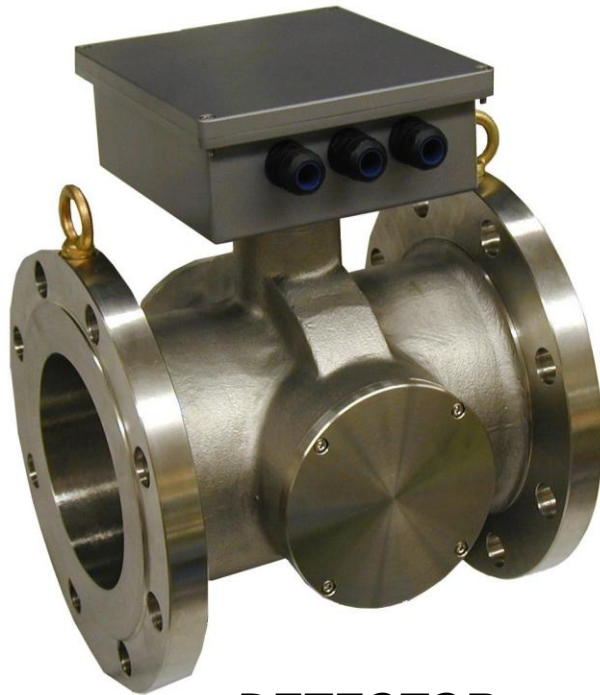


TOSHIBA

Density (Consistency) Meter



DETECTOR



CONVERTER

MODEL LQ500



Optional Line Up (Wetting parts):

TOSHIBA provides - on your request.

Wetting parts: Main pipe, Applicator base unit, and RTD sheath.

(1) SCS14A cast (equivalent to 316 SS) type.

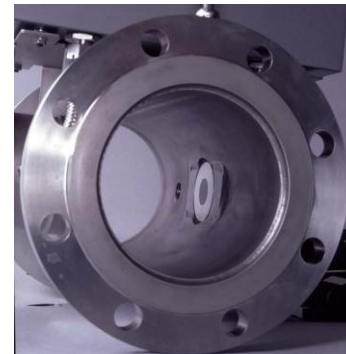
(2) Teflon PFA coating type.

(for sticky products)

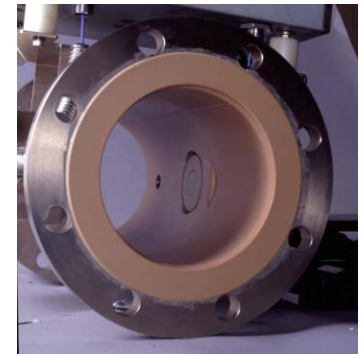
<Note>

(a) RTD sheath material: 316 SS.

(b) Applicator window: Polysulfone



SCS14A (std)

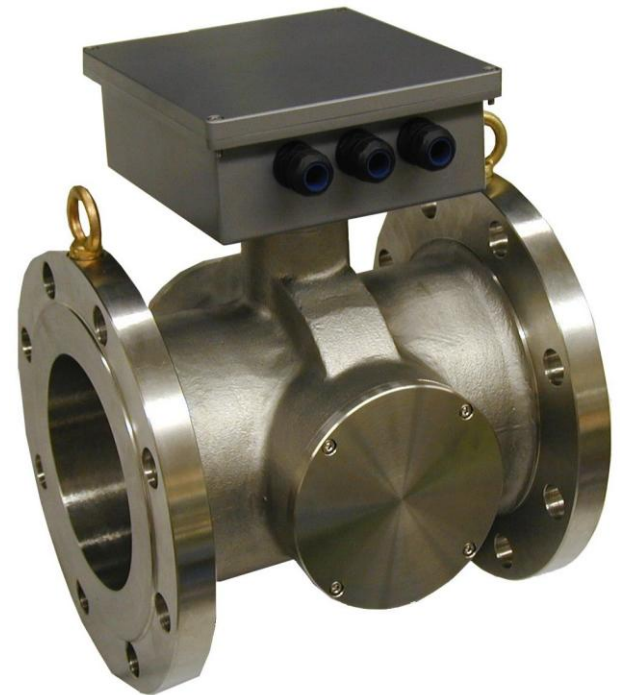
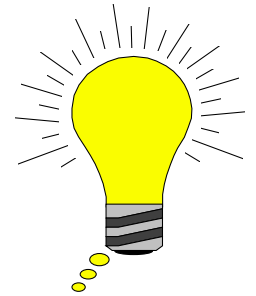


Teflon PFA coating

□ *No License Needed to Operate!*

- **Approved by FCC in USA.**
- **Declared CE.**

CE

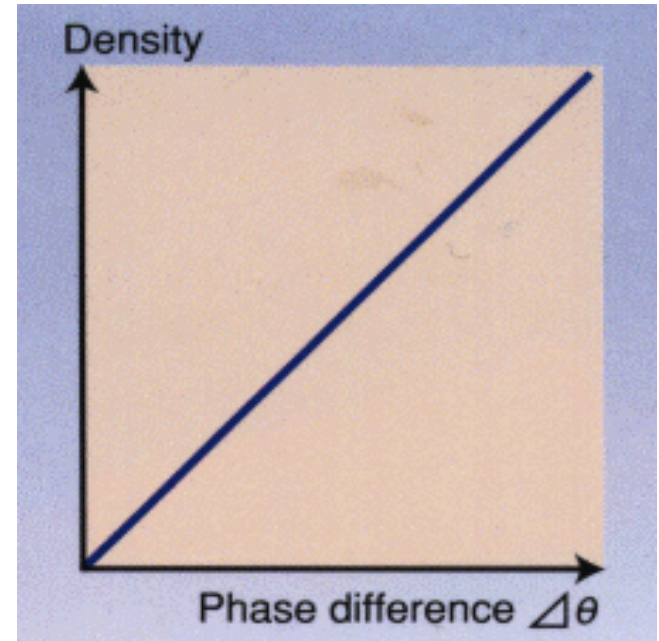
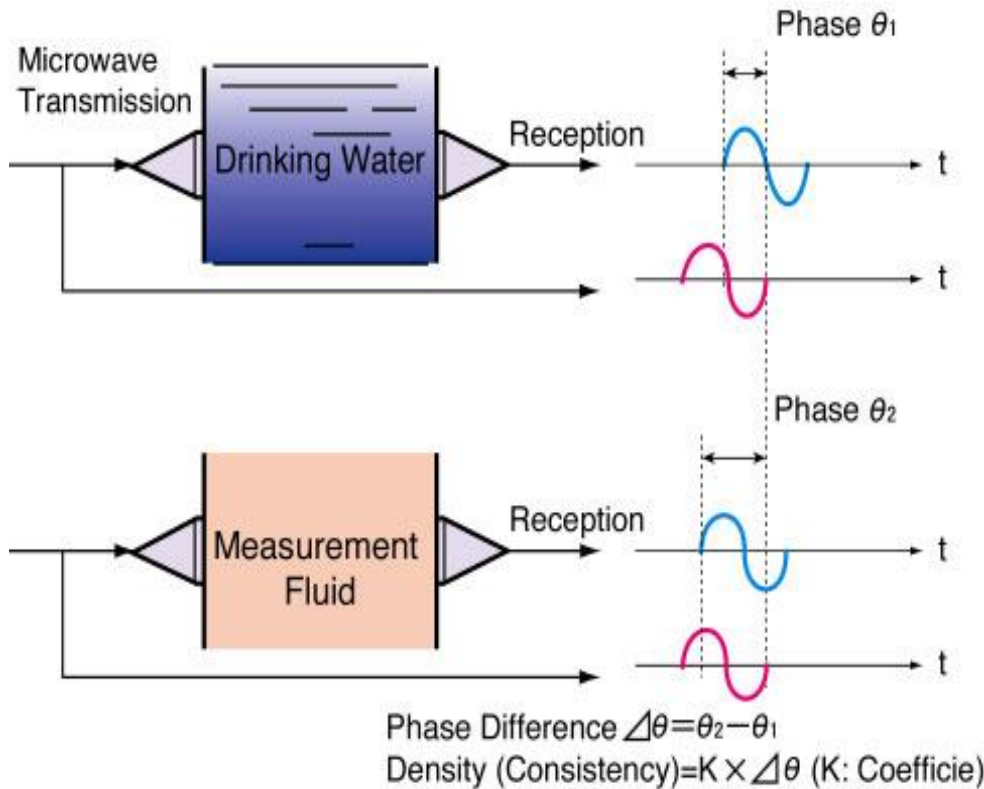


