

7500 Series Radar Tank Gauges

Continuous and non-contact precision level measurement for custody transfer and inventory control applications with NMI and PTB approvals.



FuelsManager®
Compatibility

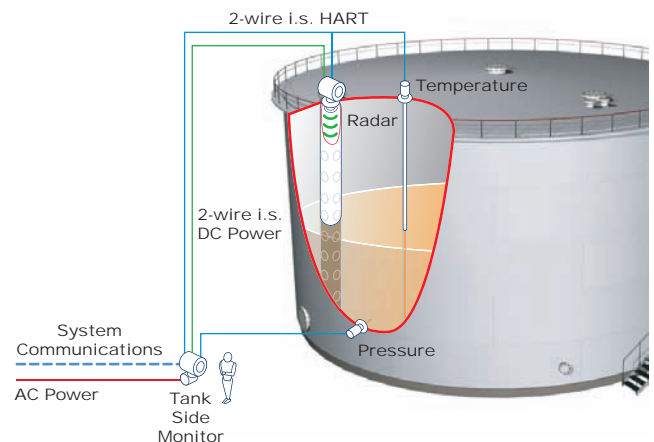


Benefits

- 0.5 mm accuracy (2σ value)
- National approvals (NMI, PTB) for custody transfer.
- Applicable as stand-alone system or tied into tank gauging systems via the 4590 Tank Side Monitor.
- Easy on-site operation via menu-driven alphanumeric display.
- Easy commissioning, documentation and diagnostics via operating software (ToF Tool).
- Application-specific antenna selection. Planar antenna versions allow direct installation on tapered stilling wells.
- Cost-effective and simple installation via 4-wire cable with HART and 24 V DC intrinsically safe power supply.
- Gas-tight process connection (second line of defense) standard for any antenna version.
- Inventory control version with reduced accuracy (3 mm) available for all instrument types.

Application

The 7500 Series Radar Tank Gauges are used for highly accurate level measurement in storage tanks and can be applied in custody transfer applications. It meets the relevant requirements according to OIML R85 and API 3.1B.



Function and System Design

Measuring Principle

The Radar Tank Gauge is a "downward-looking" measuring system, operating based on the time-of-flight method. It measures the distance from the reference point (process connection) to the product surface. Radar impulses are emitted by an antenna, reflected off the product surface and received again by the radar system.

Antenna Selection

It is essential for each and every application and installation to evaluate the right antenna type. The antenna selection depends on the following criteria:

- Type of application (i.e. free space vs. stilling well)
- Installation possibilities (size, location and height of nozzle)
- Properties of the product stored in the tank (radar reflectivity, vapor pressure, temperature, etc.)
- Accuracy requirements

The 7500 Series Radar Tank Gauge series radar comes with 4 basic radar antenna forms.

Horn antenna

The 7530 RTG with horn antenna is suitable for free space applications that disallow the use of a parabolic antenna due to tank/nozzle geometry. It is essential that the horn extends below the nozzle. The general rule for diameter selection is "the larger, the better," as a larger aperture of the antenna generates a narrower beam and has a better gain – signal to noise (S/N) ratio.



Rod antenna

The 7531 RTG with rod antenna is used for highly accurate measurements where only small diameter nozzles are available and tanks containing condensing products (or heavy water condensation) or corrosive products, such as sulphur, as the rod is easy to clean and has good "drip-off" properties. The "inactive" length of the antenna should extend below the nozzle.



Planar antenna (for stilling well)

The 7532 RTG with planar antenna is specifically suited for stilling well applications with ranges up to 38 m (124 ft). The emitted circular mode radar pattern is a must for high accuracy applications on stilling wells. This special mode allows the software to compensate for variations of the inside diameter of the stilling well and layering of



adhering product. The diameter of the antenna itself fits in 6" (DN150) stilling wells directly. Cone adapters allow installation on larger diameter stilling wells. A good match between well and adapter is essential. The Varec planar antenna with pulsed radar technology allows direct installation even on tapered stilling wells – a unique feature.

Parabolic antenna

The 7533 RTG with parabolic antenna is excellently suited for free space applications up to 40 m (131 ft). The parabolic antenna is the largest free space antenna with the smallest beam angle. It is ideal for applications close to tank walls, where a manway cover is available. The parabolic antenna is also an excellent choice on products with a low reflectivity, such as asphalts and bitumens.



Tank Gauging System

The Varec 4590 Tank Side Monitor provides integrated communications for sites with multiple tanks, each with one or more sensors on the tank, such as radar, spot or average temperature, capacitive probe for water detection and/or pressure sensors. Multiple protocols out of the Tank Side Monitor guarantee connectivity to nearly any of the existing industry standard tank gauging protocols. Optional connectivity of analog 4...20 mA sensors, digital I/O and analog output simplify full tank sensor integration. Use of the proven concept of the intrinsically safe HART bus (HART multidrop) for all on-tank sensors yields extremely low wiring costs, while at the same time providing maximum safety, reliability and data availability.



High Accuracy

The mm-accuracy of the 7500 Series Radar Tank Gauge is achieved using the patented algorithms of the Microprocessor's PhaseMaster® software.

Custody Transfer Applications

The 7500 Series Radar Tank Gauge is suitable for custody transfer and inventory control applications. The on-site testing has to be done in compliance with the applicable regulatory standards. The 7500 Series Radar Tank Gauge can be sealed after successful on-site calibration to be protected against any access to the electronics compartment and any changes of software settings. If the 7500 Series Radar Tank Gauge is used for custody transfer or inventory control, any temperature influence on the tank shell height can be compensated for using the Tank Side Monitor (TSM). In addition, the vertical movement of the gauge reference

point due to the hydrostatic tank deformation can be compensated in the Tank Side Monitor. A Tank Side Monitor can provide 24 VDC for a 7500 Series Radar Tank Gauge. The Tank Side Monitor can communicate with up to 6 devices via HART Multidrop.

Reference Operating Conditions

According to OIML R85:

- Temperature = $-25\text{ }^{\circ}\text{C} \dots +55\text{ }^{\circ}\text{C}$ ($-13 \dots +131\text{ }^{\circ}\text{F}$)
- Atmospheric pressure
- Relative humidity (air) = $65\% \pm 15\%$
- Medium properties: e.g. medium with good reflectivity and calm surface.
- Tank diameter: signal beam hits the tank wall only at one side.
- No major interference reflections inside the signal beam.

Proof of Accuracy of Custody Transfer Versions

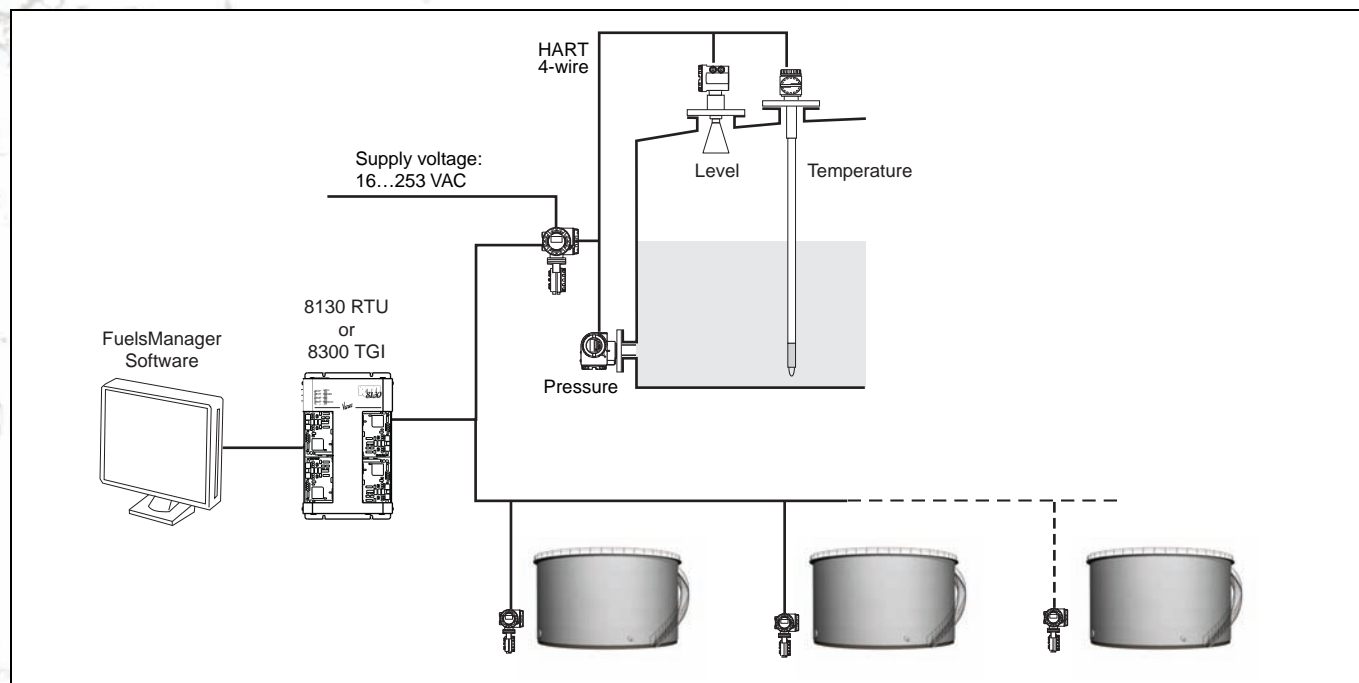
The accuracy of each 7500 Series Radar Tank Gauge is established through a calibration certificate that records the absolute and relative error at 10 equidistant points during the final test. A Laser Interferometer (Jenaer Messtechnik ZLM 500) with an absolute accuracy of 0.1 mm is used as a reference for the free space measurements with 7530 RTG, 7531 RTG and 7533 RTG.

