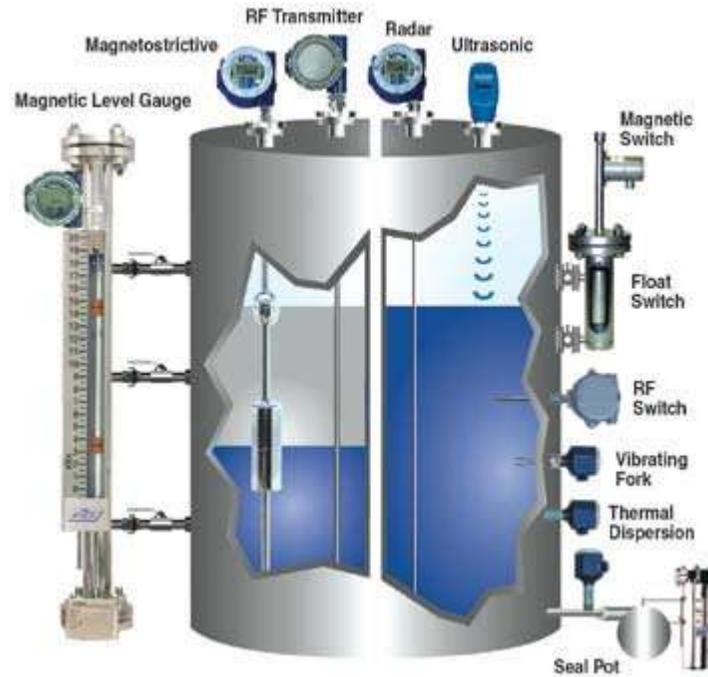
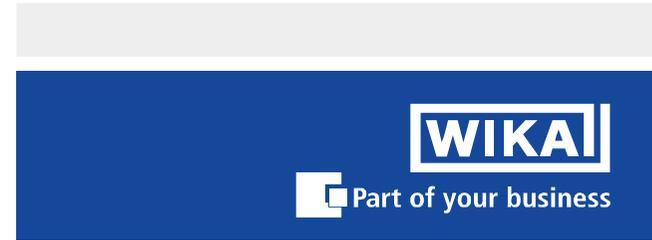


InstMC Technical Presentation

Liquid Level Measurement Techniques



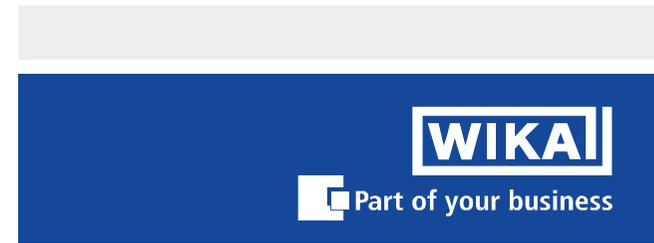
Richard Jaynes - UK Business Development

richard.jaynes@tc-fluidcontrol.com

Keith Woolnough - UK Business Development – EPC / Projects

keith.woolnough@wika.com

Liquid Level Measurement Techniques



Agenda

- Glass Level Gauges
 - Types and Applications
- Magnetic Level Gauges
 - Principles and Applications
 - Considerations in Chamber Design
- Transmitter Options
 - Magnetostrictive and GWR
 - Principles and Benefits of each
- Instrument Chambers
- Approvals, Materials, testing, welding & drawings
- Applications