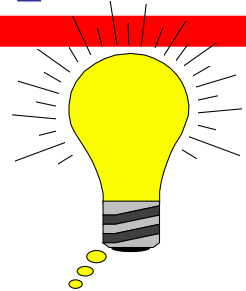


□ *FCC notice*

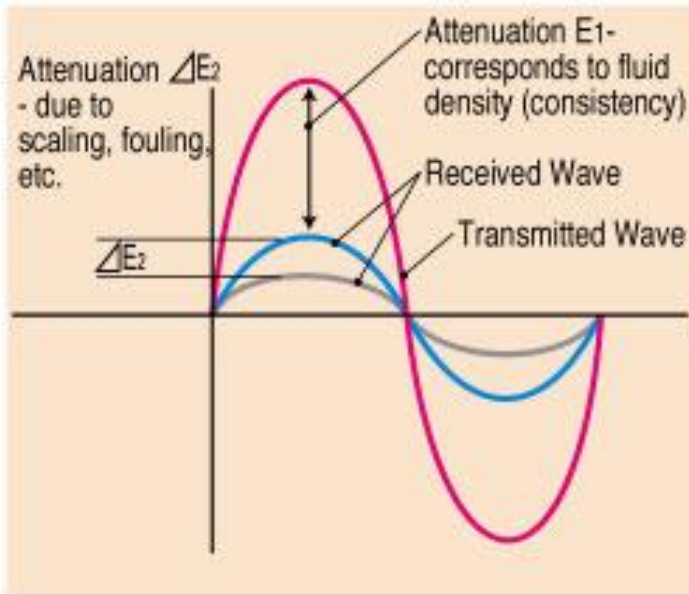
LQ500 has been tested and found to comply with the limits for a field disturbance sensor, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. LQ500 generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, it may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

Microwave Phase Difference

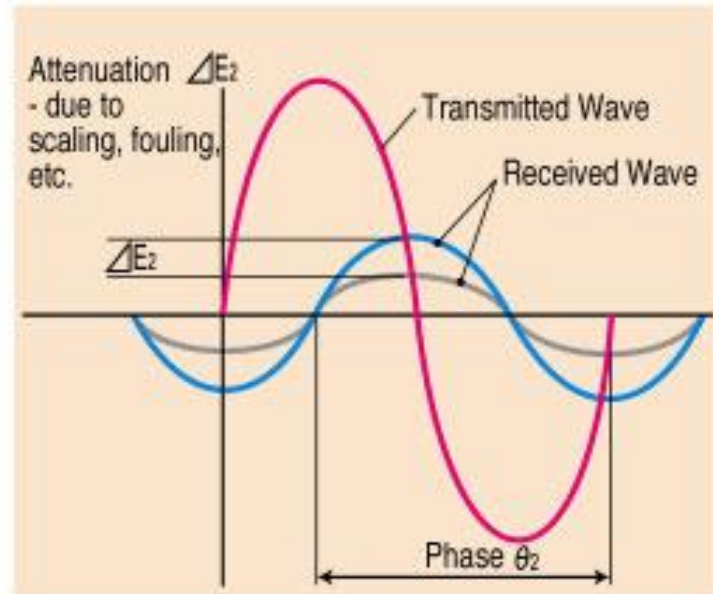




□ Not Easily Affected
by *Contaminants* !



Optics and Ultrasonic

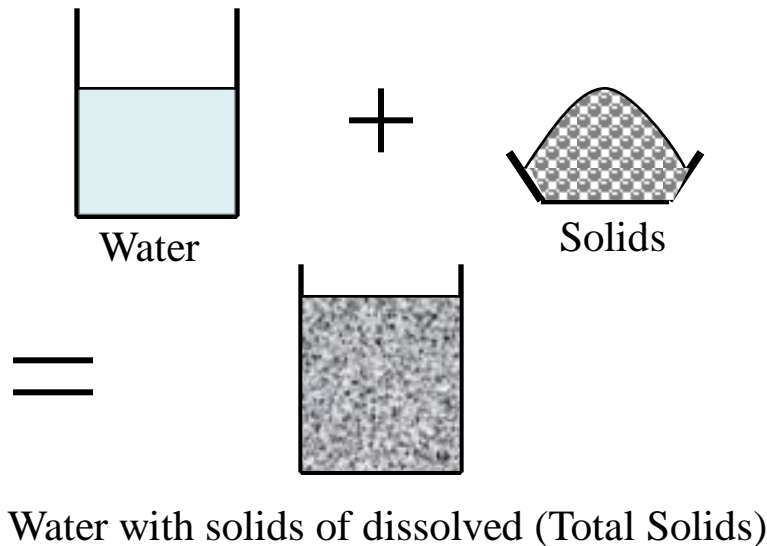


LQ500 (Microwave)

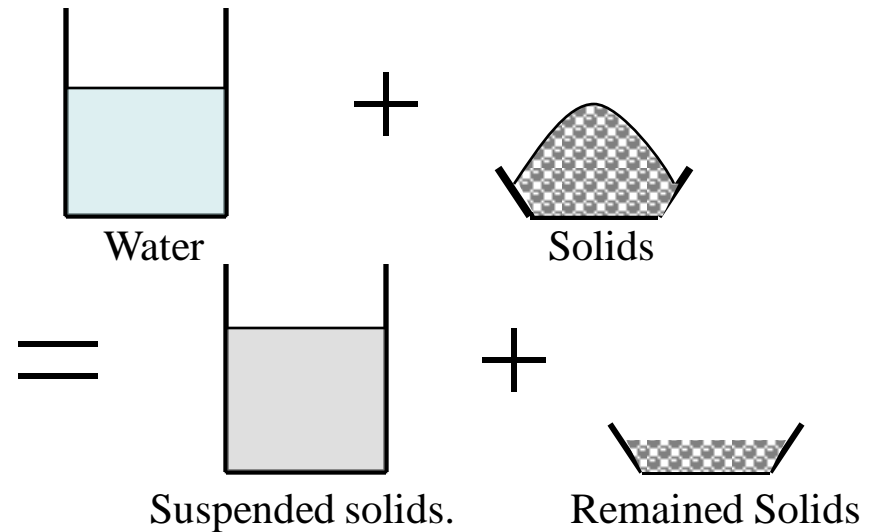
What is "%TS" ???

$$\text{TS} = \text{SS} + \text{DS} \quad (\text{DS: Dissolved Solids})$$

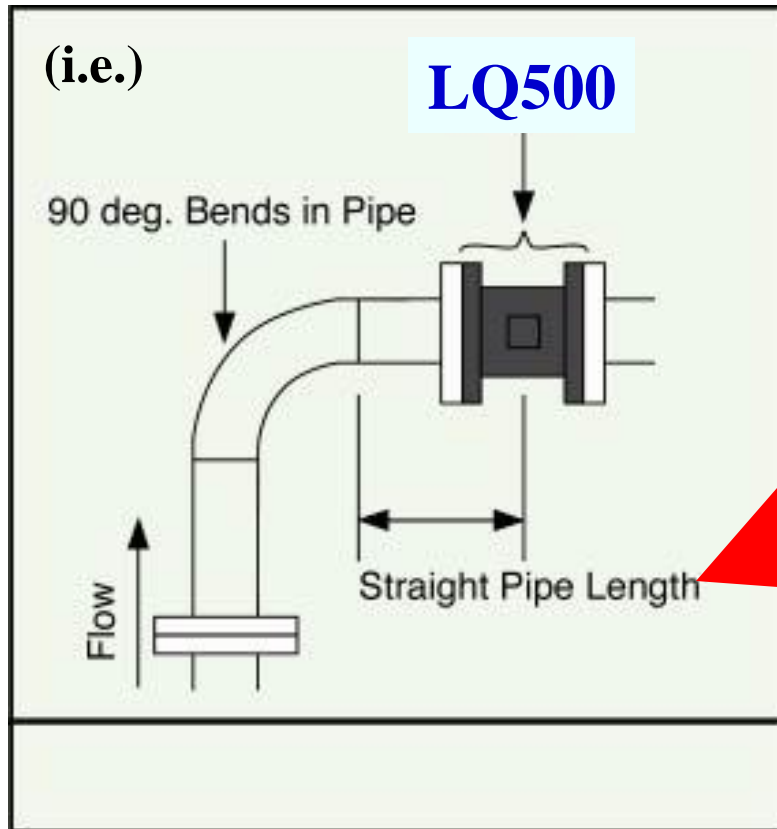
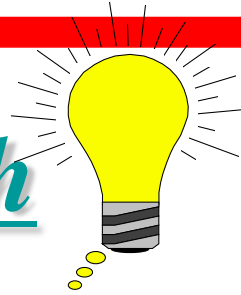
%TS : Total Solids



