

2-wire System Level Radar

TLR7500

80GHz

Microwave level meter

OUTLINE

The **TLR7500** is a non-contact type continuous level meter using microwaves. This meter determines the level of a measured object by emitting microwaves and measuring the time taken for the microwaves to travel out, be reflected and return from the object.

Since the velocity of electromagnetic waves is hardly affected by temperature and pressure, meters of this type can accurately measure levels under any conditions. Measurements are also independent of the viscosity, or changes in the density and temperature of measured objects, allowing such meters to be used for a wide range of temperatures and pressures.

Using a newly developed lens antenna, the **TLR7500** can be mounted on small-diameter nozzles, and is ideal for level measurement of 80-GHz high directivity as well as ultra-small containers.

Inheriting the features of existing microwave level meters, the **TLR7500** is even easier to use.



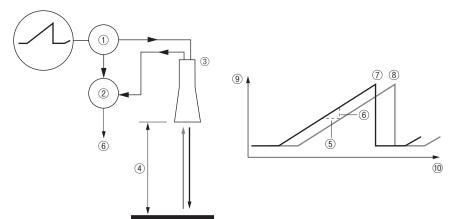


FEATURES

- ☐ Non-contact, continuous level measurement with high accuracy
- ☐ Measuring various objects such as liquids and slurries
- ☐ Displaying and outputting measurements of level, distance, volume, and mass
- ☐ High-accuracy level measurement independent of changes in temperature, pressure, or density
- ☐ Up to 4 MPa operating pressure range from vacuum
- ☐ Wide operating temperature range from -50°C to +200°C
- ☐ Minimum-size DN20 (¾") antenna mountable on small-diameter nozzles
- $\hfill \square$ Easy mounting on top of tanks, no need to worry about leakage
- ☐ Suitable for various installation environments with high directivity
- $\hfill \square$ Can start measuring immediately after mounting with simple parameter setting
- ☐ Maintenance-free with no moving parts
- ☐ The reflected signal can be checked on the display unit, which is effective for solving problems.
- $\hfill \square$ Various types of explosion-proofing available [Ex d, Ex i, Ex t]

MEASUREMENT PRINCIPLE

Microwaves, whose frequency linearly changes in the main body, are continuously emitted from the antenna. The microwaves are reflected by the measured object and return to the antenna. Based on the frequency of the returned microwaves, the return time can be calculated. Since the propagation speed of microwaves is constant, the return time is used to calculate the distance to the measured object. The calculated distance can be displayed (output) as a level, based on the preset tank data.



- 1 Emitted microwaves
- ② Received microwaves
- ③ Antenna
- (4) Distance
- ⑤ Time difference
- 6 Frequency difference
- 7 Emitted microwaves
- 8 Received microwaves
- 9 Frequency
- 10 Time

STANDARD SPECIFICATIONS

	Item	Description			
	Object	•			
	<u> </u>	Liquids, pastes, and slurries			
	Method	Frequency modulated continuous wave (FMCW)			
	Frequency	80 GHz (W band)			
Measurement	Output	Level, distance, volume, and mass			
	Range	Max. 50 m (depends on the dielectric constant of the measured objects and antenna type)			
	Minimum output range	0.2 m			
	Minimum dead zone	Antenna length + antenna extension length + 0.1 m (depends on the measuring conditions)			
	Output	4 to 20 mA DC (HART)			
	Accuracy	± 0.01 mA (at 20°C) (Output accuracy is added to the accuracy of the display value)			
	Resolution	±5μA			
Output	Temperature drift	50 ppm/K (typical)			
	Error signal	21.5 mA DC, 3.5 mA DC (selectable by parameter)			
	Load resistance (max.)	R $[\Omega] \le$ (Supply voltage – 12 V)/21.5 mA (Standard type/Ex i)			
	Load resistance (max.)	R $[\Omega] \le$ (Supply voltage – 16 V)/21.5 mA (Ex d)			
		±3 mm R. D. (less than 10 m) *3, ±0.03%/R. D. (10 m or more)			
		Temperature: 15°C to 25°C			
	Standard conditions	Pressure: 0.1 MPa ±5 kPa			
Accuracy	Staridard conditions	Humidity: 60% ±15%			
		Target: Metal plate			
	Resolution	1mm			
	Repeatability	±1mm			
	Temperature of process	-50 to +150°C [-50 to +200°C: with distance piece]			
	connection	The operating temperature range depends on the seal materials. Refer to <u>ANTENNA SPECIFICATIONS</u> .			
Measuring	Operating pressure	0 kPa (abs) to 4.0 MPa, 0 kPa (abs) to 1.6 MPa [PTFE lens antenna]			
conditions	Dielectric constant	1.4 or more: Direct mode (depends on the measuring conditions and antenna type)			
		1.1 or more: TBF mode *1			
	Change rate (max.)	60 m/min (depends on the measuring conditions)			
	Ambient temperature	-40 to +80°C (For explosionproof type, refer to EXPLOSIONPROOF SPECIFICATIONS)			
	Relative humidity	0 to 99% (no condensation)			
	Storage temperature	-40 to +85°C			
	Protection class	IP66/IP68 [IEC60529]			
	1 Total and a significant	NEMA250: NEMA type 6, 6P (housing), type 6P (antenna)			
		JPN Ex explosionproof			
Instrument		Ex ia IIC T6T3 Ga/Gb			
specifications		Ex ia IIIC T85°CT150°C or T85°CT200°C Da/Db Ex db ia IIC T6T3 Ga/Gb			
		Ex ia tb IIIC T85°CT150°C or T85°CT200°C Da/Db			
	Explosionproof	IECEx explosionproof			
		Ex ia IIC T6T3 Ga/Gb			
		Ex ia IIIC T85°CT150°C or T85°CT200°C Da/Db			
		Ex db ia IIC T6T3 Ga/Gb			
		EX ia tb IIIC T85°CT150°C or T85°CT200°C Da/Db			
	Туре	2-wire loop-powered system			
	Power supply	Rated voltage: 24 V DC			
Electrical	1 Ower supply	Voltage range: 16 to 36 V DC (Ex d), 12 to 30 V DC (Standard type, Ex i) *2			
connection	Cable entry	$M20 \times 1.5$			
	Terminal	0.5 to 2.5 mm ²			
	Cable outer diameter	7 to 12 mm			
	Housing	Aluminum (polyester coating)			
	Process connection	Stainless steel (SS316L)			
Material	Antenna	PEEK, PTFE, stainless steel (SS316L)			
iviatorial	Seal	FKM / FPM, Kalrez® 6375, EPDM			
	Weather protection (Accessory)	Stainless steel (SS316L)			
	Display panel	LCD with backlight, 128 × 64 pixels in 64-step gray scale			
	T.	Language: English or Japanese			
Dieplay	Control unit	4 key buttons (Bight Enter Un and Daws)			
Display	Control unit	4 key buttons (Right, Enter, Up and Down)			
Display	Control unit Operating ambient temperature	-20 to +70°C			
	Operating ambient	-20 to +70°C G¾", G1", G1-½", G3", ¾NPT, 1NPT, 1-½NPT, 3NPT male thread			
Display Process connection	Operating ambient temperature	-20 to +70°C			