Richard Jaynes - UK Business Development

richard.Jaynes@tc-fluidcontrol.com

Keith Woolnough - UK Business Development – EPC / Projects

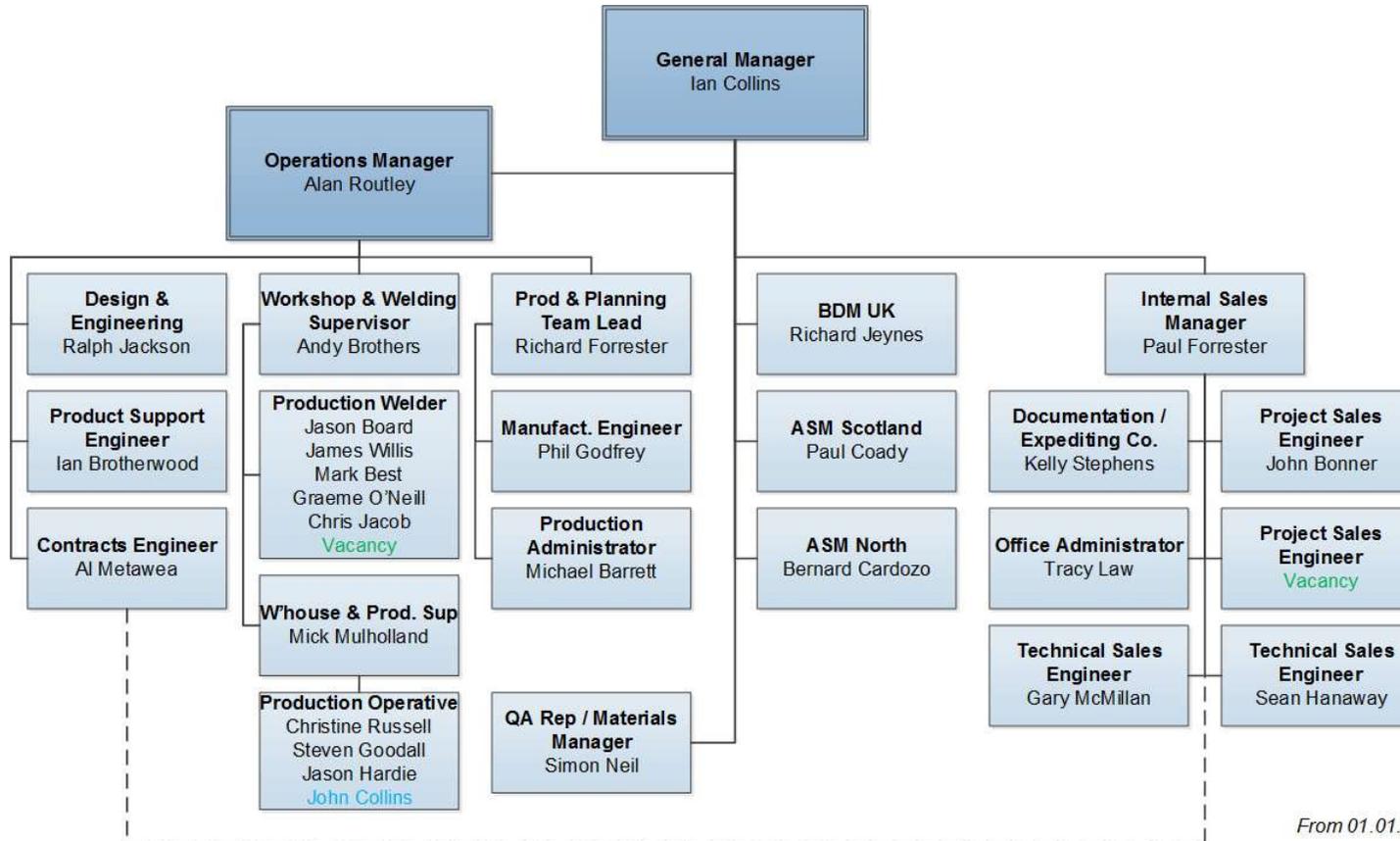
keith.woolnough@wika.com

A Quick Company Overview



- The company was originally part of the Klinger group until it was acquired by Trouvay & Cauvin in 1999.
- In 2003 the UK arm agreed a management buyout.
- In 2004 it was renamed TC Fluid Control to give focus for it to develop in the liquid level instrumentation field.
- **UK manufacturer located in Swanley, Kent**
- **2012 TC Fluid Control was acquired by WIKA Instruments**





Key Partnerships



Endress+Hauser
People for Process Automation



Liquid Level Measurement Techniques

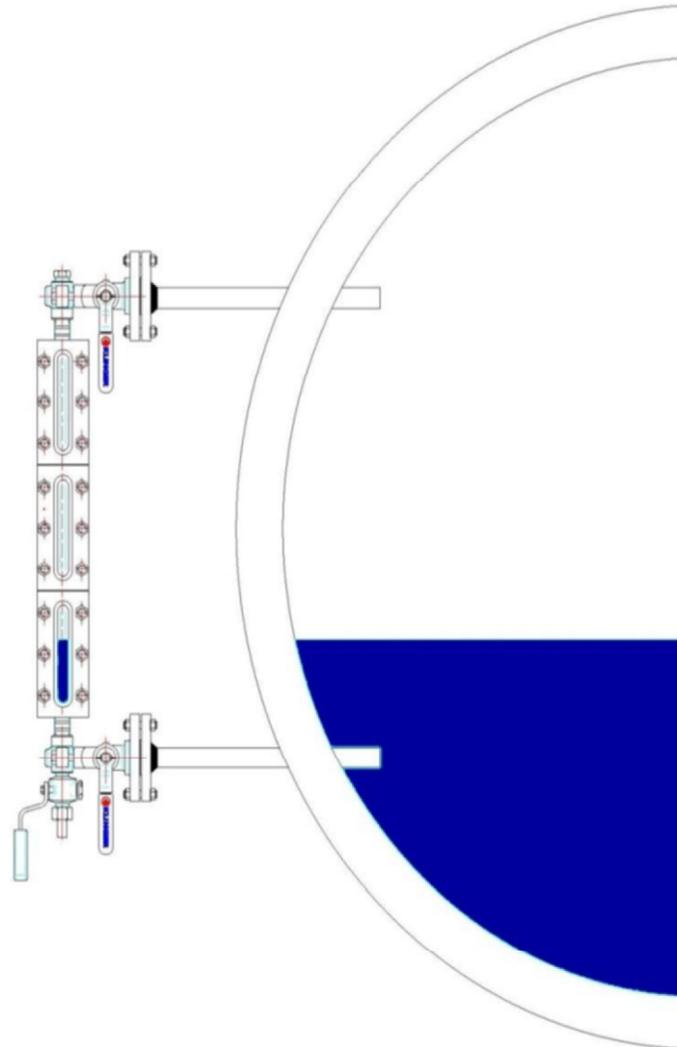


Level Gauges Glass

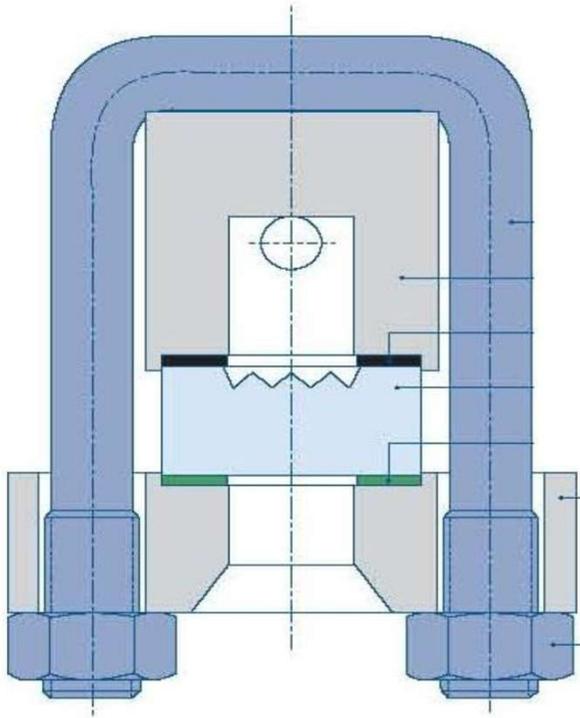


Glass Level Gauges

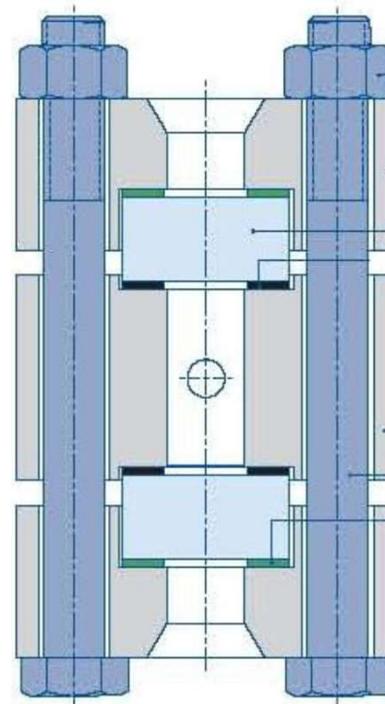
“Everywhere liquid levels have to be directly read and defined”