%SS : Suspended Solids



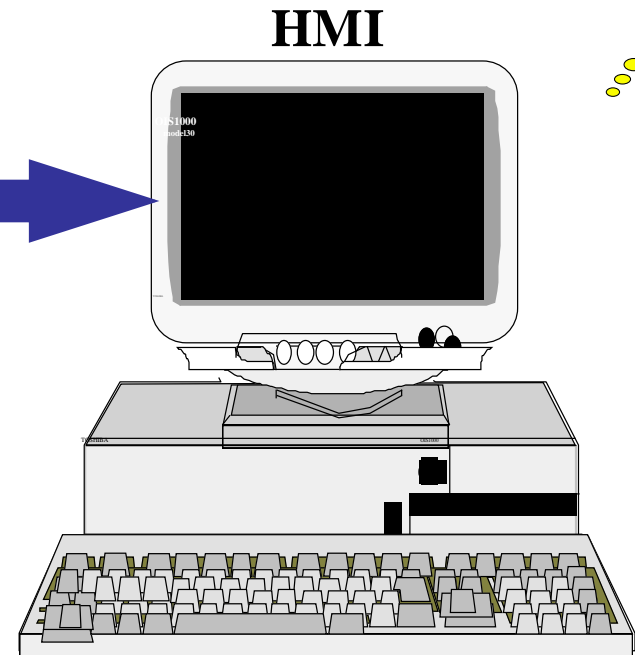
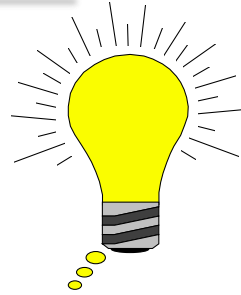
No Required Straight Pipe Length



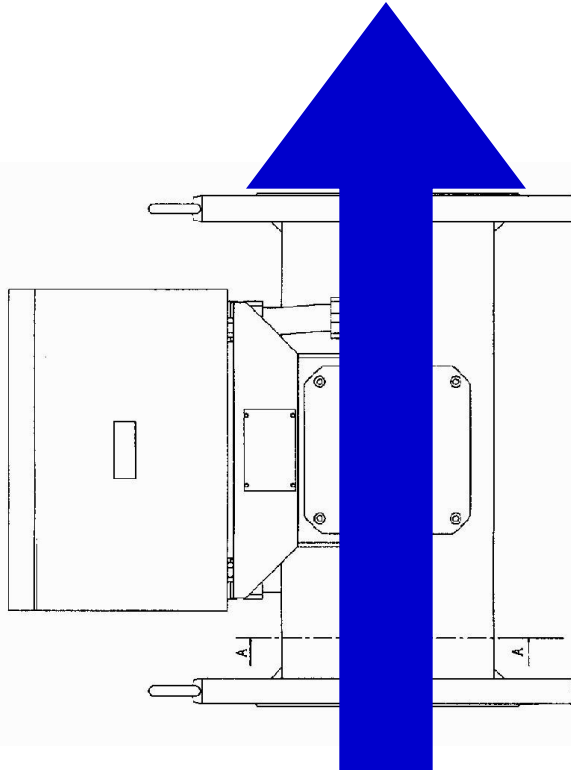
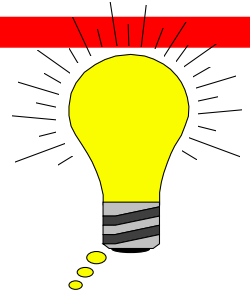
Unnecessary!

□ Continuous Measuring!! PV

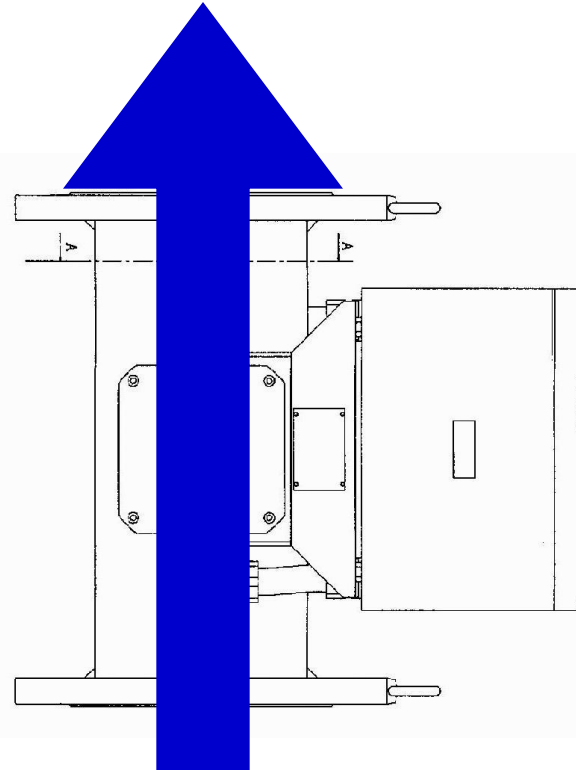
may be used for Process Control!!



No Required Flow direction



OK!!

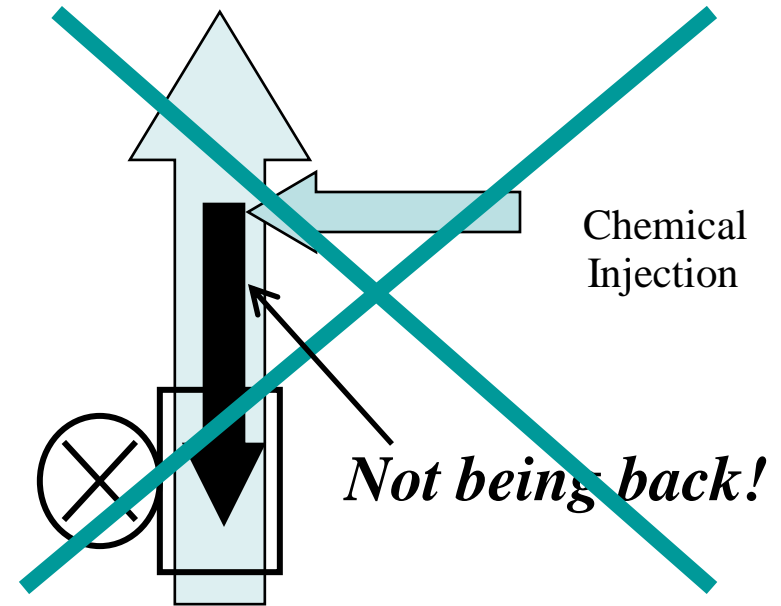
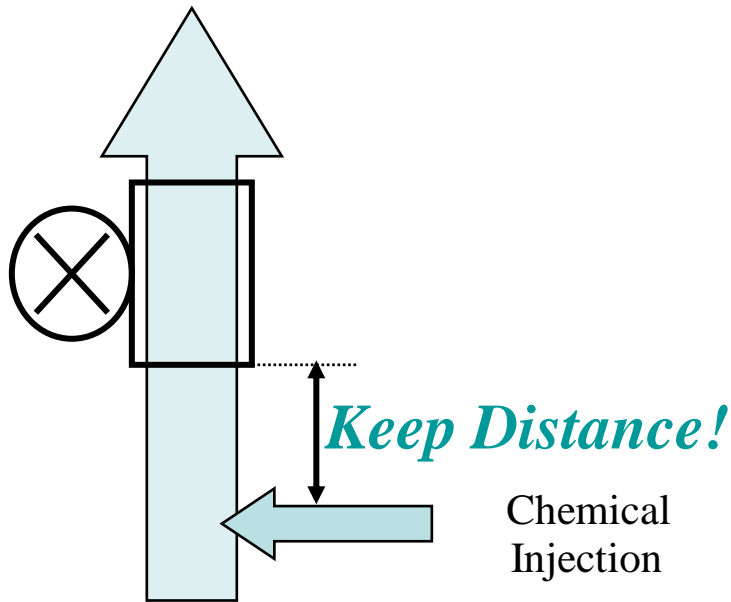


OK!!



•Fluid Conductivity Limitation

- (1) Measure the conductivity before installing LQ500.
- (2) Keep distance of Chemical Injection from LQ500.
 - To avoid Chemicals not mixed well with liquid.
 - To avoid unmixed Chemicals at the LQ500.





• Conductivity meter helps to check the value.

Handy type is easy to carry!

• Main Specification

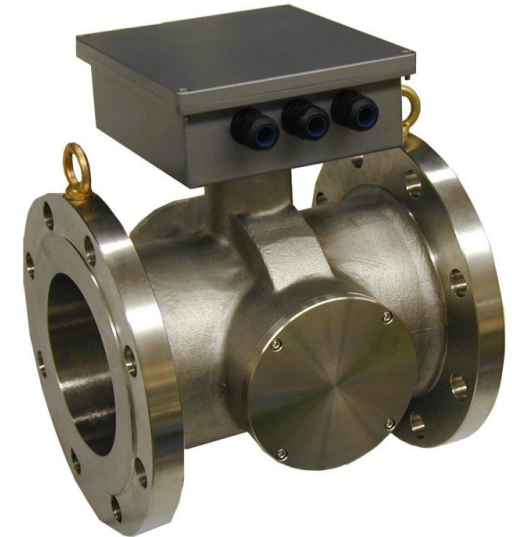
- 0 to 20.00 mS/cm (0.01 mS/cm step)
- Around US\$400





□ Meter size & Allowable Fluid Conductivity:

Meter Size	Fluid Conductivity
50mm (2'')	20 mS/cm max.
80mm (3'')	16 mS/cm max.
100mm (4'')	15 mS/cm max.
150mm (6'')	10 mS/cm max.
200mm (8'')	8 mS/cm max.
250mm (10'')	8 mS/cm max.
300mm (12'')	6 mS/cm max.