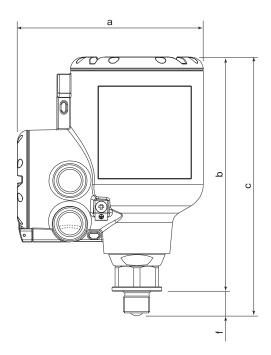
^{*1:} The dielectric constant of measured objects may not be measured depending on the measuring conditions.
*2: Voltage supply required to output 21.5 mA
*3: DN20, DN25, DN70 lens antenna: Excludes 100mm from antenna DN40 lens antenna: Excludes 200mm from the antenna

ANTENNA SPECIFICATIONS

	Description				
	DN20 (¾") lens antenna				
Antenna type	DN25 (1") lens antenna				
Antenna type	DN40 (1½") lens antenna				
	DN70 (2¾") lens antenna				
	Max. 5 m: DN20 (¾") lens antenna				
Measuring range	Max. 10 m: DN25 (1") lens antenna				
ivieasuring range	Max. 25 m: DN40 (11/2") lens anteni	na			
	Max. 50 m: DN70 (2¾") lens anteni	na			
	DN20 (¾") lens antenna: 15 degree	s			
Beam angle	DN25 (1") lens antenna: 10 degrees				
Bealti aligie	DN40 (1½") lens antenna: 8 degrees				
	DN70 (2¾") lens antenna: 4 degree	ees			
	-40 to +150°C [-40 to +200°C: with	to +150°C [-40 to +200°C: with distance piece] (Seal material: FKM/FPM)			
Onevetica	-20 to +150°C [-20 to +200°C: with distance piece] (Seal material: Kalrez® 6375)				
Operating temperature	-50 to +150°C (Seal material: EPDM)				
temperature	-50 to +150°C [With distance piece: max.+200°C]: With PEEK flange plate				
	-50 to +150°C: With PTFE flange p	plate			
Operating pressure	0 kPa (abs) to 4.0 MPa, 0 kPa (abs)	to 1.6 MPa [PTFE lens antenna]			
	DN20 (¾") lens antenna	G¾", ¾NPT male thread			
	DN25 (1") lens antenna	G1", 1NPT male thread			
Process	DN40 (1½") lens antenna	G1½", 1½NPT male thread			
connection	DN40 (172) lens antenna	JIS10K 50A, 80A, ASME 2", 3" 150 lbs, 300 lbs, flange			
	DN70 (23/") long antonna	G3", 3NPT male thread			
	DN70 (2¾") lens antenna	JIS10K 80A, 100A, 150A, 200A, ASME 3", 4", 6", 8" 150 lbs, 300 lbs, flange			

EXTERNAL DIMENSIONS

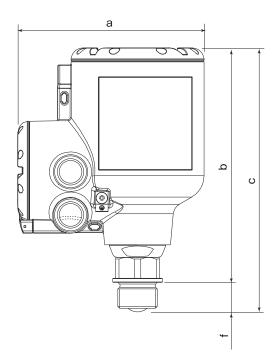
DN20 lens antenna



Process	Dimensions [mm] a b c f				
connection					
34" thread	151	190 *1	213 *1	23	

^{*1} If the process temperature is more than +150°C, add 112 mm to this value

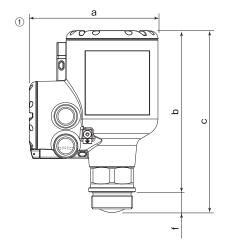
DN25 lens antenna

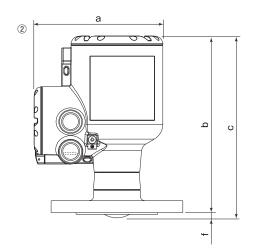


Process	Dimensions [mm]				
connection	a b c f				
1" thread	151	191 *1	215 *1	24	

^{*1} If the process temperature is more than +150°C, add 112 mm to this value

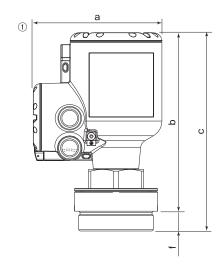
DN40 lens antenna

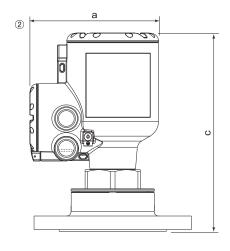




Process	Dimensions [mm]				
connection	а	b	С	f	
① 1½" thread	151	190.5 *2	215 *1 *2	24.5 *1	
② Flange	151	210.5 *2	215 *1 *2	4.5 *1	

DN70 lens antenna



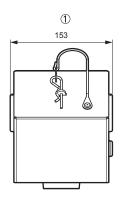


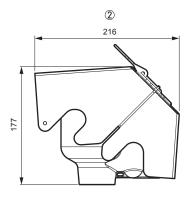
Process		Dimensions [mm]				
connection	а	b	С	f		
① 3" thread	151	210 *1	233 (G3 male thread) *1 240 (3" NPT) *1	23 (G3 male thread) 30 (3" NPT)		
② Flange	151	_	233 *1	_		

*1 If the process temperature is more than +150°C, add 112 mm to this value

^{*1} If the device has the antenna extension option, add 112 mm to this value [PEEK antenna only]
*2 If the process temperature is more than +150°C, add 112 mm to this value [PEEK antenna only]

Weather protection (Accessory)







- Front
 Left side
 Back

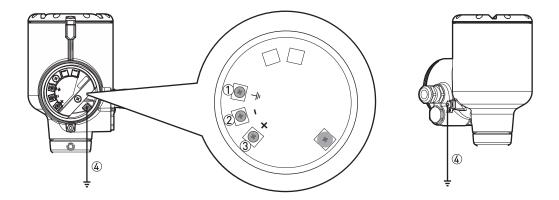
MASS

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Part name		Specification	Mass [kg]
		Aluminum	2.1
Housing		Alminium, Distance piece	3.0
		1½" thread	2.6
Antenna	DN40 lens antenna	DN80 /3" flange	6.7
		DN80 /3" flange with antenna extension	7.8
	DN70 lens antenna	3" thread	4.3
	DIN70 lens antenna	DN80 /3" flange	7.0
Accessory		·	
Weather protection		Stainless steel	1.3

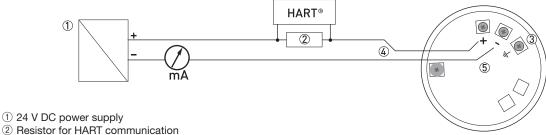
WIRING

Terminals



- 1 Housing ground terminal (connected when the signal line is a shielded cable)
- ② Signal (power supply) cable (-)
 ③ Signal (power supply) cable (+)
- 4 Ground terminal (underneath the converter housing)

Wire connection



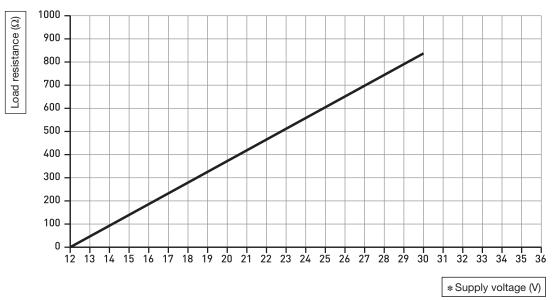
- 3 Housing ground terminal
- 4 Signal line
- (5) Housing wire connection board
- Use stranded cable of 0.5 to 2.5 mm² cross section for a signal (power supply) line.
 Avoid laying a signal (power supply) line close to a power cable.
- Use a different power supply for the TLR7500 from those for other power instruments.
- It is recommended to use a shielded cable.
- A single-point ground with a shielded cable is recommended.