For stilling well measurements with 7532 RTG, a NMI / PTB calibrated tape with an absolute accuracy of 0.25 mm is used. Each 7500 Series Radar Tank Gauge is delivered with the PTB and NMI type approval. Additional initial factory verifications for custody applications are available on demand for radar instrument 7500 Series Radar Tank Gauge.

Inventory Control Versions

All device types can be delivered as "Inventory Control Versions" with a reduced accuracy of $\pm 3\text{ mm}$ (under reference conditions).

To these versions, the calibration certificate or custody transfer type approval is NOT attached. The "Inventory Control Versions" can be selected by choosing the option »R« in the order code section »Custody transfer approvals«



Example System Diagram

Installation Guidelines

Configuration

The Radar Tank Gauge is commissioned by entering an empty distance E (=zero) and a full distance F (=span) that correspond with 4mA and 20mA current output.

A linearization table (max. 32 points) which can be configured locally or remotely provides engineering units and a linear output signal for spheres, horizontal cylindrical tanks and vessels with conical outlet.

On-site operation and configuration is performed using:

- The built in display and operating module VU331
- A Personal Computer, service adaptor (FXA193) and "ToF Tool – FieldTool Package" operating software.

Remote operation and configuration can be performed using:

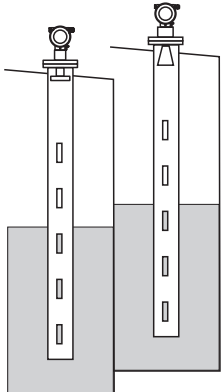
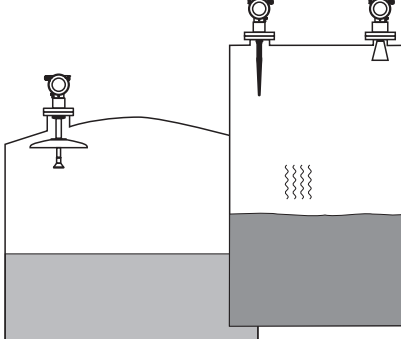
- A Personal Computer, service adaptor (FXA195) and "ToF Tool – FieldTool Package" operating software.
- A Personal Computer, TSM (Tank Side Monitor) and the operating software FuelsManager.

Measuring Range

The usable measuring range depends on the size of the antenna, the reflectivity of the medium, the mounting location, and eventual interference reflections.

The following tables describe the groups of media as well as the achievable measuring range as a function of application and media group. If the dielectric constant of a medium is unknown, it is recommended to assume media group B to ensure a reliable measurement.

Media group	DC (ϵ_r)	Examples
A	1.4... 1.9	non-conducting liquids, e.g. liquefied gas (LPG). For more information please contact your Varec representative.
B	1.9... 4	non-conducting liquids, e.g. benzene, oil, toluene, white products, black products, crudes, bitumen/asphalts, ...
C	4...10	e.g. concentrated acids, organic solvents, esters, aniline, alcohol, acetone, ...
D	> 10	conducting liquids, e.g. aqueous solutions, dilute acids and alkalis

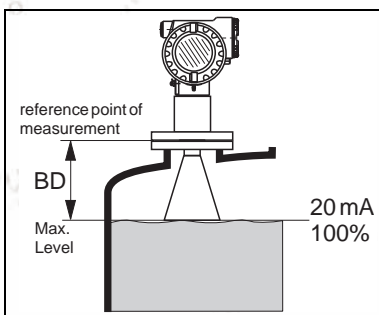
Measuring range depending on vessel type, conditions, and product for Micropilot S					
Media group		Stilling well/ Bypass	Free space (Storage tank)		
					
		Measuring range	Measuring range		
		7532 RTG ≥ DN150	7533 RTG	7530 RTG DN150/200/250	7531 RTG
A	DC (εr) = 1.4...1.9	38 m/124 ft	—	—	—
B	DC (εr) = 1.9...4	38 m/124 ft	40 m/131 ft	DN150: 10 m/33 ft DN200/250: 15/49 ft m	10 m/33 ft
C	DC (εr) = 4...10	38 m/124 ft	40 m/131 ft	DN150: 15 m/49 ft DN200/250: 20 m/65 ft	15 m/49 ft
D	DC (εr) > 10	38 m/124 ft	40 m/131 ft	DN150: 20 m/65 ft DN200/250: 25 m/82 ft	20 m/65 ft
max. measuring range with custody transfer approvals		NMi: 20 m/65 ft PTB: 30 m/98 ft	NMi: 25 m/82 ft PTB: 30 m/98 ft	NMi and PTB: DN150: 20 m/82 ft DN200/250: 25 m/82 ft	NMi and PTB: 10 m/33 ft

Blocking distance

The blocking distance (= BD) is the minimum distance from the reference point of the measurement (mounting flange) to the medium surface at maximum level.

Note! If an antenna extension is used, its length has to be added.

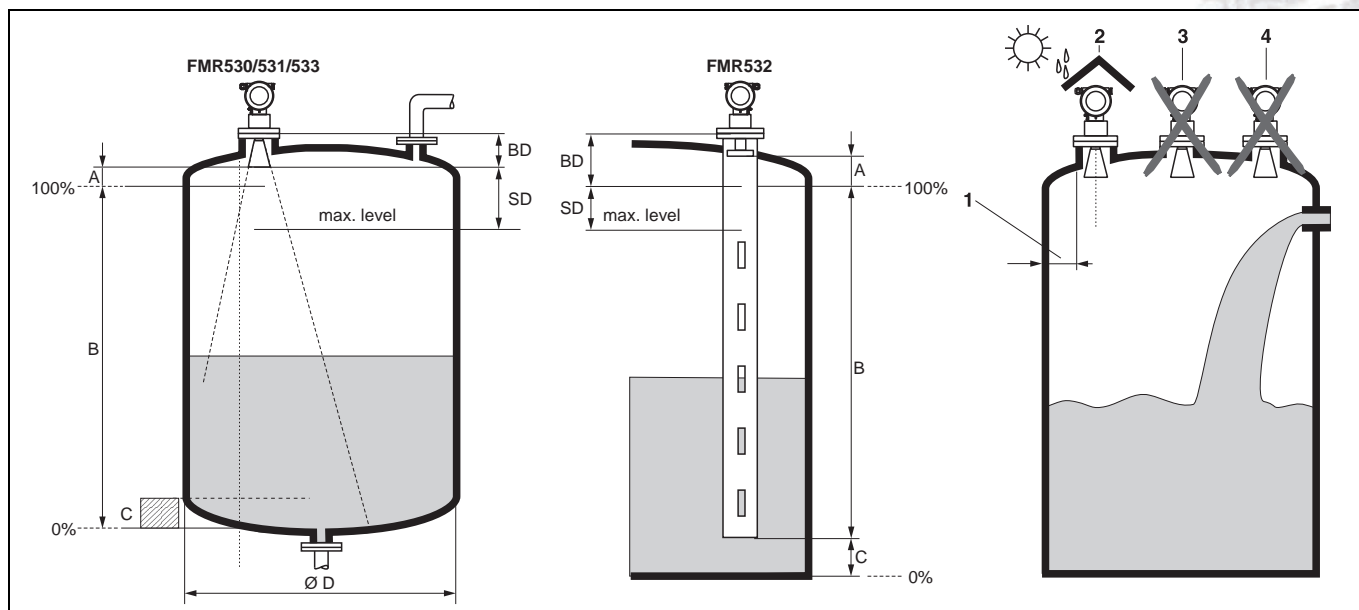
Note! Inside the blocking distance of 7532 RTG/7533 RTG, a reliable measurement can not be guaranteed.