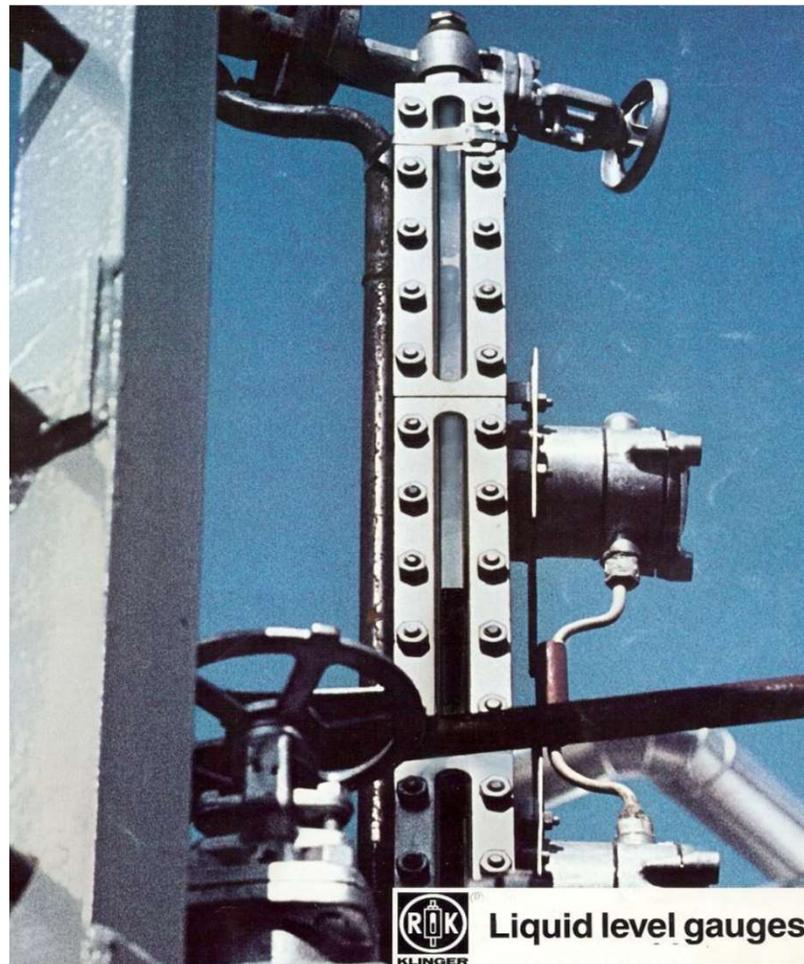


Reflex



Transparent

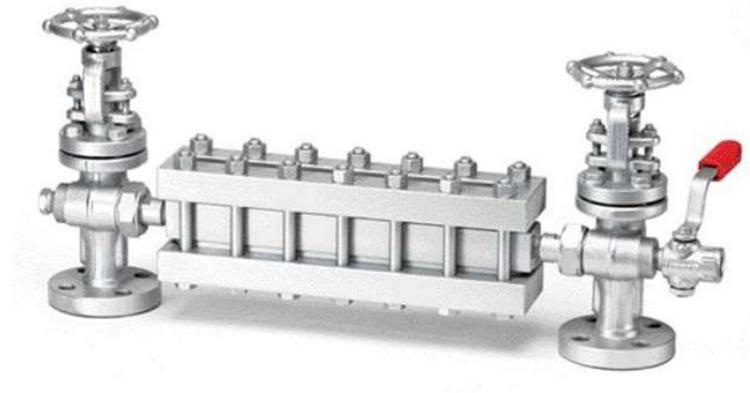




Key Advantages - Glass Gauges



- Industry standard & well respected **est. 1888**
- Direct view of the Liquid Level
- Suitable for steam applications
- No electronic signal required
- **Glass Gauges are a regulatory requirement on most steam boilers**
 - (must have at least one installed)



Liquid Level Measurement Techniques



Level Gauges Magnetic



Typical Glass Gauges



Magnetic Level Gauge vs Glass Gauge

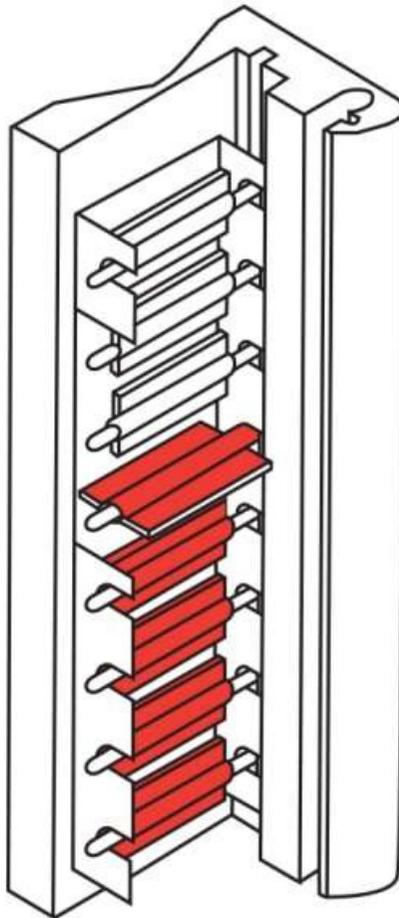


Magnetic Level Gauge

Actuated by a chamber mounted Magnetic float which provides a clear liquid level through interaction with magnetically coupled coloured wafers or rollers



The Display Unit



- Aluminium display housing & St/Steel for corrosive environments-certified IP65
- The display is capable of accommodating media surges up to 400mm per second

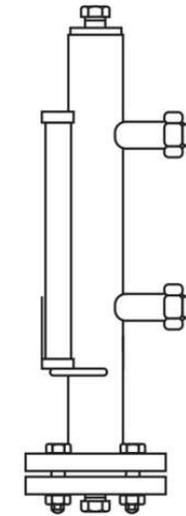
Specific Gravity is Important!