POWER SUPPLY

The graphs below show the minimum voltage required across a resistor in the loop.

Non-explosion products and intrinsically safe products

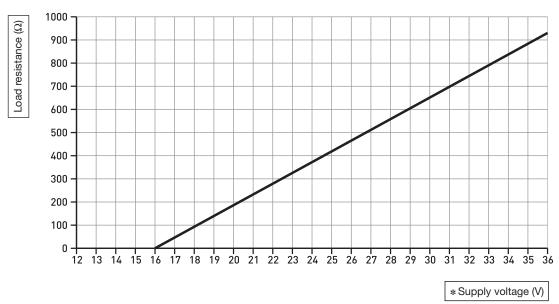
Supply voltage: 12 V to 30 V DC



*: The minimum voltage required to output 21.5 mA at the device terminal

Flameproof products

Supply voltage: 16 V to 36 V DC



*: The minimum voltage required to output 21.5 mA at the device terminal

EXPLOSIONPROOF SPECIFICATIONS

JPN Ex

Certificate number: CML 19JPN2030X

Ex ia IIC T6...T3 Ga/Gb

Ex ia IIIC T85°C...T150°C or T85°C...T200°C Da/Db

Ex db ia IIC T6...T3 Ga/Gb

Ex ia tb IIIC T85°C...T150°C or T85°C...T200°C Da/Db

Without distance piece

Temperature class	Max. surface temperature	Max. ambient t	emperature [°C]	Max. process temperature [°C]
remperature class	iviax. surface temperature	Aluminum housing	Stainless steel housing	iviax. process temperature [C]
Т6	T85°C	+60	+60	+60
10	165 C	+48	+43	+85
T5	T100°C	+75 [+70] *2	+75 [+68] *2	+75
13	1100 C	+63	+58	+100
T4 T1	T135°C	+64	+56 [+52] *2	+115
	1135 C	+55	+43	+135
T3	T150°C	+49	+33	+150

Tomporatura alaga	Max. surface temperature	Min. ambient temperature [°C]		Min. process temperature [°C]
Temperature class	Max. Surface temperature	Aluminum housing	Stainless steel housing	wiiii. process temperature [C]
All *1	All *1	-40	-40	-40
All	All	– 35	-33	-50

^{*1:} The minimum process temperature of seal material: -20°C for Kalrez 6375, and -40°C for FKM/FPM

With distance piece

Tomporaturo elace	May surface temperature	Max. ambient temperature [°C]		Max. process temperature [°C]
Temperature class	Max. surface temperature	Aluminum housing	Stainless steel housing	Max. process temperature [C]
T6	T85°C	+60	+60	+60
10	165 C	+53	+51	+85
T6	T5 T100°C	+75 [+70] *2	+75 [+69] *2	+75
13		+68	+66 [+64] *2	+100
T4	T135°C	+70	+68 [+61] *2	+115
14		+65	+61 [+58] *2	+135
		+61	+56 [+55] *2	+150
T3 *1	T200°C *1	+53	+46	+180
		+48	+40	+200

^{*1}: The maximum process temperature of seal material: $+150^{\circ}\text{C}$ for EPDM

^{*2:} Values in parentheses are for Ex db ia- or Ex ia tb- approved device.

Tomporatura alaga	May ourfood tomporature	Min. ambient temperature [°C]		Min. process temperature [°C]
Temperature class Max. surface temperature		Aluminum housing	Stainless steel housing	wiiii. process temperature [C]
All *3	All *3	-40	-40	-40
All	All	-37	-36	-50

^{*3:} Minimum process temperature of seal material: -20°C for Kalrez 6375, and -40°C for FKM/FPM

When using the TLR7500 as an intrinsically safe device, circuit variables must not exceed the following values. Ui=30 V dc, Ii=130 mA, Pi=1 W, Ci=10 nF, Li=0 μ H

When using the TLR7500 as a flameproof device, the ratings below must be observed. U=16 to 36 V DC, 4 to 20 mA (passive, HART) Um=250 V AC 50/60Hz, 250 V DC

^{*2:} Values in parentheses are for Ex db ia- or Ex ia tb- approved device.

IECEx

Certification No. IECEx KIWA 19.0009X

Ex ia IIC T6...T3 Ga/Gb

Ex ia IIIC T85°C...T150°C or T85°C...T200°C Da/Db

Ex db ia IIC T6...T3 Ga/Gb

Ex ia tb IIIC T85°C...T150°C or T85°C...T200°C Da/Db

Without distance piece

EPL Ga/Gb EPL Da/Db		Max. ambient t	emperature [°C]	Max. process temperature [°C]
Temperature class	Max. surface temperature	Aluminum housing	Stainless steel housing	iviax. process temperature [O]
Т6	T6 T85°C	+60	+60	+60
10	165 C	+48	+43	+85
T5	T100°C	+75 [+70] *2	+75 [+68] *2	+75
15	1100 C	+63	+58	+100
T4	T4 T10500	+64	+56 [+52] *2	+115
14	T135°C	+55	+43	+135
T3	T150°C	+49	+33	+150

EPL Ga/Gb	EPL Da/Db	Min. ambient te	emperature [°C]	Min. process temperature [°C]
Temperature class	Max. surface temperature	Aluminum housing	Stainless steel housing	wiiii. process temperature [C]
AII *1	All *1	-40	-40	-40
All	All	-35	-33	-50

^{*1:} The minimum process temperature of seal material: -20°C for Kalrez 6375, and -40°C for FKM/FPM

With distance piece

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EPL Ga/Gb	EPL Da/Db	Max. ambient t	emperature [°C]	Max. process temperature [°C]
Temperature class	Max. surface temperature	Aluminum housing	Stainless steel housing	wax. process temperature [C]
Т6	T85°C	+60	+60	+60
10	165 C	+53	+51	+85
T5	T100°C	+75 [+70] *2	+75 [+69] *2	+75
15	1100 C	+68	+66 [+64] *2	+100
T4	T135°C	+70	+68 [+61] *2	+115
14	1133 C	+65	+61 [+58] *2	+135
		+61	+56 [+55] *2	+150
T3 *1	T200°C *1	+53	+46	+180
		+48	+40	+200

^{*1:} The maximum process temperature of seal material: +150°C for EPDM or PTFE drop antenna

^{*2:} Values in parentheses are for Ex db ia- or Ex ia tb- approved device.