Blocking distance (BD)	Stilling well / Bypass	Free space (Storage tank)		
	7532 RTG	7533 RTG	7530 RTG	7531 RTG
from flange	1 m/40"	1 m/40"	Length of horn (see Page 28)	390 mm/15" 540 mm/21"

Measuring Conditions

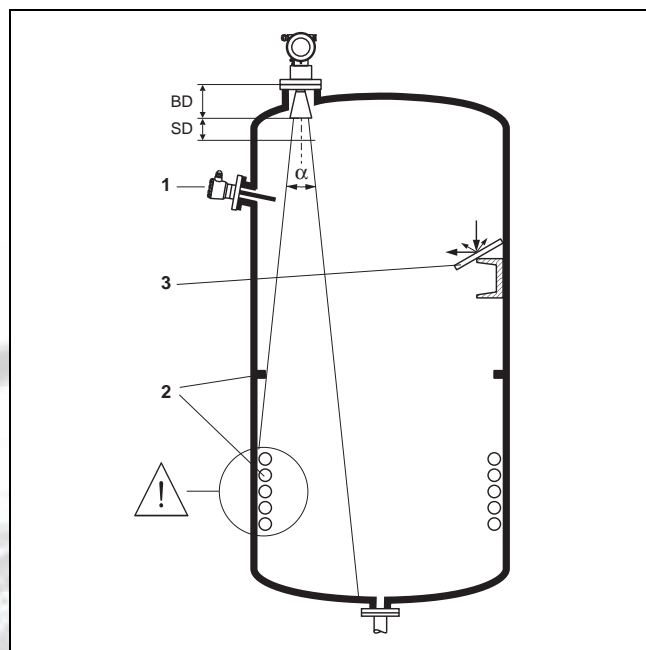
- The measuring range begins where the beam hits the tank bottom. Particularly with dish bottoms or conical outlets the level cannot be detected below this point.
- For **overspill protection**, it is possible to define a safety distance (**SD**) additionally to the blocking distance (**BD**).
- Depending on its consistence, foam can either absorb microwaves or reflect them off the foam surface. Measurement is possible under certain conditions.
- Distance **B** defined the smallest recommended measurement range.
- Tank diameter and height should be at least dimensioned such that a reflection of the radar signal on both sides of the tank can be ruled out.
- 7530 RTG, 7531 RTG, 7533 RTG:** In case of media with a low dielectric constant (groups A and B), the tank bottom can be visible through the medium at low levels (low height **C**). Reduced accuracy has to be expected in this range. If this is not acceptable, we recommend positioning the zero point at a distance **C** above the tank bottom in these applications.
- 7532 RTG:** The zero should be positioned at the end of the tube, as the electromagnetic waves do not propagate completely outside the tube. It must be taken into account that the accuracy may be reduced in the area C. In order to guarantee the required accuracy in these cases, it is recommended to position the zero-point at a distance **C** above the tank bottom.
- In principle it is possible to measure up to the tip of the **rod** and **horn** antenna. However, due to considerations regarding accuracy corrosion and build-up, the end of the measuring range should not be chosen any closer than 50 mm (2") to the tip of the **rod** and **horn** antenna.
- In applications with **planar** or **parabolic** antennas, especially for media with low dielectric constants, the end of the measuring range should not be closer than 1 m (40") to the flange.
- This safety distance (**SD**) is set to 0.1 m (4") by default for 7530 RTG (horn antenna) and 7531 RTG (rod antenna) and generating an alarm in case the product level rises inside the safety distance.
- For 7533 RTG (parabolic antenna) and 7532 RTG (planar antenna) the safety distance (**SD**) is set to 0.5 m (20") by default, generating an alarm in case the product level rises inside the safety distance.



Measuring Conditions & Gauge Orientation

	reference: flange / BD (cf. picture)		reference: antenna tip (cf. picture)		
	Blocking distance	Safety distance	recommended additional settings		
	BD [m / ft]	SD [m / ft]	A [mm / inch]	B [m / ft]	C [mm / inch]
7530 RTG (horn)	horn length	0.1 / 0.3	50 / 2	0.5 / 1.6	150...300 / 6...12
7531 RTG (rod)	0.39/1.3 or 0.54/1.8	0.1 / 0.3	50 / 2	0.5 / 1.6	150...300 / 6...12
7532 RTG (planar)	1 / 3.28"	0.5 / 1.6	1000 / 40	0.5 / 1.6	150...300 / 6...12
7533 RTG (parabolic)	1 / 3.28	0.5 / 1.6	1000 / 40	0.5 / 1.6	150...300 / 6...12

Note! The behaviour in case of the measuring range being exceeded can be freely set: the default setting is a current of 22 mA and the generation of a digital warning (E681).



Tank Installation

Tank Installations

The Radar Tank Gauge is equipped with functions to suppress interference echoes. The user can activate these functions. They ensure that interference echoes (i.e. from edges and weld seams) are not interpreted as level echo.

- Avoid any installations (1), like limit switches, temperature sensors, etc., inside the signal beam.
- It is essential that HiHi alarm is below the blocking distance (BD) and the safety distance (SD).
- Symmetrical installations (2), e.g. vacuum rings, heating coils, baffles, etc., can also interfere with the measurement.

Gauge orientation

- Recommended distance (1) wall – **outer edge** of nozzle:: $\sim 1/6$ of tank diameter.
- Not in the centre (3), interference can cause signal loss.
- Not above the fill stream (4).
- It is recommended to use a weather protection cover (2) in order to protect the transmitter from direct sun or rain. Assembly and disassembly is simply done by means of a tension clamp.

Optimisation options

- Antenna size: the bigger the antenna, the smaller the beam angle, the less interference echoes.
- Mapping: the measurement can be optimized by means of electronic suppression of interference echoes.

- Antenna alignment.
- Stilling well: a stilling well can always be used to avoid interference. The 7532 RTG with planar antenna is recommended for stilling wells with a diameter DN150 (6") and larger.
- Metallic screens (3) mounted at a slope spread the radar signals and can, therefore, reduce interference echoes.

Please contact Varec for further information.

Note! The 7500 Series Radar Tank Gauge 7532 RTG is designed for level measurement in **stilling wells** only!

Caution! Make sure that **only one tank wall (not two tank walls)** is directly hit by the radar beam!

Mounting in manway

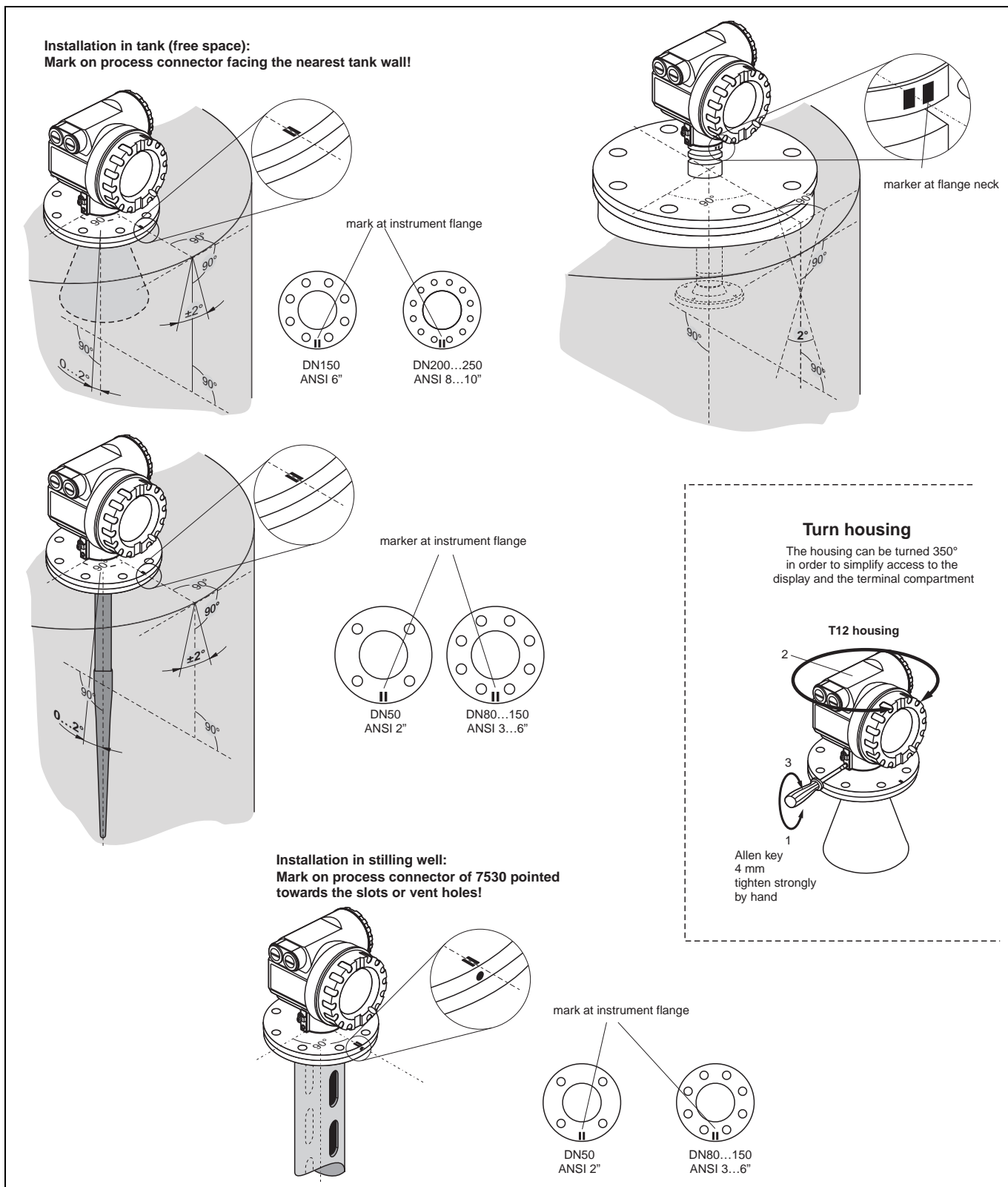
The parabolic antenna can be mounted on a manway cover. The manway cover must have an opening with a diameter D1 or D2 for mounting of the antenna. It has to be possible to remove the cover in order to mount the antenna. Please consider the maximum height of the nozzle ($H_{max} = 200 \text{ mm}/8"$) for the diameter of the basis.