Water
SG: 1.0



Hydrocarbon
SG: 0.38



'U' Dimension

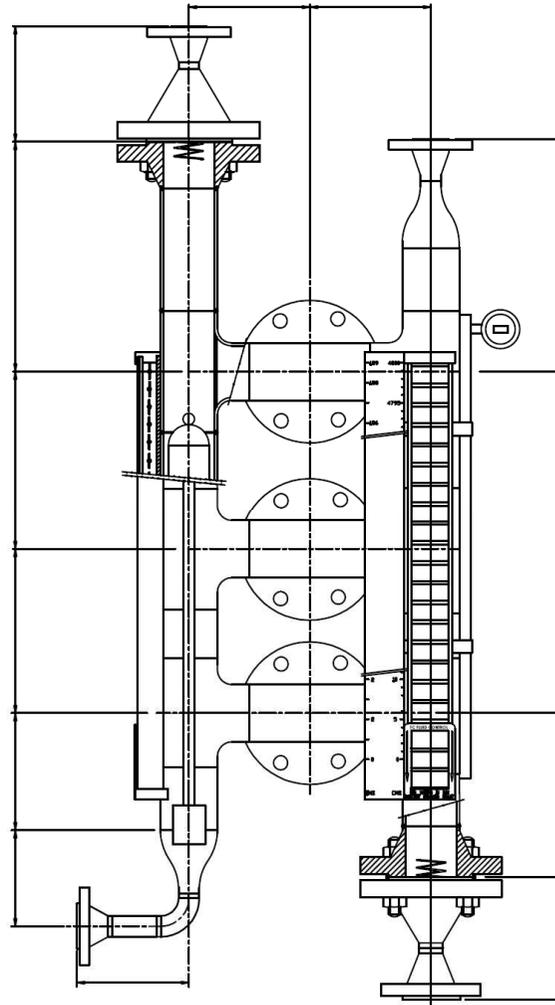
Key Advantages - Magnetic Level Gauge



- Provide a clear level contrast up to **60m**
- **Switches** can be fitted for **high/low** level alarms
- **Transmitters** can be fitted for **4-20mA**
- **Liquid interface** applications
- **Chamber compliant to PED**
- **ATEX Certified**



Magnetic Level Indicators – Custom Configurations

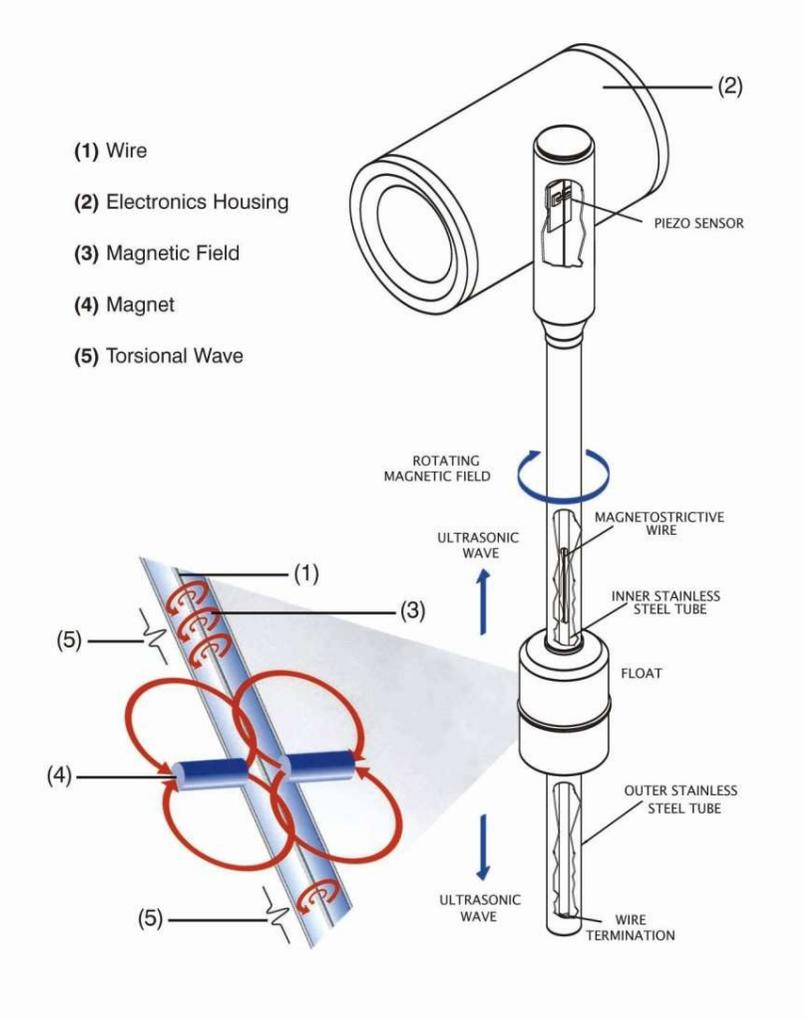
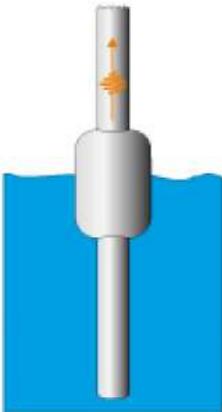




Magnetostrictive Transmitters



Magnetostrictive Transmitter



Key Advantages - Magnetostrictive Transmitter

- 4-20mA + HART communication
- Exia & Exd approvals (IEC Ex)
- Continuous & high accuracy measurement
 - Resolution & repeatability **0.8mm**
- **Can be retrofitted to a magnetic level gauge**