EPL Ga/Gb	EPL Da/Db	Min. ambient te	emperature [°C]	Min. process temperature [°C]
Temperature class	Max. surface temperature	Aluminum housing	Stainless steel housing	wiiii. process temperature [C]
All *3	All *3	-40	-40	-40
All	All	- 37	-36	-50

^{*3:} Minimum process temperature of seal material: -20°C for Kalrez 6375, and -40°C for FKM/FPM

When using the TLR7500 as an intrinsically safe device, circuit variables must not exceed the following values. Ui=30 V dc, Ii=130 mA, Pi=1 W, Ci=10 nF, Li=0 μ H

When using the TLR7500 as a flameproof device, the ratings below must be observed. $\rm U_N=36~V~dc,~I_N=22~mA,~Um=250~V~ac$

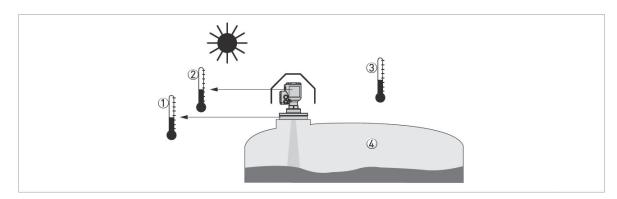
^{*2:} Values in parentheses are for Ex db ia- or Ex ia tb- approved device.

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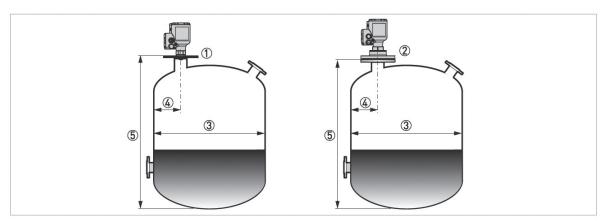
NOTES ON USE

Mounting location

- Avoid direct sunshine. Use a sunshade or weather protection to keep the TLR7500 within the operating temperature range. In particular, do not expose the LCD indicator to direct sunshine. The ambient temperature must be between -40°C and +80°C.
- Do not mount the TLR7500 at a place subject to strong vibration.
- The TLR7500 has a dead zone near the sensor in which the TLR7500 cannot measure the level. This may cause difficulties. Consider the range (vertical length) of this zone when mounting the TLR7500.

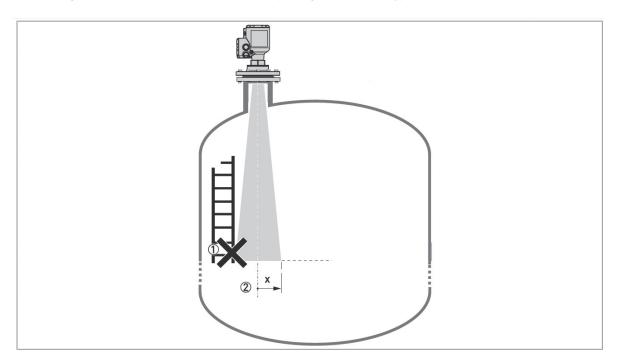


- ① The allowable temperature range of the process connection varies depending on the seal material.
- 2) The temperature of the indicator must be between -20°C and +70°C.
- 3 The ambient temperature must be between -40°C and +80°C. Refer to EXPLOSIONPROOF SPECIFICATIONS for explosionproof types.
- 4) Use the TLR7500 within the specified pressure range.
- When the TLR7500 is mounted in the center of a circular tank with a diameter of 1 m or less, multiple reflections interfere with the measurement. Install it away from the center of the tank.
 - When installing in the four corners of a non-cylindrical vessel such as a concrete pit, install it in a position where the distances to the two adjacent walls are not equal.
- Recommended mounting locations and distances from the vessel wall are shown below.
 In any case, the TLR7500 must be at least 200 mm off the tank wall.
- Ensure that walls within the emission range of microwaves are smooth.



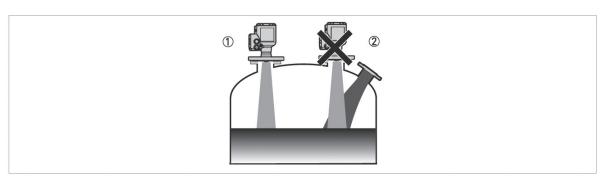
- (1) Mounting location for DN20 and DN25 lens antennas
- ② Mounting location for DN40 and DN70 lens antennas
- (3) Inner diameter of the vessel
- (4) Recommended minimum distance between the mounting location and the vessel wall for each antenna type
 - DN20 and DN25 lens antennas: Vessel height \times 1/5 (in the case of a 5 m high vessel: 5 m \times 1/5 = 1 m)
 - DN40 lens antenna: Vessel height \times 1/10 (in the case of a 5 m high vessel: 5 m \times 1/10 = 0.5 m)
 - DN70 lens antenna: Vessel height \times 1/20 (in the case of a 5 m high vessel: 5 m \times 1/20 = 0.25 m) Recommended minimum distance between the mounting location and the vessel wall: diameter of the vessel \times 1/3
- (5) Height of the vessel

- \bullet Ensure that there are no obstacles within the emission range of microwaves.
- ①Obstacles include agitators, ladders, reinforcements, and heating coils.
- ②The emission range of microwaves for measurement varies depending on the antenna type. Refer to the table below.



Antenna type	Beam angle	Beam range (x)
Antenna type	beam angle	mm/m
DN20 [¾"] lens antenna	15°	132
DN25 [1"] lens antenna	10°	87
DN40 [11/2"] lens antenna	8°	70
DN70 [2¾"] lens antenna	4°	35

Avoid a mounting position where any inflow of product enters the emission range of microwaves.
 Take appropriate measures such as changing the mounting location or the product loading method.



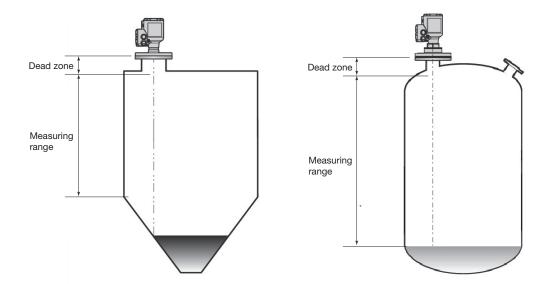
① Correct mounting position

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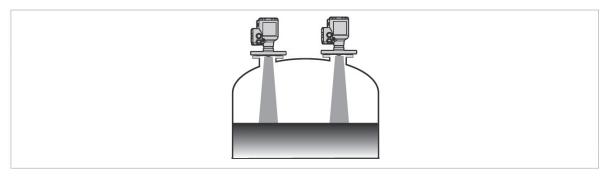
② Inflow of product may disturb measurement.

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• For tanks whose bottom is not flat but dish- or cone-shaped, the measuring range is from the lower end of the dead zone to the lower end of the cylindrical part of the tank. It is not possible to measure the level precisely below the cylindrical part.

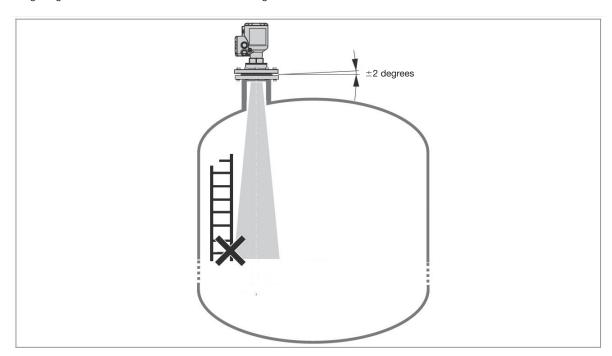


• Multiple TLR7500 units can be mounted on the same vessel. In this case, however, mount them as far as possible from each other.