Mounting in a stilling well

- The stilling well should be constructed from metal (no enamel coating, plastic on request) with a constant diameter.
- When using a 7532 RTG, an increase of the pipe diameter from DN150 to DN200 / DN200 to DN250 / DN250 to DN300 is acceptable. A larger step-width for the increase of the pipe diameter (e.g. DN150 to DN300) is possible if the upper part of the pipe has a suitable length. The length of the stilling well enlargement must be kept. In this case, the upper end of the pipe must have a minimum length of 0.5 m (20") before the diameter increases. If the length is less than L, please contact Varec in order to determine a suitable antenna adapter (separable antenna horn). Ideally, a sample hatch is used.
- Any rectangular increase of the pipe diameter has to be avoided.
- Welding seam as smooth as possible and on the same axis as the slots.
- Slots offset 180° (not 90°).
- Slot width respectively diameter of holes max. 1/10 of pipe diameter, de-burred. Length and number do not have any influence on the measurement.
- Maximum gap allowed between the antenna/horn and the inside of the stilling well is 5 mm (3/16").
- At any transition (e.g. when using a ball valve or mending pipe segments), no gap may be created exceeding 1 mm (0.04").
- The stilling well must be smooth on the inside (average roughness $R_z \leq 6.3 \mu\text{m}$). Use extruded or parallel welded stainless steel pipe. An extension of the pipe is possible with welded flanges or pipe sleeves. Flange and pipe have to be properly aligned at the inside.

- Do not weld through the pipe wall. The inside of the stilling well must remain smooth. In case of unintentional welding through the pipe, the weld seam and any unevenness on the inside need to be carefully removed and smoothed. Otherwise, strong interference echoes will be generated and material build-up will be promoted.

Note! Please refer to the specific instrument's Installation & Operation Manual for complete installation instructions

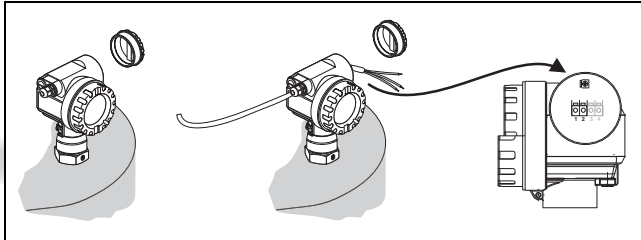


Example Installations

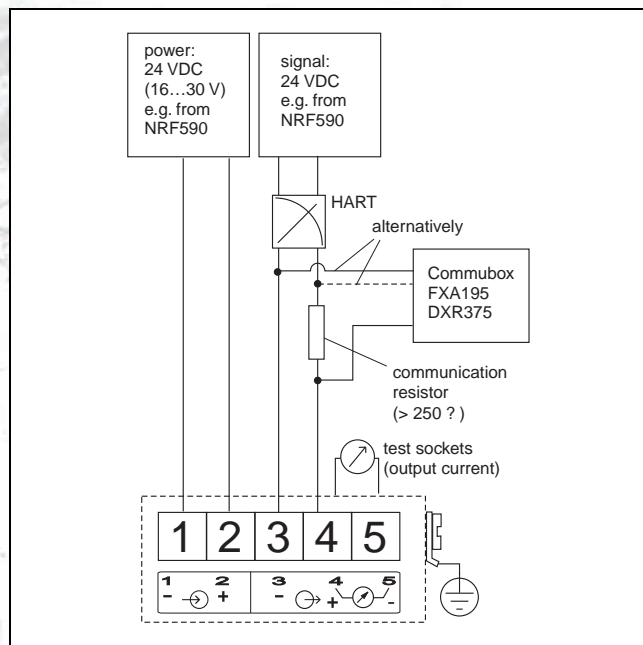
Inputs and Outputs

Terminal Assignment

The 4-wire cable is connected to the screw terminals (wire diameter 0.5...2.5 mm) in the terminal compartment. Use 4-wire twisted pair cable with screen for the connection. Protective circuitry against reverse polarity, RFI, and over-voltage peaks is built into the device.



Accessing the terminal compartment



Terminal Connections

Note! Minimum load for HART communication: 250 Ω

Note! Refer to the 4590 TSM technical information for connection to the 4590 TSM.

Input Power

The 7500 Series Radar Tank Gauges operate on a DC voltage 16–36 VDC power source.

Communication	Terminal voltage	min.	max.
Power supply Standard	U (20 mA) =	16 V	36 V
Power supply Ex	U (20 mA) =	16 V	30 V
Signal Ex	U (4 mA) =	11.5 V	30 V
	U (20 mA) =	11.5 V	30 V

Overvoltage Protector

The 7500 Series Radar Tank Gauge is equipped with an internal overvoltage protector (600 Vrms surge arrester) according to DIN EN 60079-14 or IEC 60060-1 (impulse current test 8/20 μ s, $\hat{I} = 10$ kA, 10 pulses). Additionally, the instrument is protected by a galvanic insulation of 500 Vrms between the power supply and the (HART) current output. Connect the metallic housing of the 7500 Series Radar Tank Gauge to the tank wall or screen directly with an electrically conductive lead to ensure reliable potential matching.

Installation with additional overvoltage protector HAW262Z/HAW56xZ (see XA081F-A "Safety instructions for electrical apparatus certified for use in explosion-hazardous areas").

- Connect the external overvoltage protector and the 7500 Series Radar Tank Gauge to the local potential matching system.
- Potentials shall be equalised both inside and outside the explosion hazardous area.
- The cable connecting the overvoltage protector and the 7500 Series Radar Tank Gauge shall not exceed 1 m in length;
- The cable shall be protected e.g. routed in an armoured hose.

Output Signal

4...20 mA with HART protocol (e.g. for multidrop connection to the 4590 Tank Side Monitor): this version can be operated via the PC operating software ToF Tool. The instrument supports both point-to-point and multidrop operation.

Note! For measurements with mm accuracy the measured variable must be transmitted using HART protocol to ensure the necessary resolution.

Galvanic Isolation

- 500 V towards ground.
- 500 V between power supply and signal.

Operation

Operation Concept

The display of the process value and the configuration of the Radar Tank Gauge occur locally by means of a large 4-line alphanumeric display with plain text information. The guided menu system with integrated help texts ensures a quick and safe commissioning.

Display and operation can occur in one out of six languages (English, German, French, Italian, Dutch, and Spanish). During the first start-up, the instrument explicitly asks for the desired unit / language.

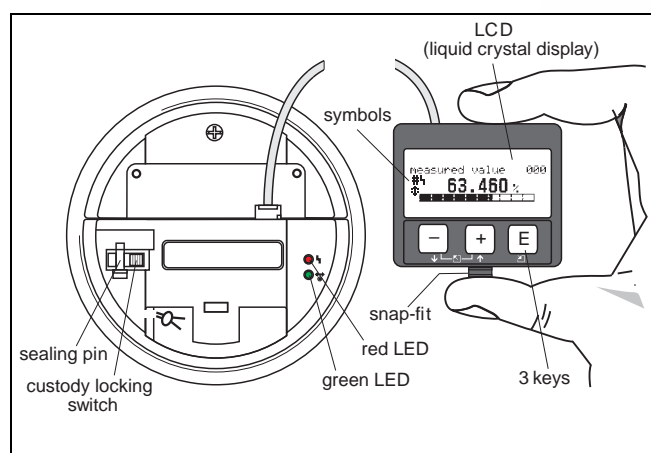
Remote commissioning, including documentation of the measuring point and in-depth analysis functions, is supported via the ToF Tool, the graphical operating software for Varec instruments.

Access to the electronics can be prevented by means of a custody locking switch that locks the device settings. The custody locking switch can be sealed for custody transfer applications.

On-site Operation

The LC-Display VU331 (Four lines with 20 characters each.) allows configuration via 3 keys directly at the instrument. It can be removed to ease operation by simply pressing the snap-fit. It is connected to the device by means of a 500 mm cable.