Liquid Level Measurement Techniques



Combined Gauge and GWR Transmitter



Guided Wave Radar



LevelSure

- **Combined Magnetic Level Indicator & Guided Wave Radar** measuring system



Key Advantages - LevelSure



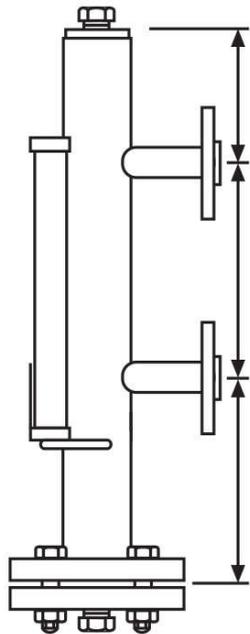
- LevelSure combines the operation of a magnetic level gauge with a GWR Transmitter in **one** assembly
- Providing independent “**Redundant**” level indication from one set of vessel connections.
- **Bespoke** applications & assemblies
- Ideal for both **Interface & bulk** level indication.
- Supplied as complete package with pre-testing of transmitter, false echo suppression & range parameters set.



Level Chambers & Bridle Assemblies

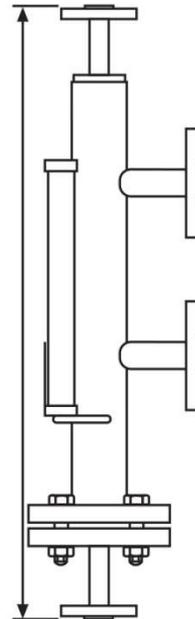


Chamber Design Options



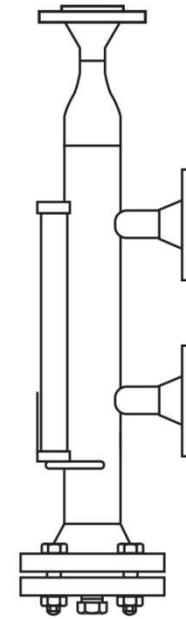
Standard Arrangement Side/Back Connected

Standard Construction Side or Back connections to process. Vent and Drain Plugged.



Flanged Vent and Drain

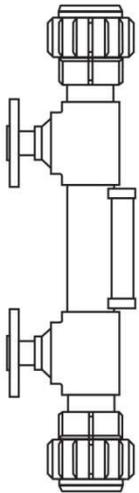
Vent and Drain flanged. Flanges can be Slip-On or Weld Neck type.



All Butt Welded

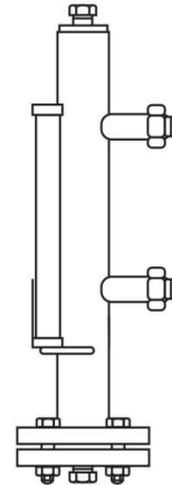
Standard Construction Side or Back Vent and Drain Plugged Flanges are Weld Neck type for all Butt Welded construction. Note – the side branch to chamber weld is not a full penetration butt weld. Please advise if full penetration weld is required.

Chamber Design Options



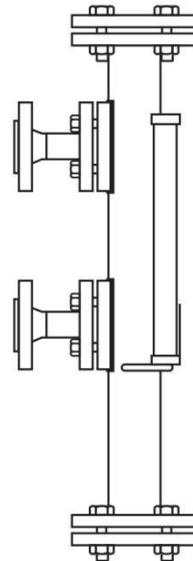
PVDF, PP, uPVC Magnetic Gauge

Plastic Construction
Side or Back
connections to
process. These
gauges are used for
highly corrosive duties
i.e. acids/alkalines or
if the vessel is plastic
as the gauge will
'move' with the vessel
due to expansion and
contraction in changing
temperatures.



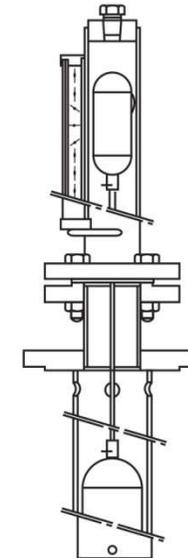
Screwed Side/Back via Union Connections

Process Connections
are screwed via
unions for easy gauge
removal, or can be
supplied with plain
threaded ends in BSP
or NPT.



PVDF/PFA Lined Gauge

Plastic Lined
Construction Side
or Back connections
to process. These
are used for highly
corrosive duties
i.e. acids/alkalines
where the pressure
is too great for all
plastics gauges,
or if the vessel is
made from metals
(or lined tanks).



Top Mounted Gauge

Top mounted
gauge to process.
For underground
tanks that need
visual indication.
The gauge can
also transmit
signals or point
alarms.