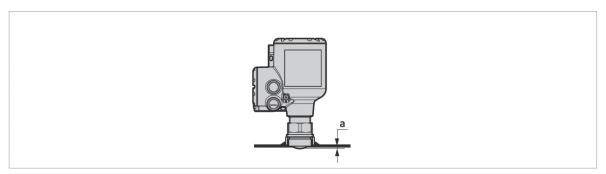
Mounting method

The mounting flange face should not be tilted more than ±2 degrees.



Thread mounting

• Weld a half coupling on the vessel roof. Do not screw in the thread with an excessive torque.

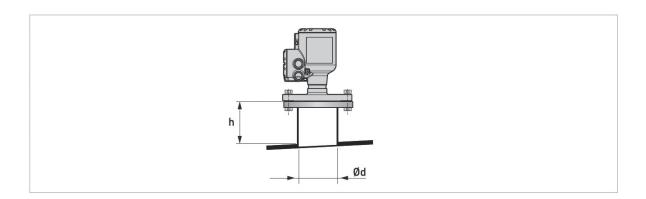


Dimension a: 6mm for DN20, DN25, and DN40 lens antennas

Flange mounting

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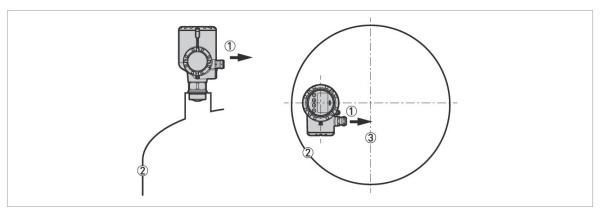
- Insert a gasket between the flanges of the vessel and the TLR7500 and fix them all with bolts and nuts.
- The nozzle length should be as short as possible and kept within the allowable range listed in the table below.
- Use an antenna extension when the antenna is shorter than the nozzle (DN40 lens antenna).
- If the flange size is smaller than 80A [3"] and the nozzle is short, use a stud bolt to connect the flange. Hexagonal bolts may interfere with the converter housing and may not be usable.



Nozzlo	liameter (ad)		Allowable max. r	nozzle length (h)	
NOZZIE (diameter (ød)	DN20	DN25	DN40	DN70
[mm]	[inch]	[mm]	[mm]	[mm]	[mm]
20	3/4	50	_	_	_
25	1	50	50	_	_
40	1½	50	50	50*	_
50	2	100	100	150*	_
80	3	150	150	200*	250
100	4	150	200	300*	350
150	6	200	300	500*	550
200	8	300	400	700*	750

*: When an antenna extension is used, its length is added to the allowable maximum nozzle length (DN40 PEEK antenna).

Mounting direction



- 1) Cable entry
- ② The nearest tank wall
- (3) Center of tank
- Ideally, the cable entry should be located toward the center of the tank.

ANTENNAS AND THEIR APPLICATIONS

PEEK antenna [Process connection temp. : max. 150°C (standard), max. 200°C (with distance piece)]

Tuna	f audauma		Lens a	ntenna	
Type o	fantenna	DN20	DN25	DN40	DN70
	G¾", ¾ NPT thread	0	=	=	=
	G1", 1 NPT thread	-	0	=	-
	G11/2", 11/2 NPT thread	=	=	0	=
	G3", 3 NPT thread	-	-	-	0
	50A JIS	-	_	0	-
	80A JIS	-	-	0	0
Process connection	100A JIS	-	_	-	0
Frocess connection	150A JIS	-	_	-	0
	200A JIS	_	_	_	0
	ASME 2"	-	_	0	-
	ASME 3"	_	_	0	0
	ASME 4"	_	_	_	0
	ASME 6"	-	_	-	0
	ASME 8"	_	_	-	0
	Measuring range	Max. 5m	Max. 10m	Max. 25m	Max. 50m
	Beam angle (both-angle)	15 degrees	10 degrees	8 degrees	4 degrees
Antenna specifications	Beam range (one-angle)	132 mm/m	87 mm/m	70 mm/m	35 mm/m
	Antenna extension	_	_	O *1	_
	PEEK flange plate	=	=	O *1	0

○: Most suitable, -: Cannot be used

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PTFE antenna [Process connection temp. : max. 150°C (standard)]

Type of a	ntonno	Lens antenna
Type of a	ntenna	DN40
	50A JIS	0
	80A JIS	0
Process connection	100A JIS	0
Process connection	ASME 2"	0
	ASME 3"	0
	ASME 4"	0
	Measuring range	Max. 25m
Antenna specifications	Beam angle (both-angle)	8 degrees
Antenna specifications	Beam range (one-angle)	70 mm/m
	PTFE flange plate	Attached

O: Possible

^{\$1} : Combination of antenna extension and flange plate is not possible.

MODEL AND SPECIFICATION CODES

Model: TLR7500

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DN20 lens antenna

Spec.code VFDF 4 4 V		0	2	1	Щ	C		1 0	4		(0 0			Description	Sto
Fixed code VFDF 4 4 V	-															0
	0							_	1		_	1			Standard (Non-Ex)	0
	K														IECEx: Intrinsically safe Ex ia IIC T6T3 Ga/Gb Ex ia IIIC T85°CT150°C or T85°CT200°C Da/Db	
Approval	L														IECEx: Flameproof Ex db ia IIC T6T3 Ga/Gb Ex ia tb IIIC T85°CT150°C or T85°CT200°C Da/Db	
	U														JPN Ex: Intrinsically safe Ex ia IIC T6T3 Ga/Gb Ex ia IIIC T85°CT150°C or T85°CT200°C Da/Db	
	W														JPN Ex: Flameproof Ex db ia IIC T6T3 Ga/Gb Ex ia tb IIIC T85°CT150°C or T85°CT200°C Da/Db	
Fixed code		0													Always 0	0
A		()				\sqcap		Τ						N/A	0
Approval 2		3	3						T	П		T			NACE design (MR0175/MR0103/ISO 15156)	
Housing type/material			2												Compact type housing (aluminum), IP66/IP68	0
Output			1	1					T			T			Two-wire system/4-20 mA passive (HART®)	0
Cable entry/cable gland				1											M20 \times 1.5 without cable gland (Cable entry : For G½ female thread, select M20 \times G½ adapter as an option.) (For JPN Ex of flameproof / dust ingnition, select the Flameproof cable gland (G½) as an option.)	С
				2					_		_				M20 × 1.5 with a plastic cable gland	_
				3			Ш		_		4				M20 × 1.5 with a metal cable gland	_
				С	\perp										M20 × 1.5 with ½NPT female adapter	
Display					0		Ш	\perp	L		4	\perp			Without display unit	
					4		Ш		L	Ш		\perp			With a plug-in display unit	C
Display language					L	1									English	
						7									Japanese	_ C
Fixed code						C									Always 0	C
							1								FKM/FPM / -40 to +150°C	C
							2								EPDM / -50 to +150°C	
Seal material/temperature	e ran	ge					3								Kalrez® 6375 / –20 to +150°C	
							5								FKM/FPM / -40 to +200°C, with distance piece	
							6								Kalrez® 6375 / –20 to +200°C, with distance piece	
Antenna type								1							DN20 (¾") lens antenna/PEEK ¾" thread connection	С
Antenna extension								0							N/A	C
Dresses sens			SO 2	228	-1, t	hre	ad		E	Р	0	T			G ¾A	C
Process connection/type			ASM	ΕВ	1.20).1,	thre	ad	E	Α	0	T	П		3/4NPT	
Fixed code									,			0 0			Always 00	
Δ '													0		N/A	
Accessories													1		Weatherproof protection *2	
													-	Blank	• •	
Special specification														/Z	For special requirements *1	+-

^{*1:} Special requirements not included in the above coding system should be designated by adding "/Z" at the end of the code. Consult us for the availability of such requirements before ordering.*2: Select awning when installing in a place exposed to direct sunshine or heavy wind and rain.