All device functions can be set through a menu system. The menu consists of function groups and functions. Within a function, application parameters can be read or adjusted. The user is guided through a complete configuration procedure.



LC-Display VU331

To access the display, it is possible to open the cover of the electronics compartment even in an explosion hazardous area.

Remote Operation

The ToF Tool is a graphical operation software for instruments from Varec that operate based on the time-of-flight principle. It is used to support commissioning, securing of data, signal analysis, and documentation of

the instruments. It is compatible with the following operating systems: Win95, Win98, WinNT4.0, Win2000 and Windows XP.

The ToF Tool supports the following functions:

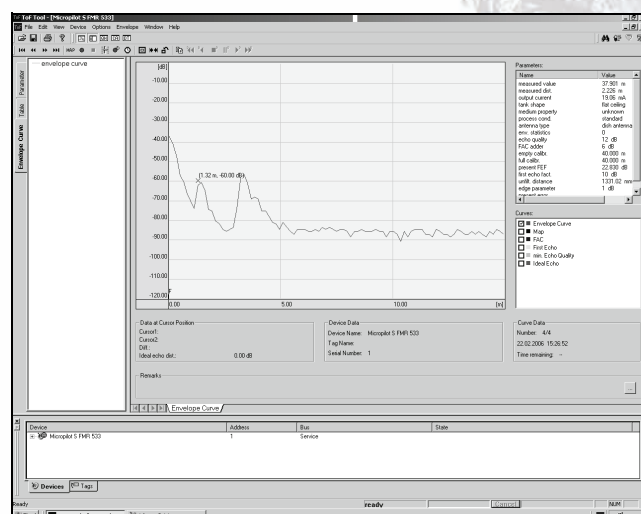
- Online configuration of transmitters
- Signal analysis via envelope curve
- Loading and saving of instrument data (Upload/Download)
- Documentation of measuring point

Note! More information on the ToF Tool can be found on the CD-ROM which is supplied with the instrument.

Menu-guided commissioning:

Signal analysis via envelope curve:

- Connection options:
- HART with Commubox FXA191/195
- Service-interface with adapter FXA193 (RS232C) or FXA291 and ToF Adapter FXA291 (USB)



ToF Tool Operating screen shots

Software Reliability

The software used in the radar instrument 7500 Series Radar Tank Gauge fulfills the requirements of OIML R85. This particularly includes:

- cyclical test of data consistency
- non-volatile memory
- segmented data storage

The radar instrument 7500 Series Radar Tank Gauge continuously monitor the compliance with accuracy requirements for custody transfer measurements according to OIML R85. If the accuracy cannot be maintained, a specific alarm is generated on the local display and via the digital communication.

Signal on Alarm

Error information can be accessed via the following interfaces:

- Local display:
 - Error symbol
 - Plain text display
 - LED's: red LED continuously on = alarm, red LED flashes = warning
- Current output
- Digital interface

Linearization

The linearization function of the 7500 Series Radar Tank Gauge allows the conversion of the measured value into any unit of length or volume. Linearization tables for calculating the volume in cylindrical tanks are pre-programmed. Other tables of up to 32 value pairs can be entered manually or semi-automatically.

Maintenance

Spare Parts and Maintenance Kits

The 7500 series RTG is designed and manufactured to provide accurate and reliable operation without an intensive maintenance schedule.

Varec can provide spare parts, preventive maintenance advice, training and warranties. Please consult your Installation and maintenance manual or a representative for more details.

Cleaning the Antenna

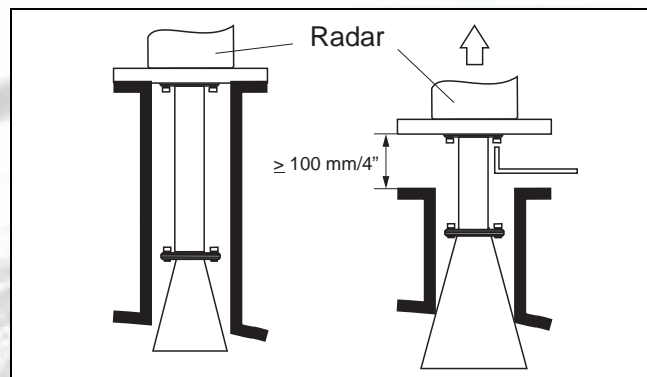
The antenna can get contaminated, depending on the application. The emission and reception of microwaves can thus eventually be hindered. The degree of contamination leading to an error depends on the medium and the reflectivity, mainly determined by the dielectric constant ϵ_r . If the medium tends to cause contamination and deposits, cleaning on a regular basis is recommended. Care has to be taken not to damage the antenna in the process of a mechanical or hose-down cleaning. The material compatibility has to be considered if cleaning agents are used! The maximum permitted temperature at the flange should not be exceeded

Accessories

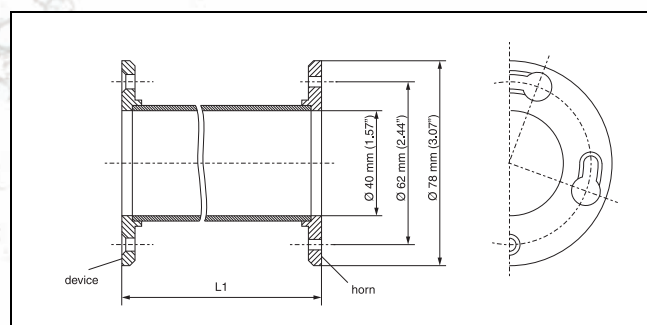
Antenna Extension for 7530 RTG

The antenna extension has to be selected such that the horn extends below the nozzle.

If the horn diameter is greater than the nominal width of the nozzle, the antenna including the extension is mounted from inside the vessel. The bolts are tightened from outside, with the instrument lifted up. The extension has to be selected such that the instrument can be lifted by at least 100 mm (4").



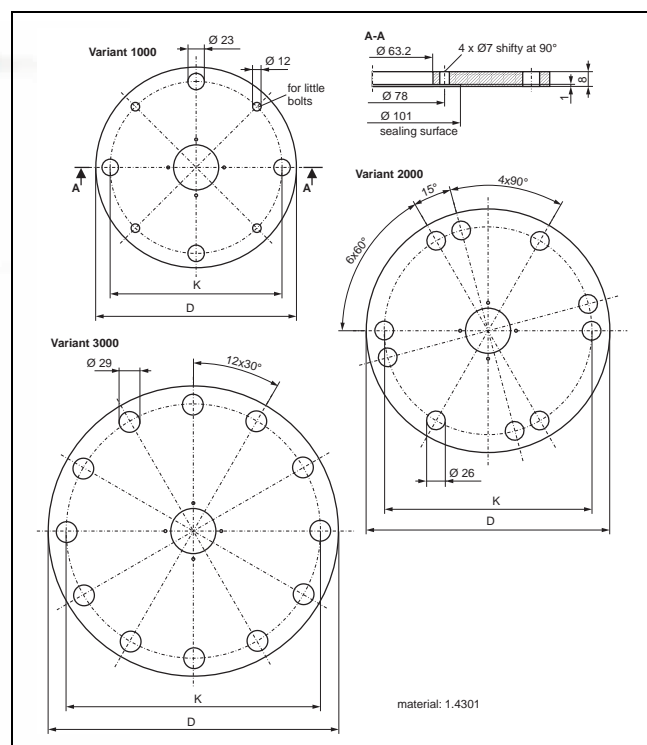
Antenna extension



Antenna extension dimensions

UNI Flange

Varec UNI flanges are designed for non-pressurized operation. Typical pressure fluctuations of breather valves can be tolerated. The number of bolts has sometimes been reduced. The bolt-holes have been enlarged for adaption of dimensions, therefore, the flange needs to be properly aligned to the counterflange before the bolts are tightened.