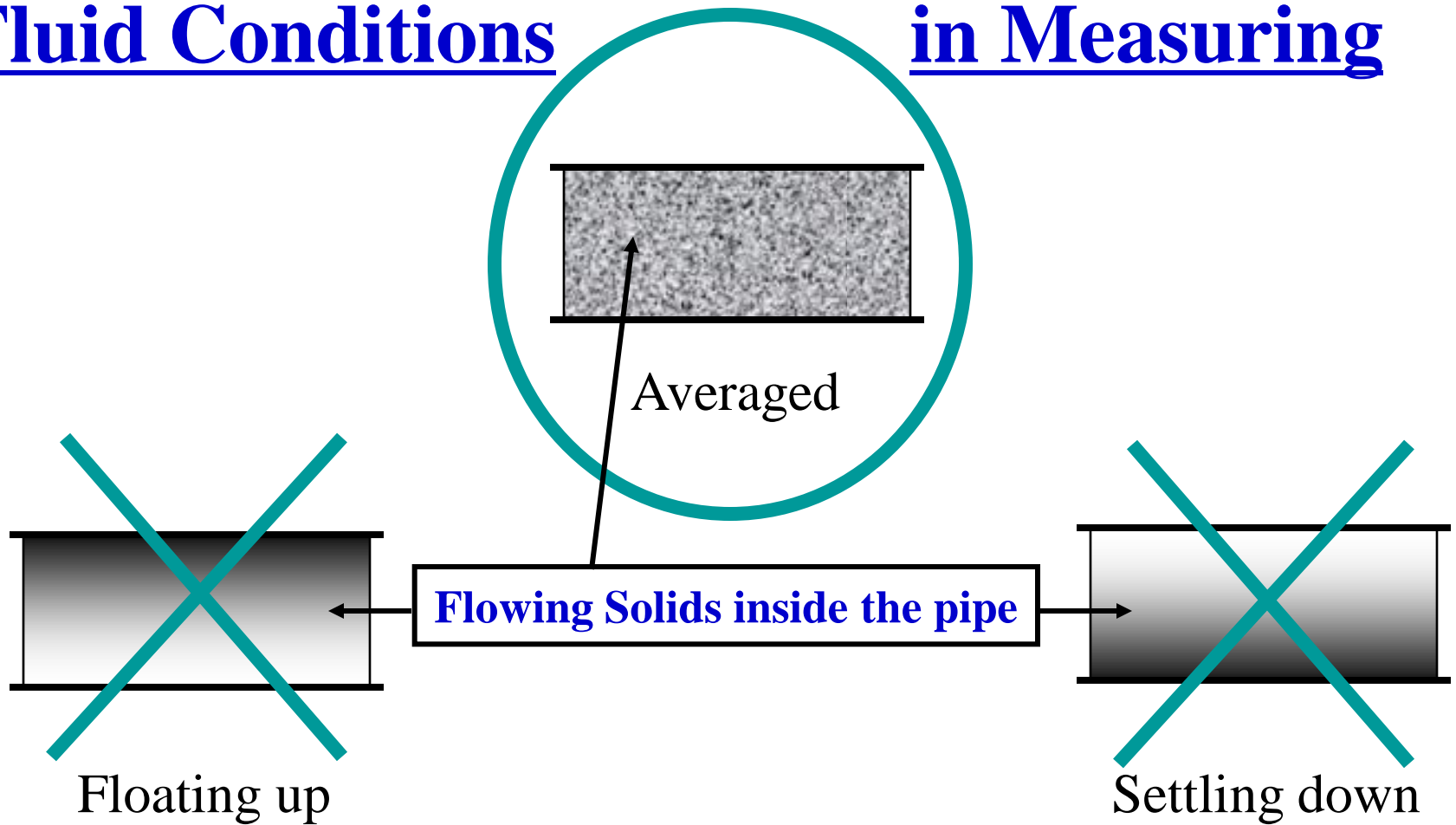


□ Fluid Temp.:

0 to 100°C (32 to 212 °F), No freezing and bubbles conditions



Fluid Conditions in Measuring in Measuring

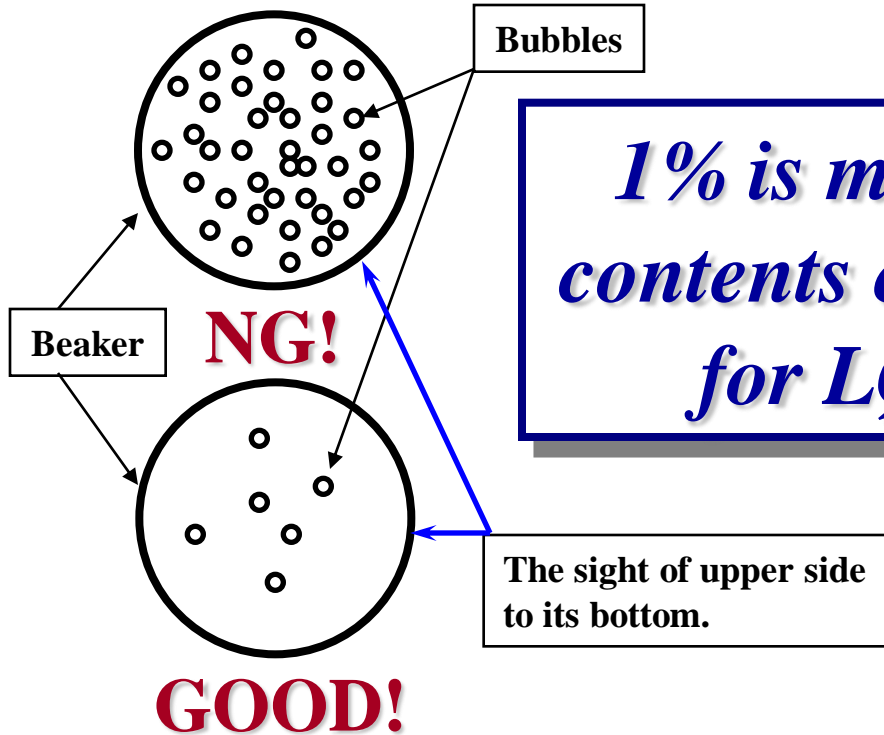




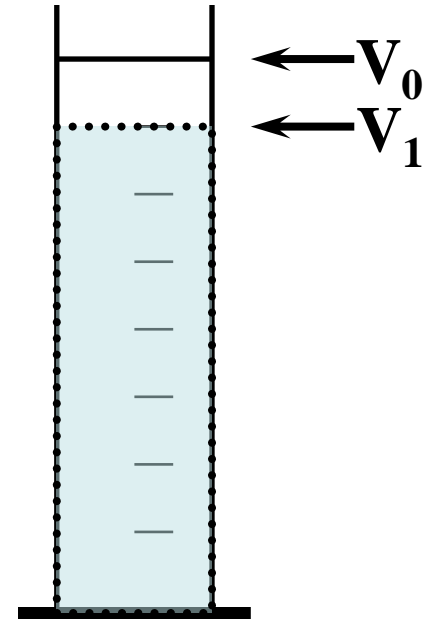
Guidance of bubble content

The method of using a beaker.
(Suitable for liquid with bubble.)

The method of using a cylinder.
(Suitable for slurry with bubble.)