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DN25 lens antenna

Approval	Spec.code VFDF 4 4 W	0		2	1		С		2	0			0	0			Description	Std.
Approval	Fixed code VFDF 4 4 W																	0
Ex la IIC T6T3 Ga/Gb Ex la IIC T6T		0		П			Т	Τ									Standard (Non-Ex)	0
Approval		К															Ex ia IIC T6T3 Ga/Gb	
U	Approval	L															Ex db ia IIC T6T3 Ga/Gb	
W		U															Ex ia IIC T6T3 Ga/Gb	
Approval 2 3		W															Ex db ia IIC T6T3 Ga/Gb	
NACE design (MR0175/MR0103/ISO 15156)	Fixed code	0															Always 0	0
NACE design (MPIOT //MRIOTUS//ISO 15156)	Approval 2		0	Ш			\prod										N/A	0
Two-wire system/4-20 mA passive (HART®)	Approval 2		3														NACE design (MR0175/MR0103/ISO 15156)	
1	Housing type/material			2													Compact type housing (aluminum), IP66/IP68	0
Cable entry/cable gland	Output				1												Two-wire system/4–20 mA passive (HART®)	0
M20 × 1.5 with a metal cable gland M20 × 1.5 with ½NPT female adapter M20 × 1.5	Cable entry/cable gland																(Cable entry: For G½ female thread, select M20 × G½ adapter as an option.) (For JPN Ex of flameproof / dust ingnition, select the Flameproof cable gland (G½) as an option.)	0
C								\perp				\perp	L		\perp		·	
Display Disp																	9	
Antenna type					(\perp	\perp							\perp		·	
4	Dienlay					-											Without display unit	
Display language	Display					4											With a plug-in display unit	0
7	Display language						1										English	
1	Display language						7										Japanese	0
2	Fixed code						C)									Always 0	0
Seal material/temperature range								1									FKM/FPM / -40 to +150°C	0
Special specification								2									EPDM / -50 to +150°C	
Comparison Com	Seal material/temperature ra	nge						3									Kalrez® 6375 / –20 to +150°C	
Antenna type 2								5									FKM/FPM / -40 to +200°C, with distance piece	
Anterina type								6									Kalrez® 6375 / –20 to +200°C, with distance piece	
ISO 228-1, thread	Antenna type								2									0
ASME B1.20.1, thread F A 0	Antenna extension									0				П			N/A	0
ASME B1.20.1, thread F A 0	D		IS	SO 2	228	8-1, th	rea	ad		1	FI	P 0		П	1		G 1 A	0
Accessories 0 N/A 1 Weatherproof protection *2 Blank N/A O	Process connection/type		Α	SM	EE	31.20	.1,	thre	eac	П	F	4 0		П	1		1 NPT	
Accessories 0 N/A 1 Weatherproof protection *2 Blank N/A O	Fixed code		-										0	0	7		Always 00	0
1 Weatherproof protection *2	Α .												-	`	0		,	0
Special specification Blank N/A	Accessories													ŀ	1		Weatherproof protection *2	
Special specification	0														\top	Blank		0
	opecial specification															/Z	For special requirements *1	

^{\$1:} Special requirements not included in the above coding system should be designated by adding "/Z" at the end of the code. Consult us for the availability of such requirements before ordering.\$2: Select awning when installing in a place exposed to direct sunshine or heavy wind and rain.

DN40 lens antenna (Antenna material: PEEK)

Spec.code VFDF 4 4 Fixed code 4 4		()	2	1	+	0	;	3	-	-	\square	0	0	4		Description	Sto
rixed code 4 4		+	+	-						+	-	Н	-	-	+		Otto double (Nov. Ev.)	0
	C	+	+	╀	+	++	+	++	+	+	+	Н	+	+	+		Standard (Non-Ex)	+
	L																IECEx : Intrinsically safe	
	k	`															Ex ia IIC T6T3 Ga/Gb	
	-	+	+	-	\perp	+	+	+	\perp	+		Н		-	+		Ex ia IIIC T85°CT150°C or T85°CT200°C Da/Db	-
	١.																IECEx : Flameproof	
A	L	-															Ex db ia IIC T6T3 Ga/Gb	
Approval		\perp		-						-		Н	_	4	4		Ex ia tb IIIC T85°CT150°C or T85°CT200°C Da/Db	
																	JPN Ex (-JEx): Intrinsically safe	
	ľ	۱ ا															Ex ia IIC T6T3 Ga/Gb	
		\perp	\perp	╙		Ш			\perp	\perp		Ш		_	4		Ex ia IIIC T85°CT150°C or T85°CT200°C Da/Db	
																	JPN Ex (-JEx) : Flamproof	
	V	٧															Ex db ia IIC T6T3 Ga/Gb	
																	Ex ia tb IIIC T85°CT150°C or T85°CT200°C Da/Db	
Fixed code		C)														Always 0	C
Approval 0			0														N/A	C
Approval 2			3									П					NACE design (MR0175 / MR0103 / ISO 15156)	
Housing type / materia	al			2		П				T		П			\top		Compact type housing, aluminium - IP66 / IP68	С
Output					1	Ħ	T			T		П		1	\top		Two-wire system / 4-20 mA passive HART®	
						\Box	+			+		H		1	\dagger		M20 × 1.5 / without cable gland	
																	(Cable entry: For $G\frac{1}{2}$ female thread, select M20 \times $G\frac{1}{2}$	
					-												adapter as an option.)	10
																	(For JPN Ex of flameproof / dust ingnition, select the	
Cable entry / cable gla	and																Flameproof cable gland (G½) as an option.)	
					2	,	+	+	+	+	+	Н	\dashv	\dashv	+		M20 × 1.5 / with a plastic cable gland	+
					3		+	+	+	+		Н	+	+	+		M20 × 1.5 / with a metal cable gland	
							-	+	+	+	+	Н		+	+		-	-
					-	-	+	++	+	+	+	Н	-	\dashv	+		M20 × 1.5 / with ½ NPT female adapter	+
Display						0	_	+	_	+		Н	_	\dashv	+		Without display unit	+
						4		++	-	+		Н		_	4		With a plug-in display unit	С
Display language						L	1	\perp	_	\perp		Ш			4		English	
							7					Ш			_		Japanese	C
Fixed code							0					Ш					Always 0	С
								1									FKM/FPM / -40 to +150°C	C
								2				П					EPDM / -50 to +150°C	
								3									Kalrez® 6375 / -20 to +150°C	
0 1								4		\top		П		\exists	\top		PEEK (with flange plate) / -50 to +150°C	
Seal material / tenpera	ature ra	anç	ge					5	\top	$^{+}$		Н			\top		FKM/FPM / -40 to +200°C, with distance piece	
								6				H		1	\dagger		Kalrez® 6375 / -20 to +200°C, with distance piece	
										+		Н	-		+		PEEK (with flange plate) / –50 to +200°C, with distance	
								7									piece	
										+		Н	+	+	+		DN40 (1.5") lens antenna / PEEK, 1.5" thread or flange	
Antenna type								;	3								connection	C
									C	1		Н	_	+	+		N/A	+c
Antenna extension / fla	ango r	.lat	_						1	_		Н	+	+	+		Antenna extension (112 mm / SS316L)	+
Antenna extension/ ne	ange p	лас							Α	_		Н		-	+		Flange plate (PEEK)	
	100	000		41-					F		-		+	+	+		G1-½A (Not selectable with flange plate)	+
	ISO 2						_				P		_	\dashv	+		, , ,	
	ASM	IE E	31.2	20.	1, tr	irea	d	_		_	iA		_	4	4		1-1/2"NPT (Not selectable with flange plate)	
										Н		Α	4	4	4		2" 150lb RF	1
Process connection	ASM	IF F	316	5.5	flan	ne.				_	2				_		2" 300lb RF (Not selectable with flange plate)	
1 100000 0011110011011	AOIVI		٠١٠	,.0	iiaii	90				L		Α	_[3" 150lb RF (Not selectable with flange plate)	\perp
										L	2	Α	T	\top	T		3" 300lb RF (Not selectable with flange plate)	
		200		r,						Н	U	Р		\exists	\top		50A JIS10K RF	
	JIS E	322	220	tia	nge						U		1	\dashv	\top		80A JIS10K RF (Not selectable with flange plate)	
											1		0	0	+		Always 00	
Fixed code														\rightarrow	+		·	
Fixed code															nι		N/A	
Fixed code Accessories														- 1	0		N/A Weatherproof protection #2	+
														- 1	1	Blank	Weatherproof protection *2	