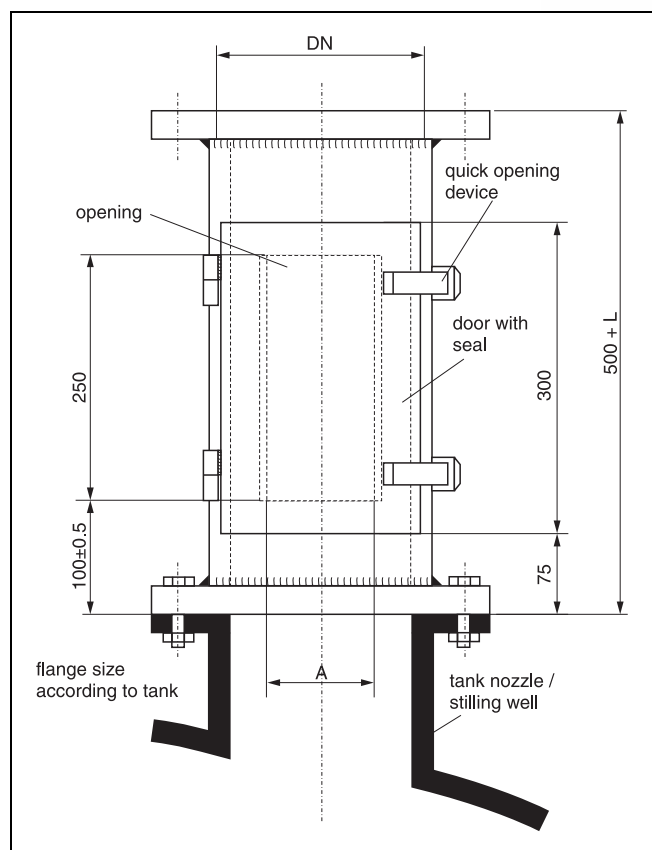
Uni Flange

Version	Compatible with	D [mm]	K [mm]	Type plate no.
1000	DN150 PN16 ANSI 6" 150lbs JIS 10K 150	280	240	942455-3001
2000	DN200 PN16 ANSI 8" 150lbs JIS 10K 200	340	294.5	942455-3002
3000	DN250 PN16 ANSI 10" 150lbs JIS 10K 250	405	358	942455-3003
4000	DN300 PN16 ANSI 12" 150lbs JIS 10K 300	482	410 (for DIN) 431.8 (for ANSI) 400 (for JIS) 404.5 (for DIN + JIS)	942455-3004

Sample Hatch for 7532 RTG

For control and cleaning purposes for sample taking as well as for hand dipping (tape), a sample hatch is recommended. The sensor head of 7532 RTG (planar antenna!) can be easily checked in the area of the opening. Manual gauging with gauge rod or tape is possible without removal of the transmitter. The lower edge of the opening is the reference for the gauging. The construction is only suitable for non-pressurized operation and should be used for the planar antenna version 7532 RTG only.

Note! The sample hatch is not part of the standard offering from Varec. Please contact Varec for further information.



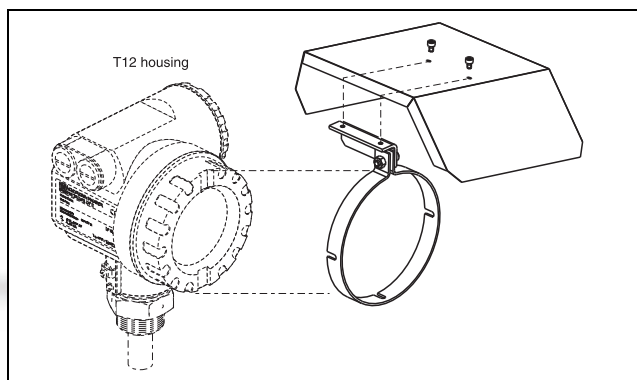
Sample Hatch

Flange	DN150	DN200	DN250/300
PN [bar]	16	16	16
A [mm]	110	140	170
L [mm]	—	300	450

Flange	ANSI 6"	ANSI 8"	ANSI 10"
PN [lbs]	150	150	150
A [mm]	110	140	170
L [mm]	—	300	450

Weather Protection Cover

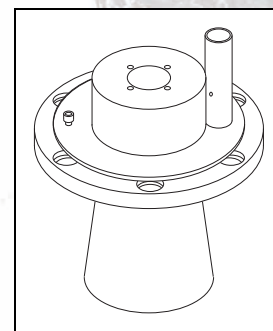
A weather protective cover made of stainless steel is available for outdoor mounting (order code: 543199-0001). The shipment includes the protective cover and tension clamp.



Weather Protection Cover

Pivoting Element for 7500 Series Radar Tank Gauge 7532 RTG

The pivoting element is intended for the 7500 Series Radar Tank Gauge with planar antenna. It serves to swivel the 7500 Series Radar Tank Gauge from the measuring position, e.g. to clean the antenna or dip the tank. The pivoting element is not part of the standard offering from Varec. For more information please contact your Varec representative.



Note! When mounting, avoid any gaps within the path of the beam.

Roof Reflector

Measurements on floating roofs are not recommended for highly accurate measurements due to the unsteady movements of the floating roofs. A special reflector can be used for applications on floating roofs (not for 7532 RTG with planar antenna!).

Optimum mounting position

- Positioning of the reflector on a floating roof:
- The upper edges of the reflector have to be aligned horizontally.
- For slanted locations (e.g. dome-shaped floating roof), the feet must be extended accordingly.

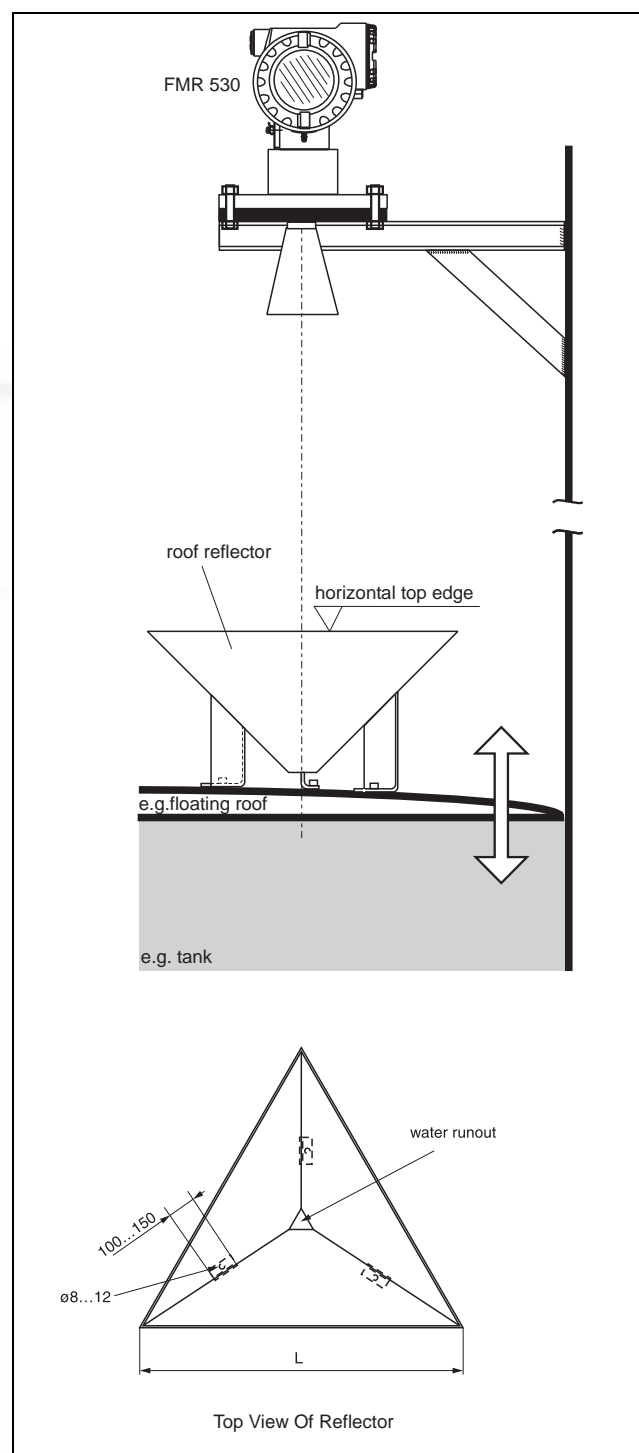
Construction hints

The construction serves as retroreflector such that a tank roof incline does not influence the measured value.

The cross-sectional area shouldn't be smaller than specified in the figure above to receive and transmit enough energy

The construction should be open in the bottom part to allow rainwater to drop out. Thin stainless steel sheets should be used, to prevent the construction from becoming too heavy.

Note! The roof reflector is not part of the standard offering from Varec. Please contact Varec for further information.



Roof Reflector

Technical Specifications

The following specifications apply to the 7500 Series Radar Tank Gauge 7530, 753, 7532 and 7533 RTG over the normal (ambient) operating temperature range that can be calibrated for inventory control and custody transfer applications according to regulatory standards in compliance with OIML R85.

General

Manufacturer	Varec, Inc.
Designation	7500 Series Radar Tank Gauge 7530/7531/7532/7533 RTG
Function	Level-Radar Smart Transmitter for continuous and non-contact precision level measurement. For custody transfer and inventory control applications with NMI- and PTB-approvals.