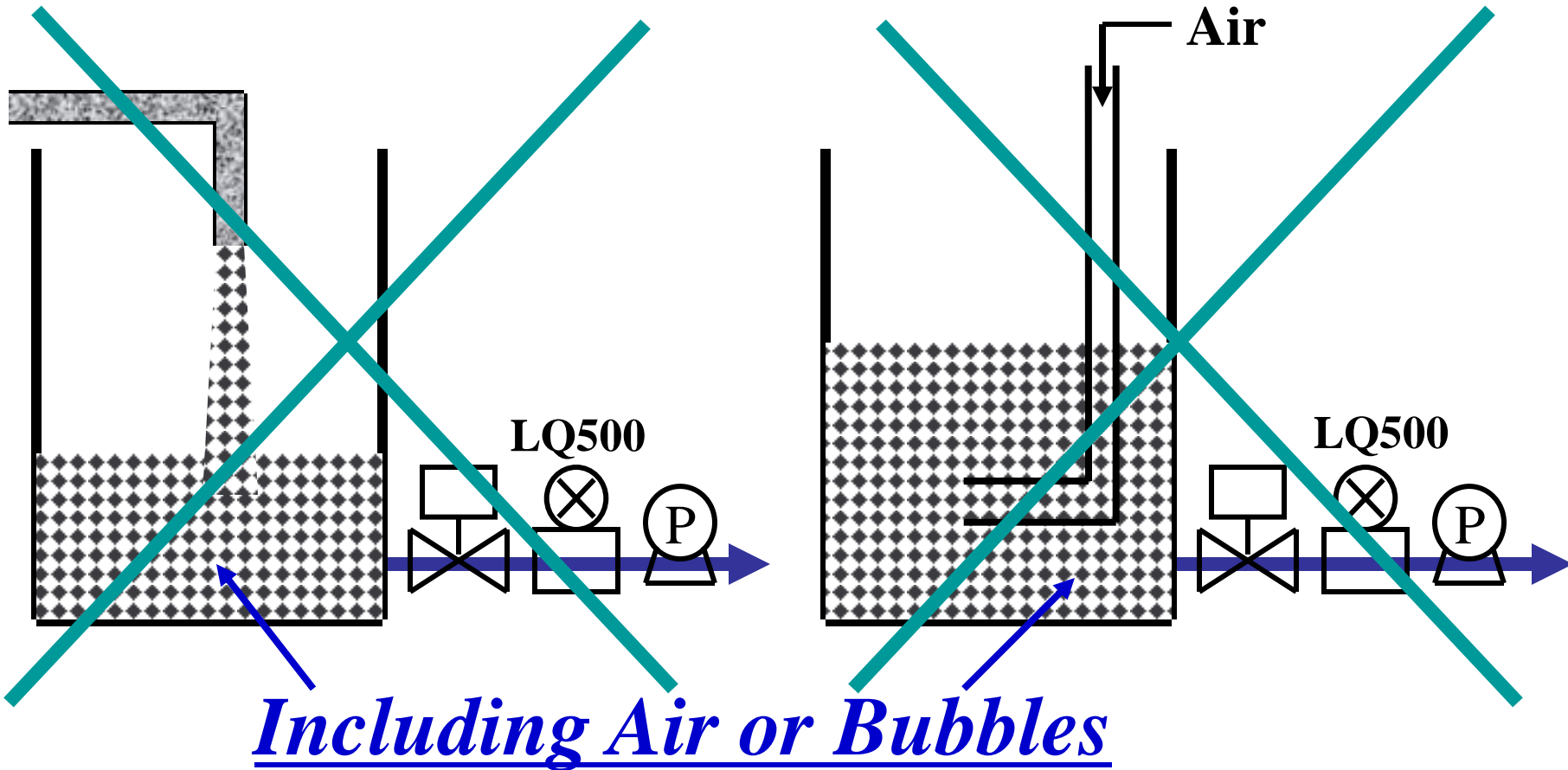
1% is maximum contents of bubbles for LQ500!



V_0 : The upper line when the fluid pour into cylinder.
 V_1 : The upper line after leaving bubbles from the fluid.



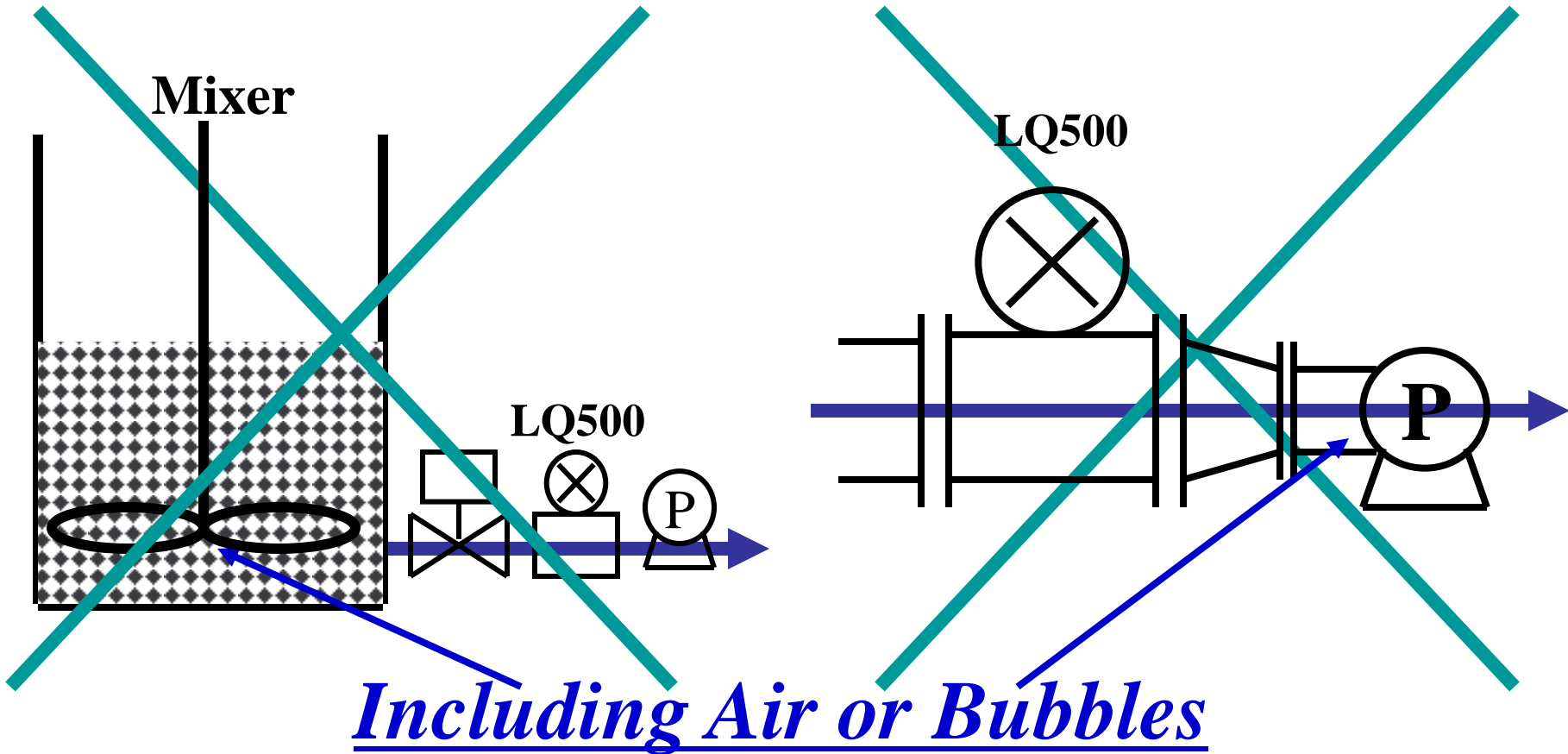
•Need to avoid the Air or Bubbles (Case 1&2).



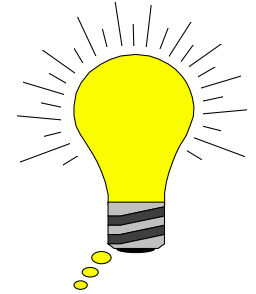
Including Air or Bubbles



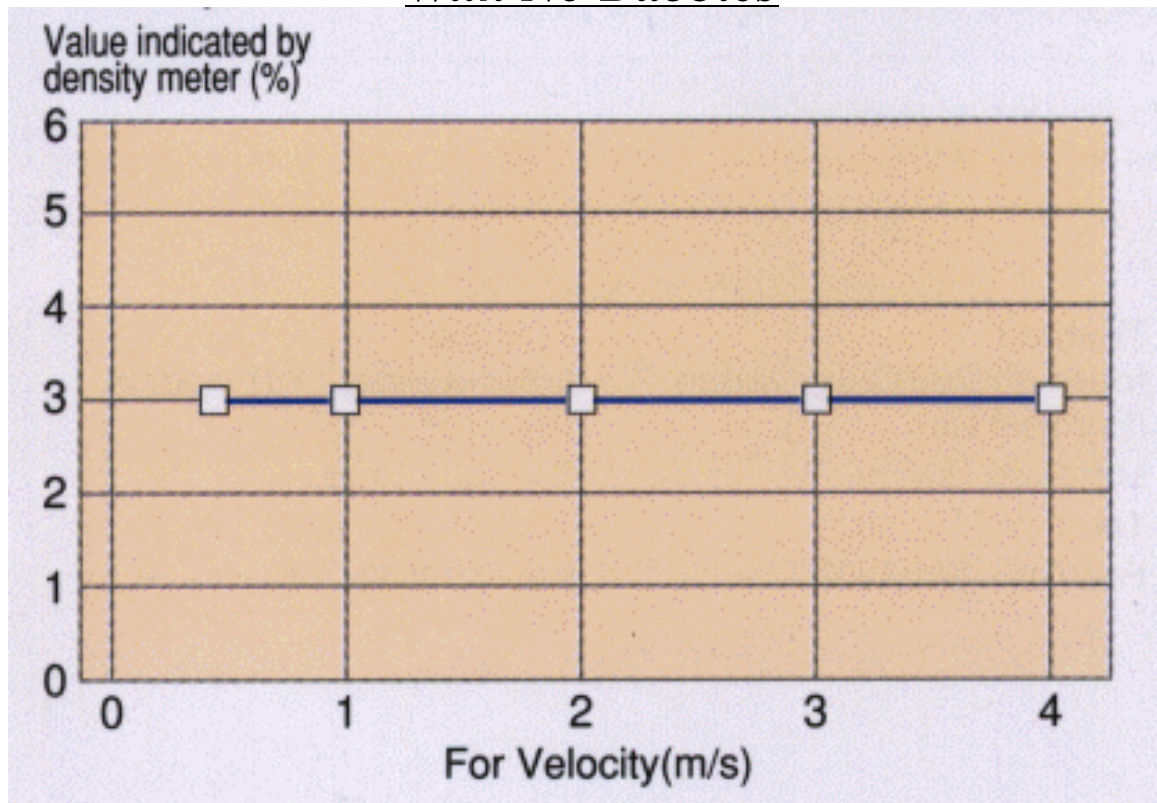
•Need to avoid the Air or Bubbles (Case 3&4).