Liquid Level Measurement Techniques



Application Examples



LevelSure for EDF Hydraulic Power Plant



Before



After

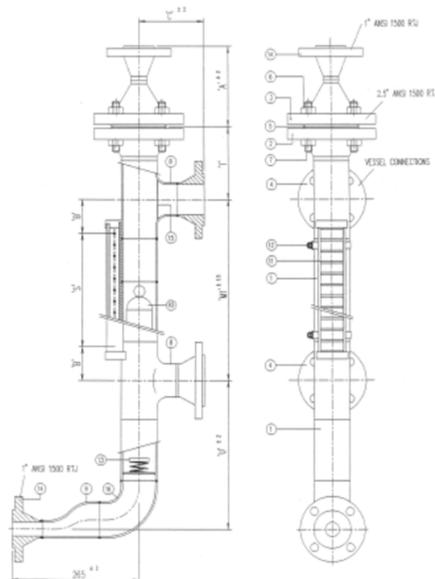
Application

Diesel Dye tanks



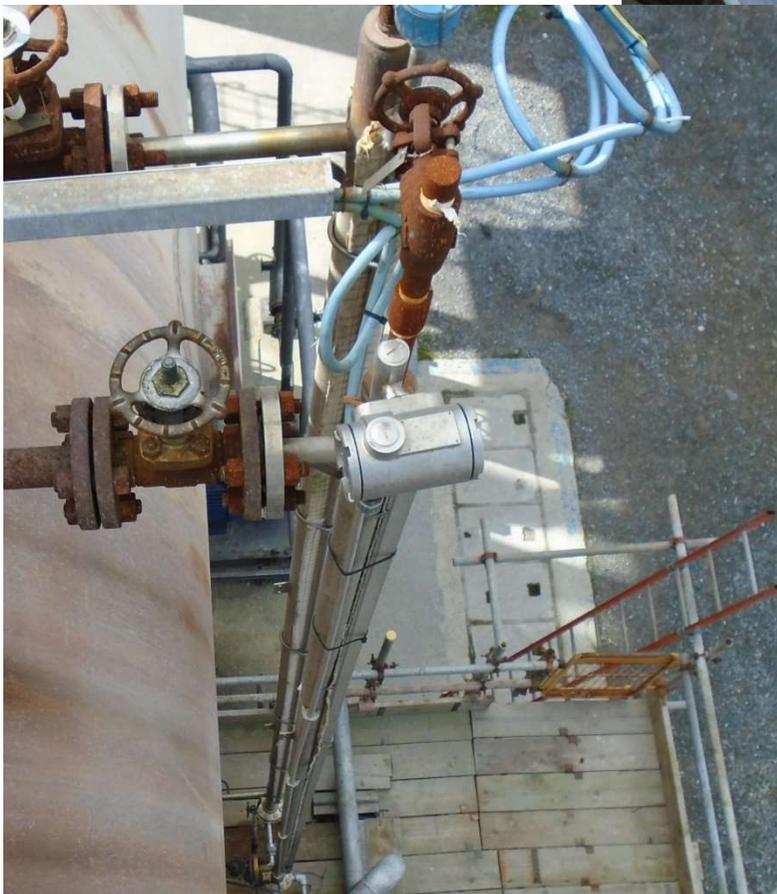
SD2 Compressor Lubrication Package

- Vessel height lowered by client, space for gauge limited
- Client faced with having to design a sump in their skid to accommodate drain
- Proposed design for removing float from top and welding on elbow for drain valve to minimise height required