Physical

Weight	7530 RTG 7.1 kg + weight of flange 7531 RTG 5 kg + weight of flange 7532 RTG 6.5 kg + weight of flange 7533 RTG 13 kg + weight of flange
Process connection	See Ordering information. All process connections dispose of a gas-tight glass feed-through to prevent any gas leakage to the inside of the housing.
Enclosure	IP 65, NEMA 4X (open housing and removed liquid crystal display: IP20, NEMA 1) Housing T12: separate terminal compartment for increased safety respectively explosion proof. Material: aluminium, seawater repellent, chromate, powder coated Sight window: glass
Antenna	IP 68 (NEMA 6P)
Conduit entries	M20x1.5; Pg 13.5 (gland included); ¾ NPT; G ¾ internal thread

Power

Power consumption	Max. 330 mW at 16 V, max. 500 mW at 24 V, max. 600 mW at 30 V.
Current consumption	Max. 21 mA (50 mA inrush current).
Supply voltage	DC voltage: 16...36 VDC

HART Field Communications

Min load	250 Ω
Cable	Four (4) wire, twisted pairs (wire diameter 0.5...2.5 mm)
Ripple HART	47...125 Hz: U _{ss} = 200 mV (at 500 W)

Environmental

T

Ambient temperature	-40 °F and +185 °F (-40 °C and +85 °C) For calibration to regulatory standards: -25 °C ... +55 °C (-30 °F...+140 °F) With T _u < -20 °C and T _u > +60 °C the operability of the LC-display is reduced. A weather protection cover should be used for outdoor operation if the instrument is exposed to direct sunlight.												
Process pressure limits	7530 RTG: 0...40 bar / 14.5...580 psi (option 64 bar / 928 psi) 7531 RTG: 0...40 bar / 14.5...580 psi 7532 RTG: 0...25 bar / 14.5...362 psi 7533 RTG: 0...16 bar / 14.5...232 psi												
<p>The graph plots process pressure p in bar against temperature T in °C. The y-axis ranges from 5 to 25 bar, and the x-axis ranges from -40 to 150 °C. The pressure profile is as follows:</p> <table border="1"> <thead> <tr> <th>Temperature T [°C]</th> <th>Pressure p [bar]</th> </tr> </thead> <tbody> <tr> <td>-40</td> <td>25</td> </tr> <tr> <td>80</td> <td>25</td> </tr> <tr> <td>100</td> <td>20</td> </tr> <tr> <td>120</td> <td>10</td> </tr> <tr> <td>150</td> <td>5</td> </tr> </tbody> </table>		Temperature T [°C]	Pressure p [bar]	-40	25	80	25	100	20	120	10	150	5
Temperature T [°C]	Pressure p [bar]												
-40	25												
80	25												
100	20												
120	10												
150	5												
Storage Temperature	-40 °F and +176 °F (-40 °C and +88 °C)												
Climate class	DIN EN 60068-2-38 (test Z/AD)												
Electromagnetic compatibility (EMC)	Interference Emission to EN 61326, Electrical Equipment Class B. Interference Immunity to EN 61326, Annex A (Industrial) and NAMUR Recommendation NE 21 (EMC) Use a screened cable for the connection to the sensor.												
Vibration Shock	DIN EN 60068-2-64 / IEC 68-2-64: 20...2000 Hz, 1 (m/s ²) ² /Hz												

Process Temperature Range

Horn antenna	-40 °C...+200 °C -40 °F...+ 392 °F
Rod antenna	-40 °C...+150 °C -40 °F...+ 302 °F
Planar antenna	-40 °C...+150 °C (-40 °F...+302 °F), (-4 °F...+302 °F) for FKM-seal
Parabolic antenna	-40 °C...+200 °C -40 °F...+ 392 °F

Performance

Hysteresis	0.3 mm (1/64")
Absolute accuracy	better than ± 1 mm Free space 7500 Series Radar Tank Gauge radar gauges typically provide accuracy of ± 0.5 mm (2 sigma value). The 7500 Series Radar Tank Gauge 7532 RTG stilling well radar gauges typically provide accuracy of ± 0.8 mm (2 sigma value). Depending on the respective national gauging regulations, the admissible errors AFTER installation of the instrument on the tank are ± 3 mm (OIML), ± 4 mm (API),
Non-repeatability	0.3 mm (1/64")
Long-term drift	The long-term drift is within the specified accuracy.
Influence of ambient temperature	Within the specified accuracy according to OIML R85
Maximum fill speed	By the first pass trough of measuring range: 100 mm/min., thereafter unlimited.
Reaction time	The reaction time depends on the parameter settings (min. 1 s). In case of fast level changes, the instrument needs the reaction time to indicate the new value.
Resolution	digital: 0.1 mm analog: 0.03 % of measuring range
Settling time	Typical 15 sec

Certifications & Approvals

CE approval – The measuring system meets the legal requirements of the EC-guidelines. Varec confirms the instrument passing the required tests by attaching the CE-mark.
Ex approval – See "Ordering information"
External standards and guidelines To conception and development for Micropilot S have been followed the external standards and guidelines: EN 60529 – Protection class of housing (IP-code) EN 61010 – Safety regulations for electrical devices for measurement, control, regulation, and laboratory use. EN 61326 – Emissions (equipment class B), compatibility (appendix A – industrial area) NAMUR – Standards committee for measurement and control in the chemical industry API (American Petroleum Institute) – Particularly "Manual of Petroleum Measurement Standards". OIML R85 (Organisation Internationale de Métrologie Légale)
Overspill protection – WHG, see ZE243F/00/de.
Custody type approval – All aspects of OIML R85 are fulfilled.
RF approvals – R&TTE 1999/5/EG, FCC CRF 47, part 15
Marine certificate – GL (Germanischer Lloyd)

Wetted Parts

7530 RTG

Type of antenna / Seal	Media	Antenna cone	Wetted parts
Standard / Viton –20...+200 °C (–4 °F...+392 °F)	for non-conductive media	PTFE	PTFE and 1.4571
Standard / EPDM –40...+150 °C (–40 °F...+302 °F)			
Standard / Kalrez 0...+200 °C (+32 °F...392 °F)			
Standard –20...+200 °C (–4 °F...392 °F) PTFE seal (non wetted Viton O-Ring)	for conductive media	PTFE	PTFE and 1.4571
Note! All process connections are gas-tight. The horn version for conductive media is resistant to hot vapour.			

7531 RTG

Rod gas-tight, antistatic	1.4435 / SS 316 L / PTFE
Stab gas-tight^a	1.4435 / SS 316 L / PTFE (TFM 1600)

a. Rod antenna with FDA listed materials, white PTFE (TFM 1600), 3A approved in combination with 2" and 3" Tri-clamp process connection.

7532 RTG

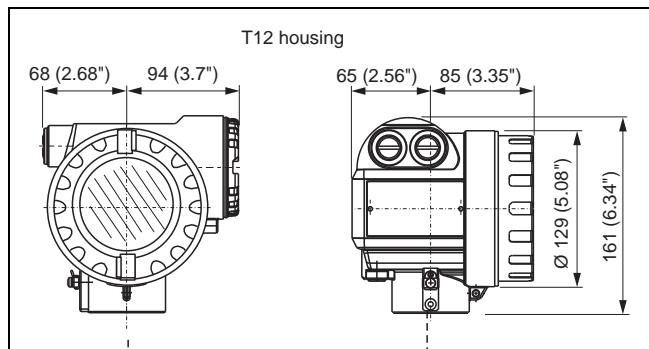
Planar, gas-tight	1.4435 / HNBR (Hydrated Nitrit Butadien Rubber, resistant to NH ₃) or FKM / PTFE glas fibre laminat
Horn adapter for increase of diameter	1.4435
Note! The planar antenna is not resistant to hot vapour and NH ₃ !	

7533 RTG

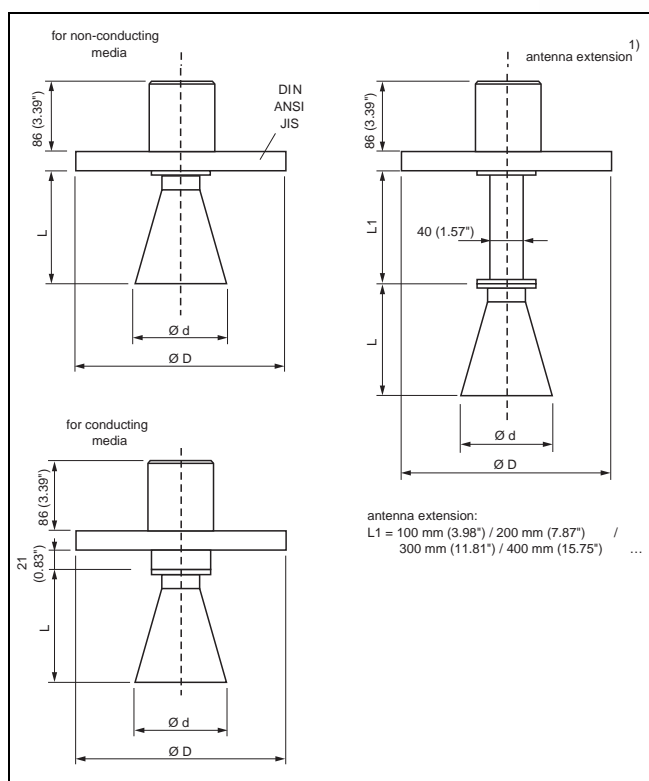
Parabolic, gas-tight	1.4435 / SS 316 L / PTFE
-----------------------------	--------------------------