^{*1:} Special requirements not included in the above coding system should be designated by adding "/Z" at the end of the code. Consult us for the availability of such requirements before ordering.*2: Select awning when installing in a place exposed to direct sunshine or heavy wind and rain.

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DN40 lens antenna (Antenna material: PTFE)

Spec.code VFDF 4 4		0		2 1			() A	Α	С				0	0			Description	Std.
Fixed code 4 4		Ш				Ш													0
	C	۱																Standard (Non-Ex)	0
																		IECEx : Intrinsically safe	
	k																	Ex ia IIC T6T3 Ga/Gb	
																		Ex ia IIIC T85°CT150°C or T85°CT200°C Da/Db	
																		IECEx : Flameproof	
	L	.																Ex db ia IIC T6T3 Ga/Gb	
Approval																		Ex ia tb IIIC T85°CT150°C or T85°CT200°C Da/Db	
																		JPN Ex (-JEx): Intrinsically safe	
	L	1																Ex ia IIC T6T3 Ga/Gb	
																		Ex ia IIIC T85°CT150°C or T85°CT200°C Da/Db	
																		JPN Ex (-JEx) : Flamproof	
	V	/																Ex db ia IIC T6T3 Ga/Gb	
																		Ex ia tb IIIC T85°CT150°C or T85°CT200°C Da/Db	
Fixed code		0																Always 0	0
A = = = = 1 O			0											T				N/A	0
Approval 2			3															NACE design (MR0175 / MR0103 / ISO 15156)	
Housing type / material				2					Г									Compact type housing、aluminium - IP66/IP68	0
Output				1														Two-wire system / 4-20 mA passive HART®	0
									T									M20 × 1.5 / without cable gland	
																		(Cable entry : For G½ female thread, select M20 \times G½	
					1													adapter as an option.)	
																		(For JPN Ex of flameproof / dust ingnition, select the	
Cable entry / cable glan	d																	Flameproof cable gland (G½) as an option.)	
					2		T	\top				П		T		\top		M20 × 1.5 / with a plastic cable gland	\top
					3			\top						T				M20 × 1.5 / with a metal cable gland	\top
					C									1				M20 × 1.5 / with ½ NPT female adapter	
						0	T	\top				П		T		\top		Without display unit	\top
Display						4	T							1				With a plug-in display unit	0
							1		T					\top				English	
Display language						r	7	\top	T			Г	\forall	\top				Japanese	10
Fixed code							(5						T				Always 0	0
Seal material / tenperatu	ure rar	nae						Α				П		\forall		\vdash		PTFE, 0 kPa to 1.6 MPa / -50 to +150°C	0
Antenna type		<u>J - </u>							A					\top		\vdash		DN40 (1.5") lens antenna / PTFE, flange connection	0
Flange plate	-									С				\forall				Flange plate (PTFE)	0
g p										1-	Н	1	Α	†				2" 150lb RF	Ť
	ASM	F B	16.	5 fl	and	ne					L	1		\forall				3" 150lb RF	_
						,-					M			\forall		\vdash		4" 150lb RF	_
Process connection												Ū		+		\vdash		50A JIS10K RF	
	JIS E	1222	n f	flan	ae							-		+				80A JIS10K RF	+
	0.0 L				ອິ						М			+	+	+		100A JIS10K RF	+
Fixed code											141	J	\rightarrow	0	0	+		Always 00	-
i ixou coue														٦	0	1		N/A	
Accessories															1	+		Weatherproof protection *2	+
															1	-	ank	N/A	
Special specification																-	ziik Z	For special requirements *1	+
																/	_	i oi apediai requirementa 🖚	

^{*1:} Special requirements not included in the above coding system should be designated by adding "/Z" at the end of the code. Consult us for the availability of such requirements before ordering.
*2: Select awning when installing in a place exposed to direct sunshine or heavy wind and rain.