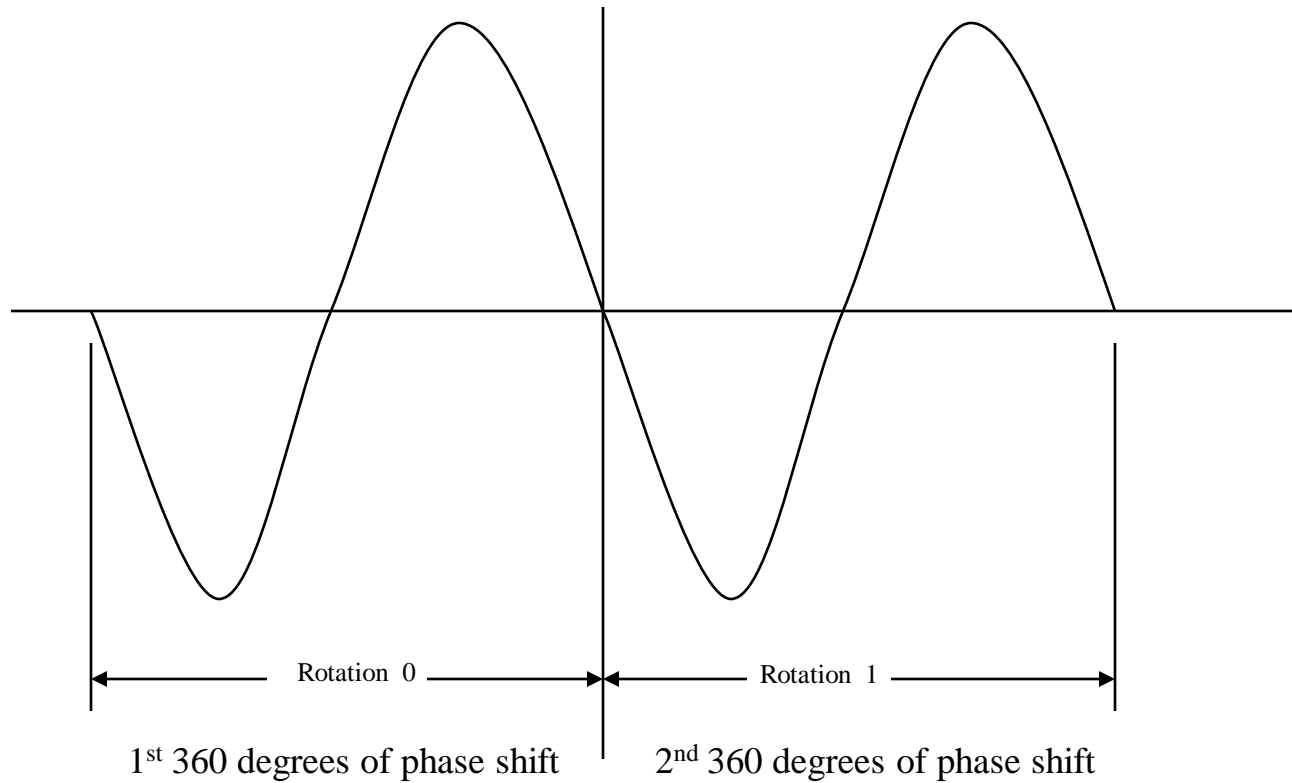
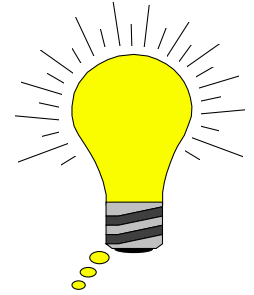
Flow Velocity vs. Density!



With No Bubbles

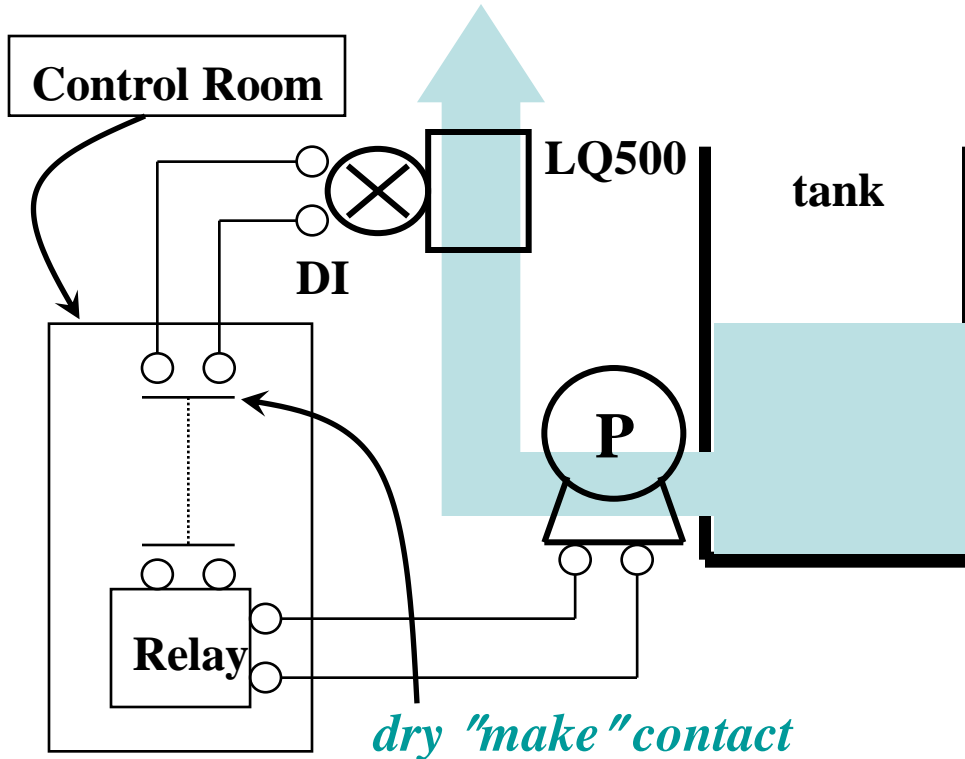
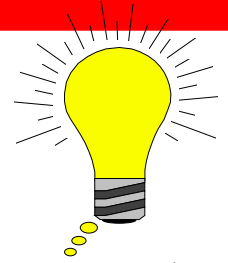


Rotation Number !!

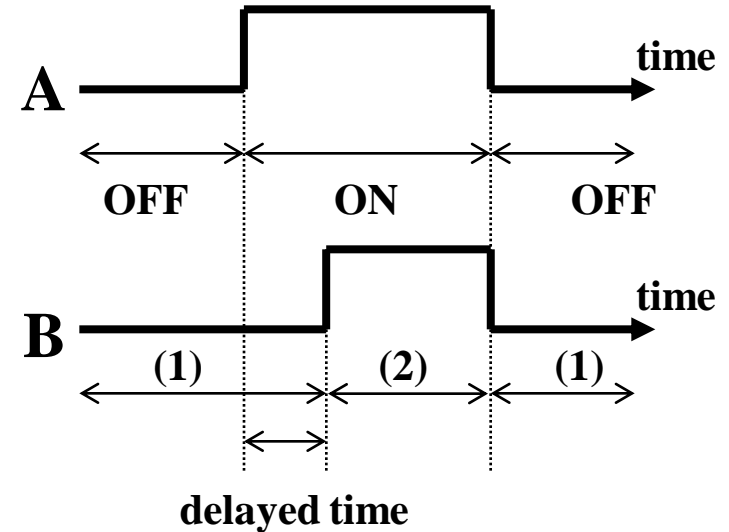


External Synchronized Operation

- For Discontinuous consistency measurement.
- For Possible Empty pipe.



- A: Pump operating status (External contact).
B: Consistency measuring status (output).

