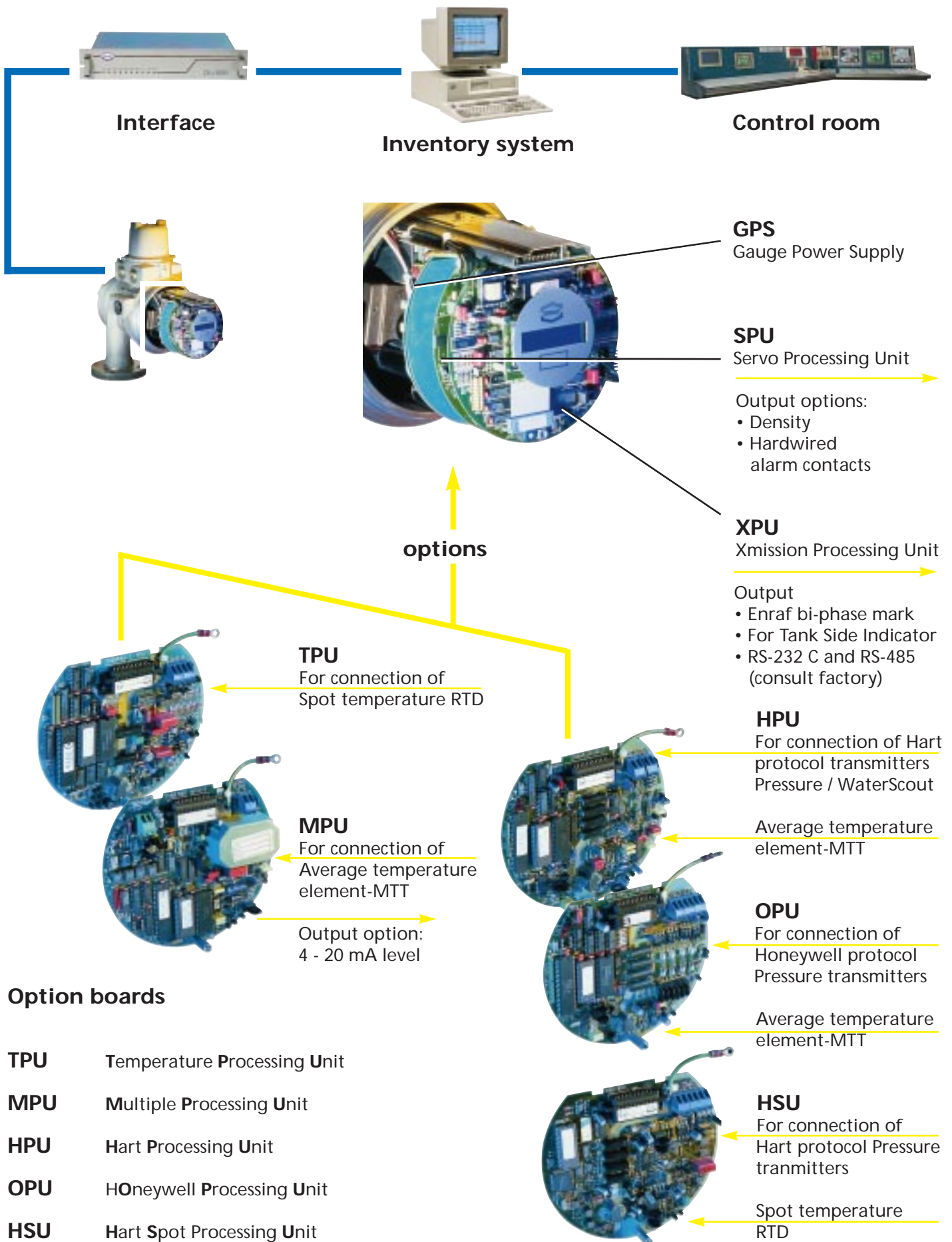
The programmed interface set point is the weight of the displacer minus the upward force achieved by the two liquids.



Turbulent liquid surfaces

The weight of the displacer always keeps the measuring wire tensioned, even on turbulent liquid surfaces. This also means no drifting away from the displacer.

The Servo Gauge at a glimpse



Interface

Inventory system

Control room

GPS
Gauge Power Supply

SPU
Servo Processing Unit

Output options:
• Density
• Hardwired alarm contacts

XPU
Xmission Processing Unit

Output
• Enraf bi-phase mark
• For Tank Side Indicator
• RS-232 C and RS-485 (consult factory)

options

TPU
For connection of Spot temperature RTD

MPU
For connection of Average temperature element-MTT

Output option:
4 - 20 mA level

HPU
For connection of Hart protocol transmitters Pressure / WaterScout

Average temperature element-MTT

OPU
For connection of Honeywell protocol Pressure transmitters

Average temperature element-MTT

HSU
For connection of Hart protocol Pressure transmitters

Spot temperature RTD

Option boards

TPU	Temperature Processing Unit
MPU	Multiple Processing Unit
HPU	Hart Processing Unit
OPU	Honeywell Processing Unit
HSU	Hart Spot Processing Unit



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Servo gauges - guarantee for accuracy and reliability