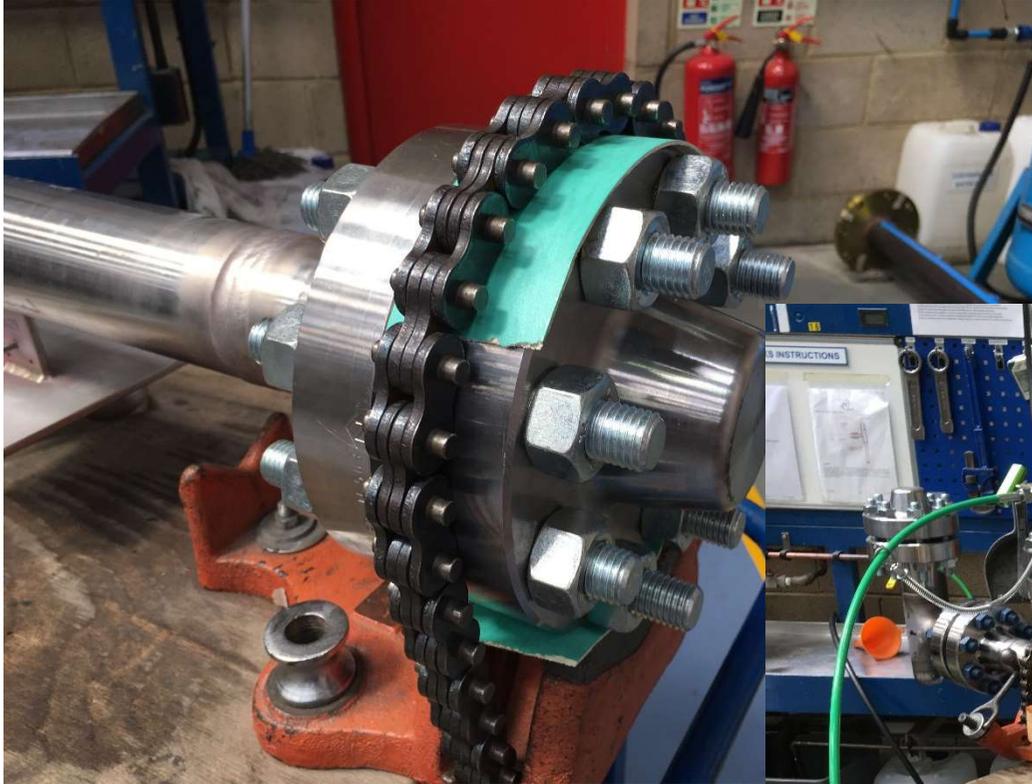
Application

FCCU Flare Drum



Application

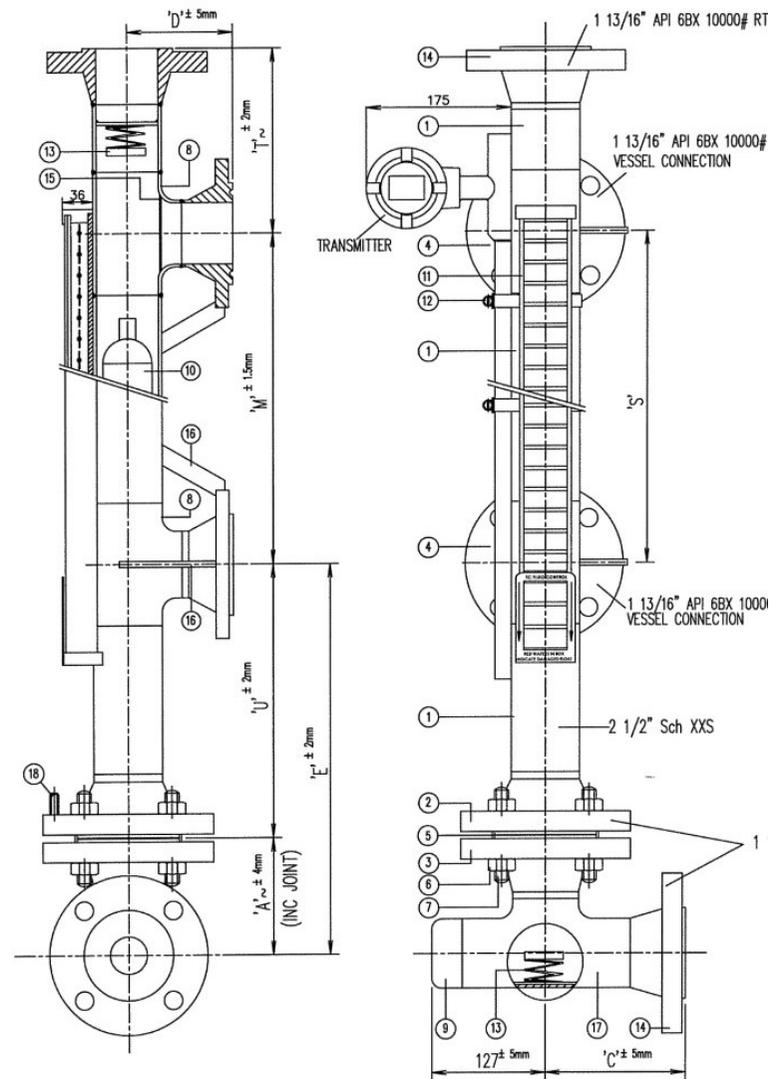
TCO High Pressure Chamber – 721 Barg



Tested at 721 barg and passed with flying colours, contains a vented float to allow it to function and is the highest rated unit we have ever manufactured. Our PED has been increased to accommodate this design.

Application

TCO Magnetic Level Gauge



Application

Cygnus Project

FRONT VIEW
 Dimensions: 424 (FLEX 86), 211 ± 2mm, 253 ± 2mm, 171 ± 2mm, 137 ± 15mm, 107 ± 2mm, 87, 326 ± 2mm, 255 ± 2mm, 95, 25, 27, 7, 235, 356, 21, 10, 9, 20, 19, 18, 16, 17, 12, 15, 11, 24, 8, 4, 25, 2, 5, 3, 9, 10.

TOP VIEW
 Dimensions: 270° DEGREES, 90° DEGREES, 180° DEGREES, 270° DEGREES.

NOTES:
 1) DESIGN COMPLIANT WITH PED 97/23/EC
 2) CHAMBERS DESIGNED TO ASME B31.3
 3) GAUGE SUITABLE FOR ATEX CAT.2 APPLICATION (ZONE 1)
 4) CUSHIONED SPRING FITTED AT TOP & BOTTOM OF CHAMBER. (BOTTOM SPRING NOT SHOWN TO BE FITTED TO ITEM 3.)
 5) ALL WELDING BY A CODED WELDER TO ASME IX
 6) ALL BUTT WELDS TO BE X-RAYED
 7) ALL WELDS TO BE DYE PEN TESTED
 8) POSITION OF LOCAL INDICATOR IS FIXED DUE TO THE INTERNAL GUIDE TUBE - SEE TOP VIEW,
 9) INSTRUMENT FLANGE TO BE FITTED WITH A VEGA GUIDED WAVE RADAR UNIT. TO BE SUPPLIED, FITTED & RANGED BY WIKA INSTRUMENTS LTD. INSTRUMENT TO BE RANGED 4-20mA OVER GAUGE CENTRES 'M'. INSTRUMENT TO BE FITTED WITH WIRED ON ST-STL TAG PLATE. RADAR PROBE LENGTH 1538mm. RADAR PROBE DIAMETER 16mm.
 10) ST-STL LOCATING DOWEL FITTED TO BOTTOM CHAMBER FLANGE TO ENSURE BOTTOM SPRING IS CORRECTLY LOCATED.
 11) ALL MATERIALS TO BE OF EUROPEAN ORIGIN FROM NORSOK M-650 APPROVED SUPPLIER
 DUPLX MATERIALS CERTIFICATION TO EN10204-3.2
 6MO MATERIALS CERTIFICATION TO EN10204-3.1
 12) ALL 6MO & DUPLX PRESSURE RETAINING PARTS TO BE PMI TESTED (INCLUDING WELDS).
 13) ALL WETTED PRESSURE RETAINING MATERIALS TO NACE MR-01-75 / ISO 15156.
 14) FLOAT GUIDE TUBE TO HAVE HOLES DRILLED ALONG LENGTH TO ALLOW FLOW OF MEDIA.
 15) GAUGE & RADAR TO BE FITTED WITH INDIVIDUAL WIRED ON ST-STL TAG PLATES.
 16) GAUGE & INDICATOR TO BE PAINTED TO TC-GA-PA - CONDUCTIVE PAINT FOR ATEX ENVIRONMENT REVISION A BOLTING & INSTRUMENT FLANGE TO BE UNPAINTED.
 17) FLANGES AS PER ASME B16.5
 18) INDICATOR FITTED WITH RED/WHITE WAFERS. RED INDICATES FLUID LEVEL. WAFER PITCH TO BE 13mm.

ACCESSORIES
 S - INDICATOR FITTED WITH ST-STL SCALE GRADUATED 0-100% OVER TUBE TO HAVE HOLES DRILLED ALONG LENGTH TO ALLOW FLOW OF MEDIA. SCALE TO HAVE INTERMEDIATE SUPPORT.