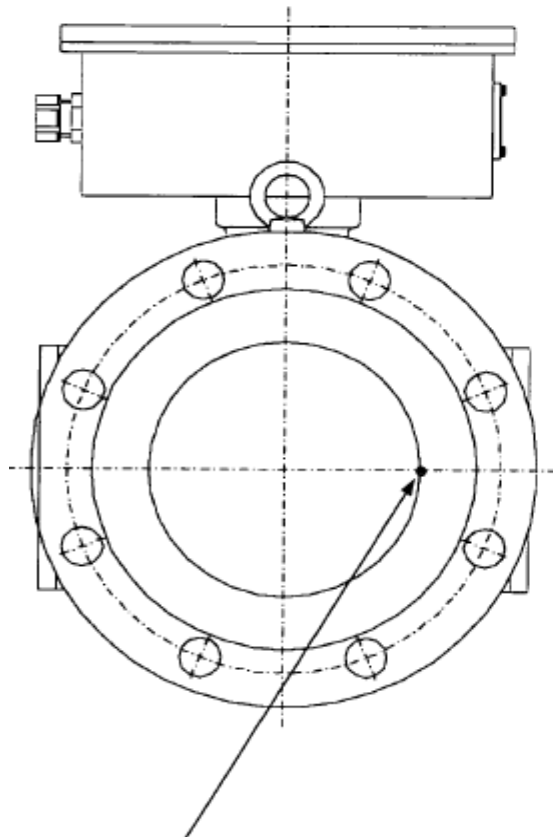


- (1) Suspension of consistency measurement.
(Simulated output)
- (2) Execution of consistency measurement.
(Measured value output)

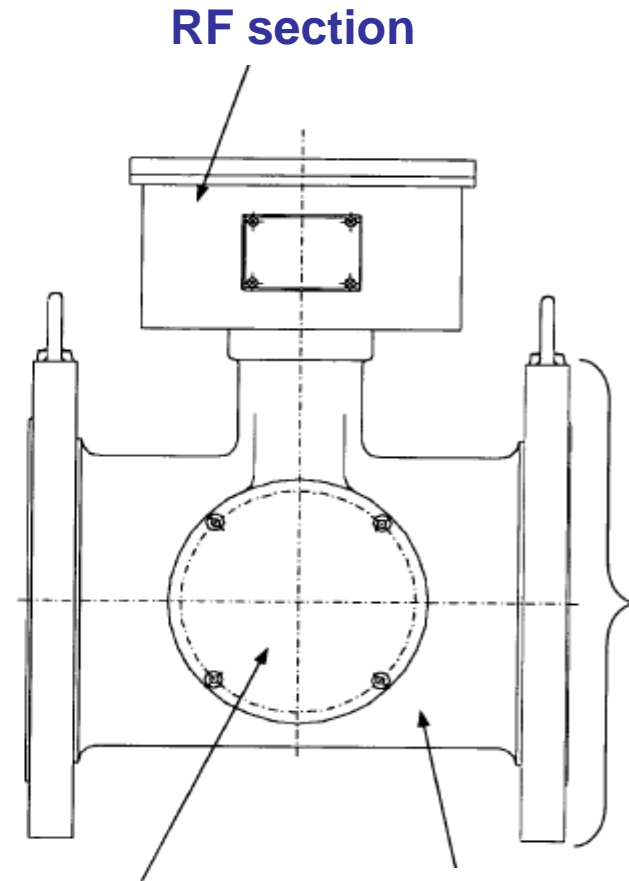
Data Save Function

- **Measurement data save and read at intervals (1 to 1800 seconds)**
- **Use RS232C communication function**
- **Save up to 256 points**
- **At 10 minutes intervals 42 hours of data can be saved**
- **Communication terminal of PC (such hyper terminal) can be used to collect data**