DN70 lens antenna

Spec.code	VFDF VFDF			-	2	1	Н	- 0)	4	+	+	+		0 0	\vdash		Description	Std
Fixed code	VFUF	4 4 7	0	+	\mathbb{H}	+	H	+	+	H	+	+	+	+	+	+		Standard (Non-Ex)	0
					Н	+	\vdash	+	+	Н		+	+	-	+			IECEx: Intrinsically safe	
			K															Ex ia IIC T6T3 Ga/Gb	
																		Ex ia IIIC T85°CT150°C or T85°CT200°C Da/Db	
																		IECEx: Flameproof	
			L															Ex db ia IIC T6T3 Ga/Gb	
Approval																		Ex ia tb IIIC T85°CT150°C or T85°CT200°C Da/	
Арріочаі				+	H	+	Н	+	+	\vdash	+	+	+	+	+	\vdash		JPN Ex: Intrinsically safe	
			U															Ex ia IIC T6T3 Ga/Gb	
																		Ex ia IIIC T85°CT150°C or T85°CT200°C Da/Db	
																		JPN Ex: Flameproof	
			W															Ex db ia IIC T6T3 Ga/Gb	
																		Ex ia tb IIIC T85°CT150°C or T85°CT200°C Da/	
Fixed code			0		H	+	Н	+	+	Н		+	+	+	+	\vdash		Always 0	0
i ixed code			0	0	H	+	Н	+	+	Н		+	+	-	+	\vdash		N/A	0
Approval 2				3	H	+	Н	+		Н	-	+	+	+		\vdash		NACE design (MR0175/MR0103/ISO 15156)	
Housing type/m	natorial			J	2	+	Н	+		Н		+	+	+	+	\vdash		Compact type housing (aluminum), IP66/IP68	0
Output	lateriai				$\overline{}$	1	Н	+	+	\vdash	+	+	+	+	+	\vdash		Two-wire system/4–20 mA passive (HART®)	-
Output						+	Н	+	+	\vdash	+	+	+	+	+	\vdash		M20 × 1.5 / without cable gland	
																		(Cable entry: For G½ female thread, select M20 ×	
						1												G½ adapter as an option.)	0
O-1-1		ı																(For JPN Ex of flameproof / dust ingnition, select the	
Cable entry/cab	ne giano	ג				Ļ	Ш	4		Н	_	4	_	4		\perp		Flameproof cable gland (G½) as an option.)	
						2	-			Н		4	4			\perp		M20 × 1.5 with a plastic cable gland	
						3				Ш		4						M20 × 1.5 with a metal cable gland	
						С	-	4		Н				_		\perp		M20 × 1.5 with ½ NPT female adapter	
Display							0	_	-	Н	_		_	_	_	\vdash		Without display unit	
							4	4	_	Н	_	+	4	+	_	\vdash		With a plug-in display unit	0
Display languag	ge							1	+	\vdash	+	+	+	+	_	\vdash		English	
F. 1 1								7	_	\vdash	_	+	+	_	_	\vdash		Japanese	0
Fixed code								()	Н		1	4	_		\vdash		Always 0	0
									1	Н	_	-						FKM/FPM / -40 to +150°C	0
									2	Н	_			_		\vdash		EPDM / -50 to +150°C	
									3	Н	_	+	4	_		\vdash		Kalrez® 6375 / –20 to +150°C	
Seal material/te	mperati	ure ran	ge						5	\vdash	_	+	-	+	+	\vdash		PEEK (with flange plate) / –50 to +150°C	
									6	\vdash	+	+	+	+	_	\vdash		FKM/FPM / -40 to +200°C, with distance piece Kalrez® 6375 / -20 to +200°C, with distance piece	
										Н	_	+	+	+	+	\vdash		PEEK (with flange plate) / –50 to +200°C, with	
									7									distance piece	
												+	+	+		\vdash		DN70 (2.75") lens antenna/PEEK	
Antenna type										4								3" thread or flange connection	0
Antonno ovtono	ion/flon	ماما مم									0							N/A	0
Antenna extens	ion/nan	ge piai	le								Α							Flange plate/PEEK	
				IS	SO 2	228-	1, t	hre	ad		I		Р	0				G 3A (Not selectable with flange plate)	
				Α	SM	EΒ	1.20).1,	thr	ead	I		Α	0				3 NPT (Not selectable with flange plate)	
				Г							I		1	Α				3" 150 lb RF	
											ī		2	Α				3" 300 lb RF (Not selectable with flange plate)	
											N	Л	1	Α				4" 150 lb RF (Not selectable with flange plate)	
Process connec	ction/			_	O N A	E B	16 1	- fl	000	_	Ν	M.	2	Α				4" 300 lb RF (Not selectable with flange plate)	
)tioii/			^	SIVI	ΕБ	10.3), 11	ang	е	F	0	1	Α				6" 150 lb RF (Not selectable with flange plate)	
Type/											F	5	2	Α				6" 300 lb RF (Not selectable with flange plate)	
Rating												3	1	Α		П		8" 150 lb RF (Not selectable with flange plate)	
					_						F	3	2	Α				8" 300 lb RF (Not selectable with flange plate)	
											_	_	U	_	I			80A JIS 10K RF	0
					S E	3222	n fi	anc	10				U		I			100A JIS 10K RF (Not selectable with flange plate)	
				ال	0 0	,	.0 11	arıç	JC.			_	U	_	\Box			150A JIS 10K RF (Not selectable with flange plate)	
											F	٦ [U					200A JIS 10K RF (Not selectable with flange plate)	
														T	0 0			Always 00	
Fixed code														'	0 0	_		7 tivaye oo	
Fixed code															0 0	0		N/A	0
Fixed code Accessories														'		-		,	0
	ration															0	Blank	N/A Weatherproof protection *2	0

^{*1:} Special requirements not included in the above coding system should be designated by adding "/Z" at the end of the code. Consult us for the availability of such requirements before ordering.
*2: Select awning when installing in a place exposed to direct sunshine or heavy wind and rain.

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STANDARD ACCESSORIES

Parameter sheet : 1
Instruction manual : 1
Magnet for setting parameters : 1
Tool for opening the converter cover : 1
Tool for removing the display : 1

OPTIONS

- M20 × G½ female adapter: [GA]
- Flameproof cable gland (G½): [DG]
 Note: Service temperature -40°C to +80°C
- Individual data setting of output ranges: [DS]

ORDERING INFORMATION

Measuring conditions

Measuring method

Distance

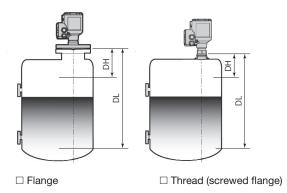
Measuring range

Distance from the process connection to the lowest level

() m

() m

Distance from the process connection to the highest level



Measured object

	ivame		()
	Dielectric constant (ε r))	
	Fluid		☐ Liqu	ıid	☐ Slurry
	Corrosivit	ty	\square No	\square Medium	☐ Strong
	Adhesiveness		\square No	\square Medium	☐ Strong
	Crystallinity		\square No	\square Medium	☐ Strong
	Waving		\square No	\square Medium	☐ Strong
	Foaming		\square No	\square Medium	☐ Strong
Operation	conditio	ns			
	Measuring location			☐ Outdoor	□ Indoor
	Fluid temperature			()	°C
	Ambient temperature			()	°C
	Pressure			()	MPa
	Explosionproof			□ Non-hazardous area	
				☐ Hazardous area	
Vessel co	nditions				
	Shape	☐ Ground tank☐ Closed pit		☐ Underground tank	
				□ Others	
	Height		()	
	Diameter	or width	()	
	Inner structure				
	☐ Yes:			☐ Agitator (shape:
	☐ Ther			rmometer	
	□ Reir			nforcement Ladder	
	□ Others				
	Material	\square Metal	()	
		Coating:	☐ Yes	\square N/A \square C	Others
Installatio	n conditi	ons			
	Location	Distanc	ce from	tank wall () m
	Distance from			inlet () m

ORDERING INSTRUCTIONS

Mounting nozzle

1. Model and specification code

Example Model: TLR7500, standard, DN25 lens antenna, G1" thread connection, with weather protection

Nozzle diameter

Nozzle height

Specification code: VFDF44W000211470120FP0001

Distance from obstacle (

) m

) mm

) mm

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- 2. Option (specified only when necessary)
 - Refer to "OPTIONS" and specify any with respective codes.
- 3. Special requirements (specified only when necessary)

 If you have any special requirements, let us know separately from
 - the model and specification code.

 Consult us for the availability of such requirements before ordering.
- 4. Intrinsically safe specification

This model needs a barrier.

5. Flameproof specification

This model needs a flameproof cable gland.

* Specification is subject to change without notice.

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TG-L2186-E03