TABLES:

No. OFF	VESSEL No.	TAG No.s GAUGE / RADAR	M C-C	S.G. (Kg/m3)	SIGHT 'S'	DIM 'C1'	DIM 'C2'	DIM 'U'	DIM 'T'	ACCES-SORIES	VESSEL CONNS.	VENT CONN.	DRAIN CONN.	RADAR CONN.
1	020-V004	020-LG-022 / 020-LT-023	830	717.6/995.3 (TOP LEVEL)	830	226	226	521	316	S	2"ANSI 2500 RTJ	3/4"ANSI 2500 RTJ	2"ANSI 2500 RTJ	2"ANSI 2500 RTJ

TC TO FLUID CONTROL
 BRANLEY, KENT
 80M STEINGRAM
 Tel: 44(0)1522 42400

CHAMBER MATL: 6MO / F51
PS: _____ bar
PT: _____ bar
S.G.: _____
TS: _____ °C
FLOAT MATL: _____
FLOAT TESTED: _____ bar
SERIAL No./YEAR: _____
JOB No.: 0210010
TAG No.: _____

Supplier Drawing Decal: amec®

Supplier Drawing Decal Table:

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Application

**Oil & Gas
Gorgon LNG Plant**

Separator Skid – Mercury Process



Customer:

KBR – London Office

<http://www.kbruk.co.uk/>

SIC 8711/NACE 71.12

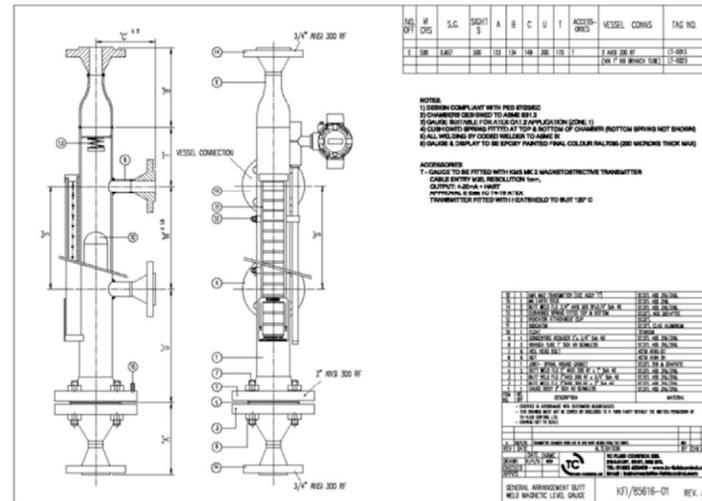
Product / Solution:

Combined Magnetic Level Gauge &
Emerson Guided Wave Radar – 316ss

Solution to measure the level of Mercury
within a separator system.

Facilities

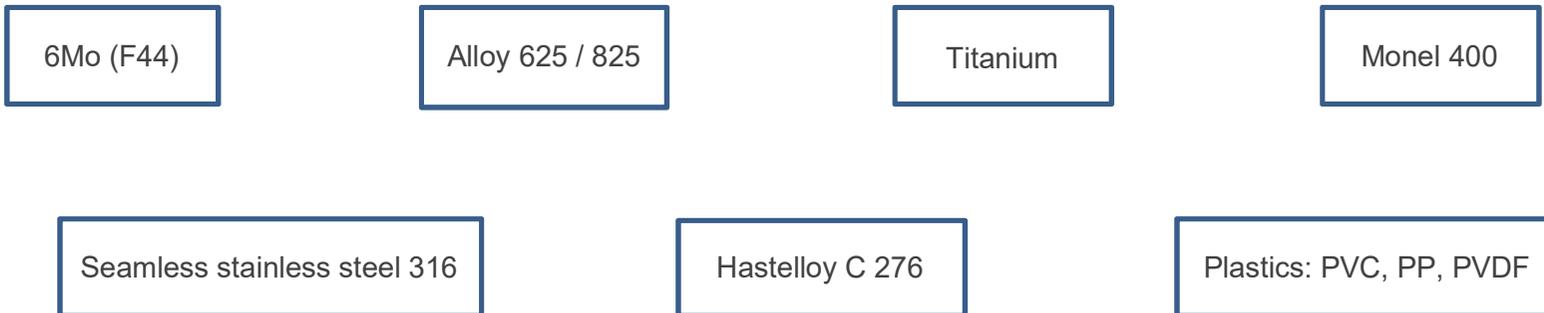
- Design & Drawing
- Welding – ASME IX
- Float Manufacture
- Transmitter Manufacture
- Mechanical Assembly
- Testing
- Documentation
- Shipping / Logistics



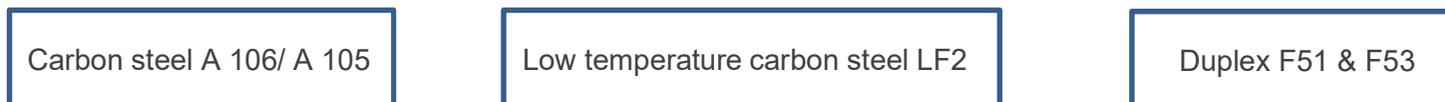
Materials of construction



Magnetic Level Gauges & Instrument Chambers



Instrument Chambers Only



Welder Approvals – ASME I



6Mo (F44)

Alloy 625 / 825

Titanium

Monel 400

Seamless stainless steel 316

Hastelloy C 276

Duplex (F51/F53) to 6Mo (F44)

Carbon steel A 106/ A 105

Low temperature carbon steel LF2

Duplex F51 & F53

Carbon steel to stainless steel

- Construction – Seam welded or seamless pipe



Non destructive testing

- Dye Penetrant Testing – In/Ext
- Positive Material Testing – In/Ext
- Radiograph of welds
- Hardness Testing
- Pickling / Passivation – In/Ext
- Offshore paint finishes
- Post Weld Heat Treatment – In/Ext



Approvals



- ISO 9001 – 2008
- SGS BASEEFA ATEX & IEC Ex QAN for Hazardous area manufacture – Exd & Exia certified.
- P.E.D. – ASME B31.3 & B31.1 (ANSI 2500 DN200 - 8")
- FPAL – Achilles registered (Offshore UK) – Registered ID: 10040485
- JQS Achilles registered (Offshore Norway) – Registered ID: 26586



Unique breadth and depth of product



Electronic pressure measurement



Mechatronic pressure measurement



Mechanical pressure measurement



Diaphragm seals



Electrical temperature measurement



Mechatronic temperature measurement



Mechanical temperature measurement



Thermowells



Level measurement



Flow measurement



Calibration technology



Accessories

Thank You!

A strong Group for your success.