Product Dimensions

T12 Housing



7530 RTG horn antenna

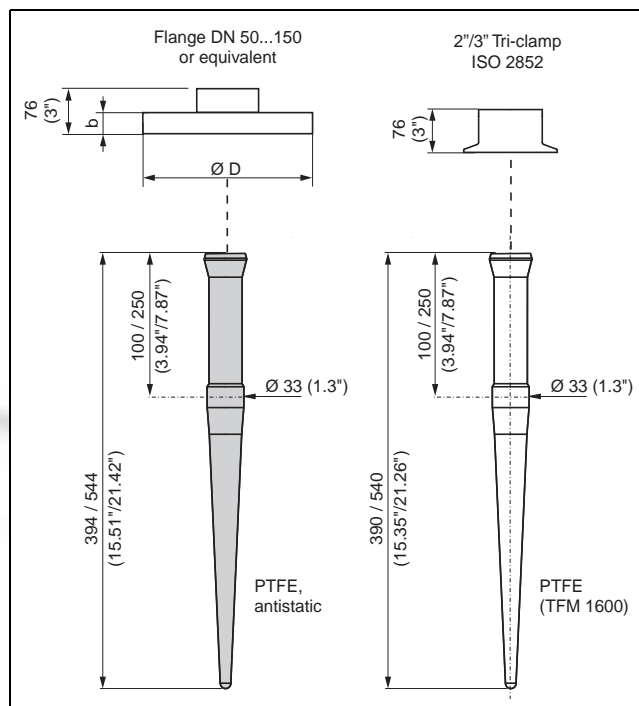


Antenna type (ØD)	DN80 / 3"	DN100 / 4"
D [mm (inch)]	76 (3")	96 (3.78")
L [mm (inch)]	68 (2.68")	105 (4.13")

Antenna type (ØD)	DN150 / 6"	DN200 / 8"	DN250 / 10"
D [mm (inch)]	146 (5.75")	191 (7.52")	241 (9.49")
L [mm (inch)]	185 (7.28)	267 (10.51")	359 (14.13")

*) compatible with DIN 2527

7531 RTG rod antenna



Flange to EN 1092-1 *, for PN 16 (für PN 40)

Flange	DN50	DN80	DN100	DN150
B [mm](inch)	18 (0.71")	20 (0.79") [24 (0.94")]	20 (0.79")	22 (0.87")
D [mm](inch)	165 (6.5")	200 (7.87")	220 (8.66")	285 (11.22")

*) compatible with DIN 2527

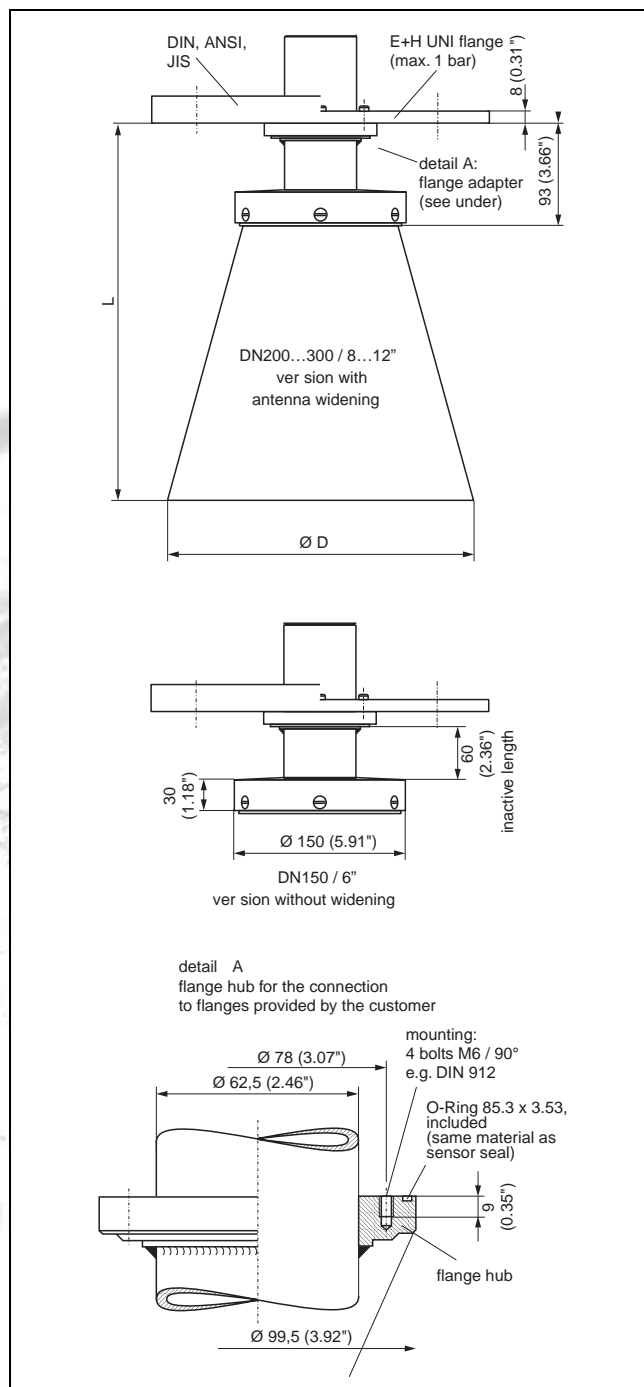
Flange to ANSI B16.5, for 150 lbs (for 300 lbs)

Flange	ANSI 2"	ANSI 3"	ANSI 4"	ANSI 6"
B [mm](inch)	19.1 (0.75")	23.9 (0.94") [28.4 (1.12")]	23.9 (0.94")	25.4 (1")
D [mm](inch)	152.4 (6")	190.5 (7.5") [209.5 (8.25")]	228.6 (9")	279.4 (11")

Flange to JIS B2210, for 10K

Flange	DN50	DN80	DN100	DN150
B [mm](inch)	16 (0.63")	18 (0.71")	18 (0.71")	22 (0.87")
D [mm](inch)	155 (6.1")	185 (7.28")	210 (8.27")	280 (11.02")

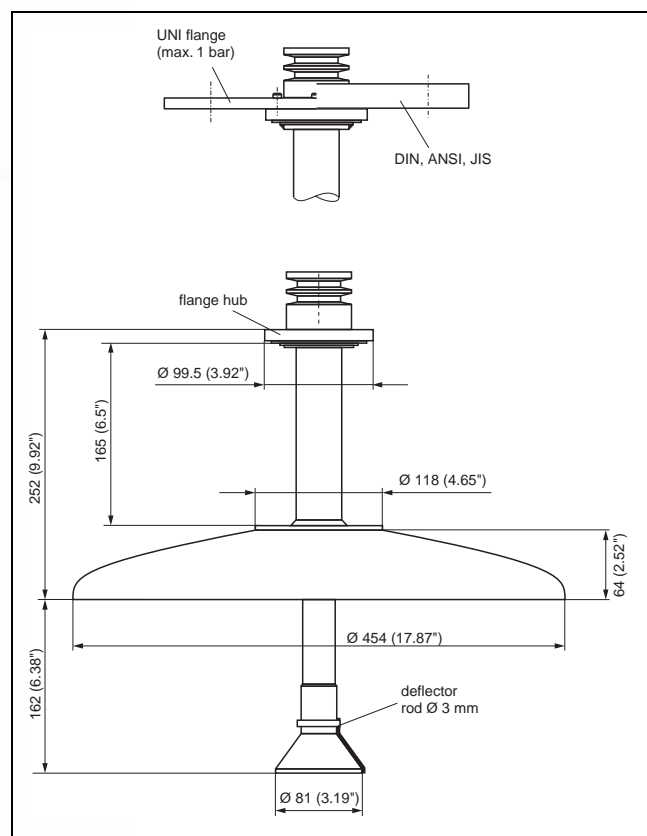
7532 RTG planar antenna



Antenna version (ØD)	DN150 / 6"	DN200 / 8"	DN250 / 10"	DN300 / 12"
L [mm (inch)]	93 (3.66")	337 (13.27")	490 (19.29")	517 (20.35")
D [mm (inch)]	no horn	192 (7.56")	242 (9.53")	292 (11.5")

Note! The inactive length of 60 mm prevents condensation effects to the antenna performance.

7533 RTG parabolic antenna



Order Codes

Please consult your local sales representative for product options.



www.varec.com

Corporate Headquarters
5834 Peachtree Corners East
Norcross, GA 30092
Tel: +1 (770) 447-9202
Toll Free: +1 (866) 698-2732
Fax: +1 (770) 662-8939

Your Official Representative

If no official representative is listed here, please visit www.varec.com to find your local representative.
© 2006 Varec, Inc. An SAIC Company. All Rights Reserved. This document is for information purposes only. Varec, Inc. makes no warranties, express or implied, in this summary. The names of actual companies and products mentioned herein may be the trademarks of their respective owners.