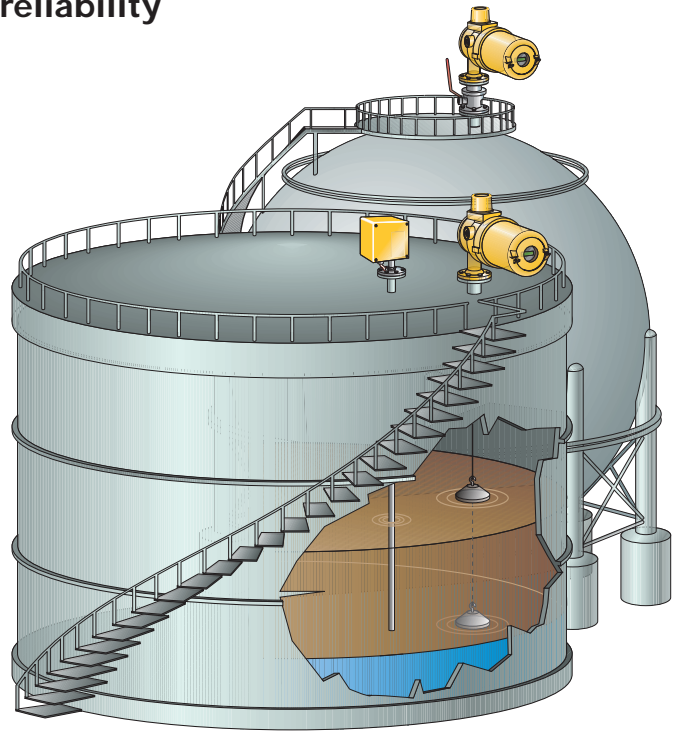
Organizations and Standards

Enraf Servo gauges are approved and fully certified by numerous organizations all over the world, including Weight & Measures, Excise and Metrological Institutes.

Enraf instruments comply with regulations from world leading standardization organizations in the storage industry.

Accreditation's include:

- CENELEC Europe
- UL/FM USA
- CSA Canada
- BASEEFA United Kingdom
- PTB Germany
- SIM France
- NMI the Netherlands
- SEV Switzerland
- BEV/TÜV Austria
- KDB/Prochem Poland
- SAA Australia
- SAA Canada
- SIRIM Malaysia
- GOS Standard Russia
- NEPSI China
- CCE India
- MIGAS Indonesia



For all your applications

Enraf Servo gauges are in use by most leading companies throughout the world. They can be found on all kinds of bulk storage tanks, storing a wide range of liquids, including:

- Petrochemical industries
- Refineries
- Independent terminals
- Marketing terminals
- Pipeline terminals
- Gas terminals
- Chemical industries
- Food and beverage industries
- Aviation fuel supply companies
- Utilities
- Strategic oil & gas storage organisations

Enraf is an ISO 9001 certified company

- OIML Organization International de Métrologie Légale
- API American Petroleum Institute
- CEN Comité Européen de Normalisation
- ISO International Standardization Organization

.....and many others.



For more detailed information

If you would like more information on the technical specifications, please contact your nearest Enraf office. Full details are given on the back of this brochure.

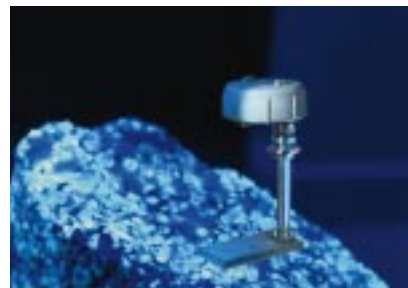
The following Enraf Product Sheets are available of the individual Servo gauges:

- 854ATG series
- 854XTG series

Other Tank Gauging products

SmartRadar

This unique tank gauge - complete with the newest radar technology - is the very latest development in non-intrusive level measurement systems for bulk liquid storage tanks. SmartRadar gives optimal measuring performance in any application. Its small size and flexible construction ensure that there are no problems integrating it with existing servo, hydrostatic, or hybrid gauging installations.



Hydrostatic Tank Gauging

The Enraf HTG system - the ultimate solution for accurate direct mass measurement - is an example of trend-setting technology at its best. The system's highly accurate digital pressure transmitters also provide continuous product density data.



Hybrid Inventory Management Systems

Introduced by Enraf, the Hybrid Inventory Management System (HIMS) is an easy-to-install combination of hydrostatic and level gauging technology. The system unites the best of Smart Radar and servo gauging techniques with digital pressure transmitter technology - for maximum accuracy when gauging level, mass, density, and volume.



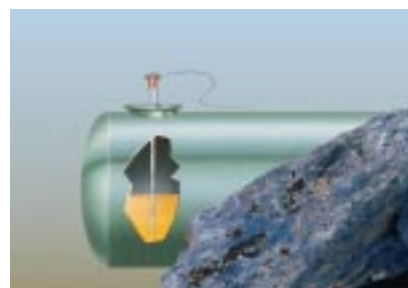
Tank Inventory Management Systems

Enraf's systems collect and calculate data for effective tank farm management, and can be fully customized to meet specific needs. Information is provided in a range of formats over a series of user-friendly screens. A variety of documents and reports can easily be produced. The system includes its own diagnostics routines. Enraf's Tank Inventory Management Systems have received official recognition from a number of international measurement authorities.



DataDIP Tank Gauge System

The total tank inventory system that puts you in control. Developed for tanks situated above or below ground - especially at service stations. The system makes use of proven solid-state technology to provide highly efficient inventory control. It is an effective early warning system for product loss and leaks.



Other instruments in the Enraf range

- **WaterScout** - for product/water interface measurement
- **Multi Temperature Sensor Thermometer (MTT)** - for liquid and vapor temperature measurement
- **Portable Enraf Terminal (PET)** - for easy commissioning and field configuration
- **Communication Interface Unit (CIU)** - for communication between field instruments and management systems
- **Indicators** - remote and local, for data in the field or any location
- **AlarmScout** level and interface sensors - to prevent overfill and spills

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