Detector



(3) Temperature detector



(2) Applicator section (1) Main pipe

Converter
(3) Power indicator

(4) Measure indicator

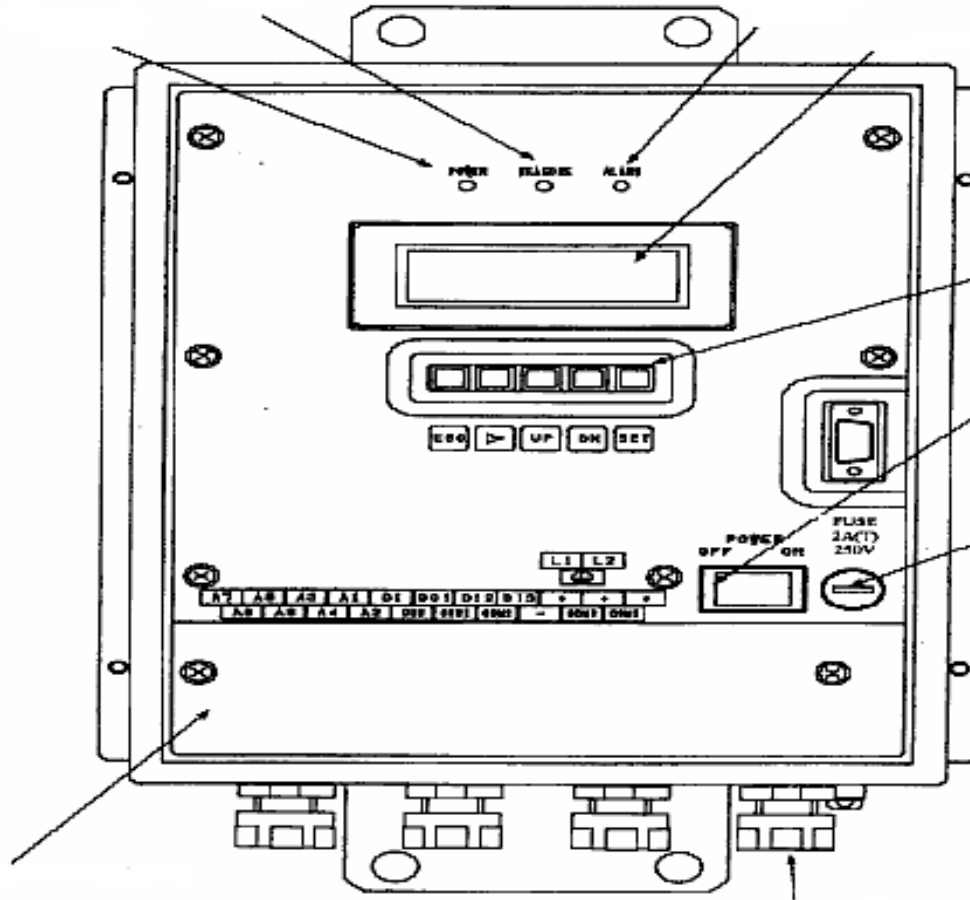
(5) Alarm indicator

(6) LCD indicator

7) Setting Keys

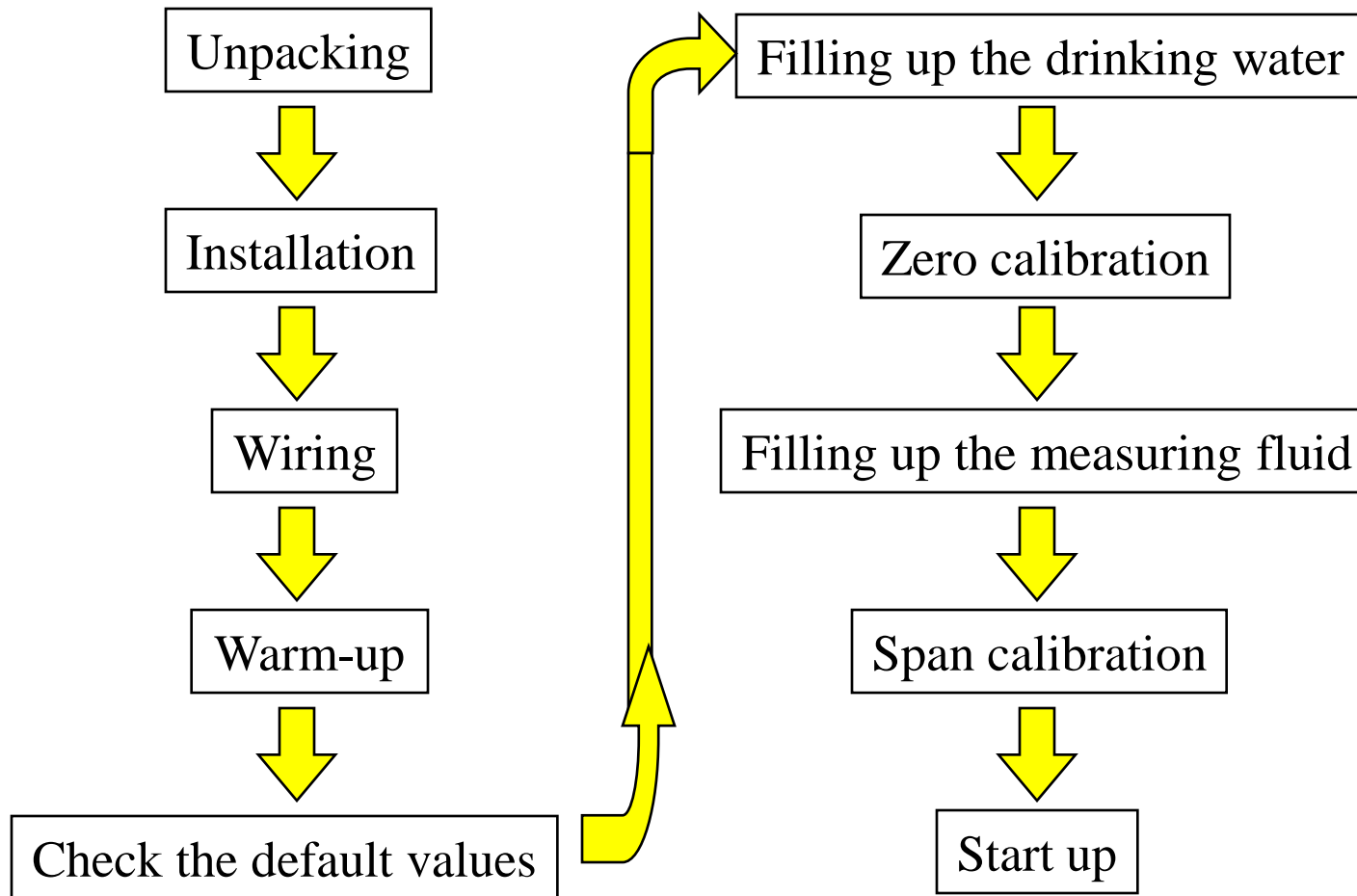
(1) Power Switch

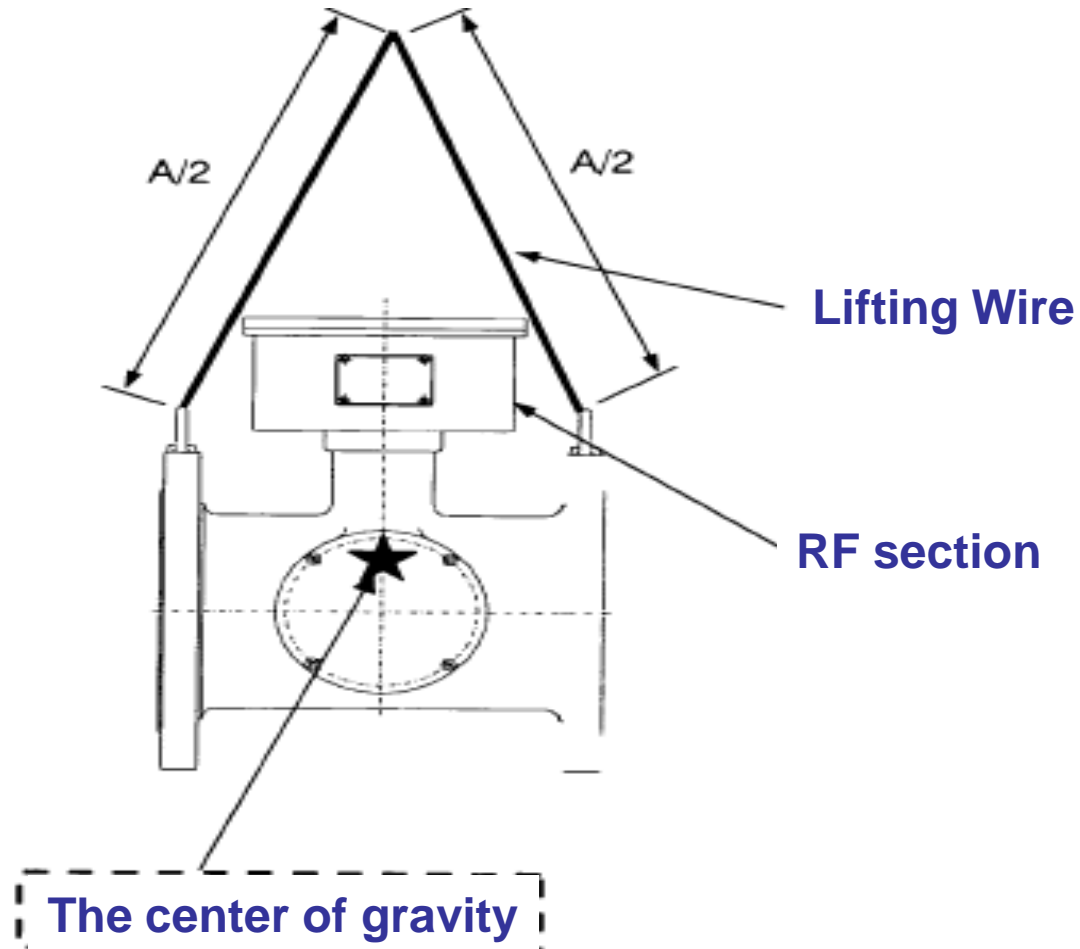
2) Fuse



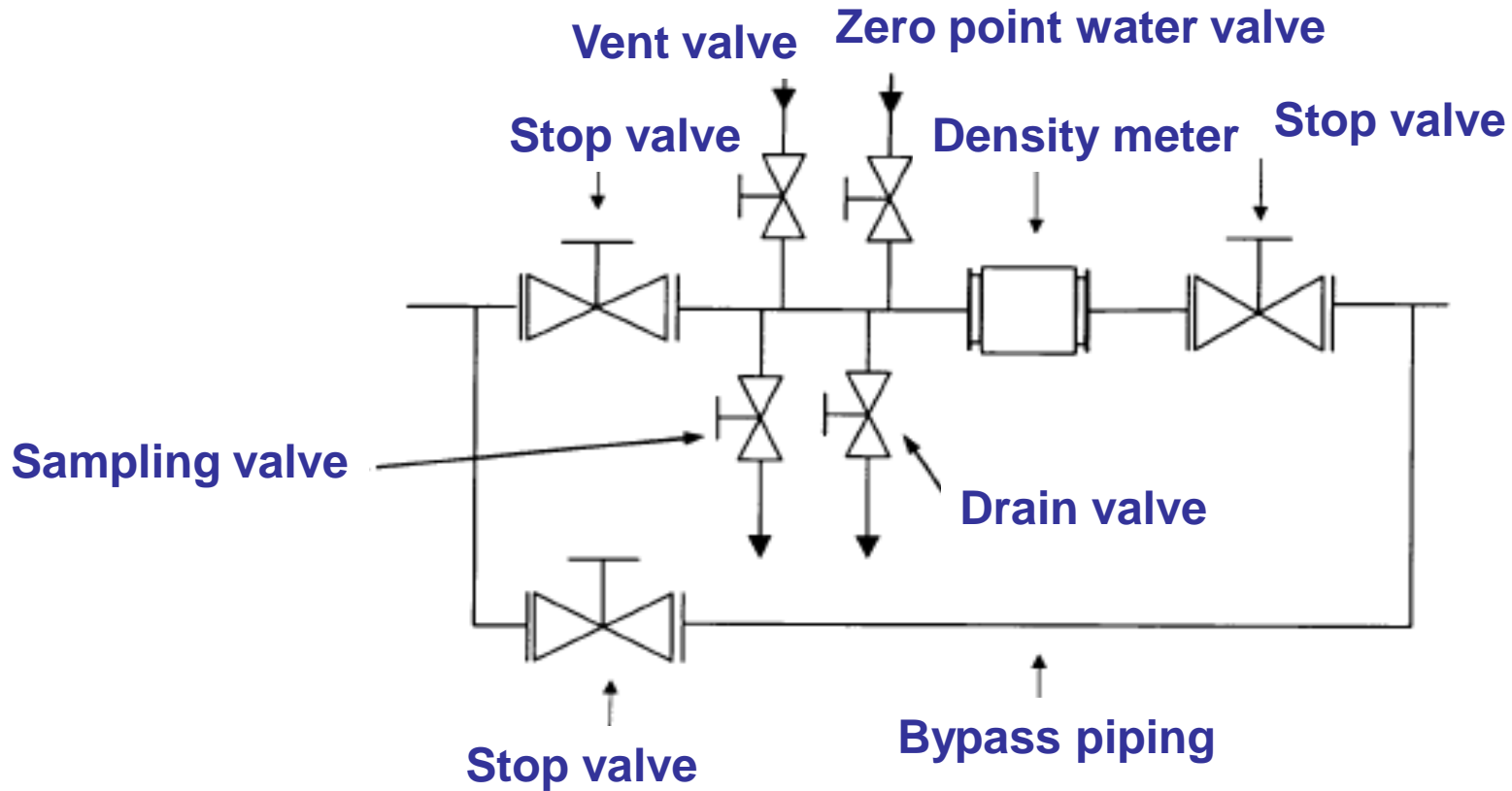
(8) Terminal Block

(9) Cable gland

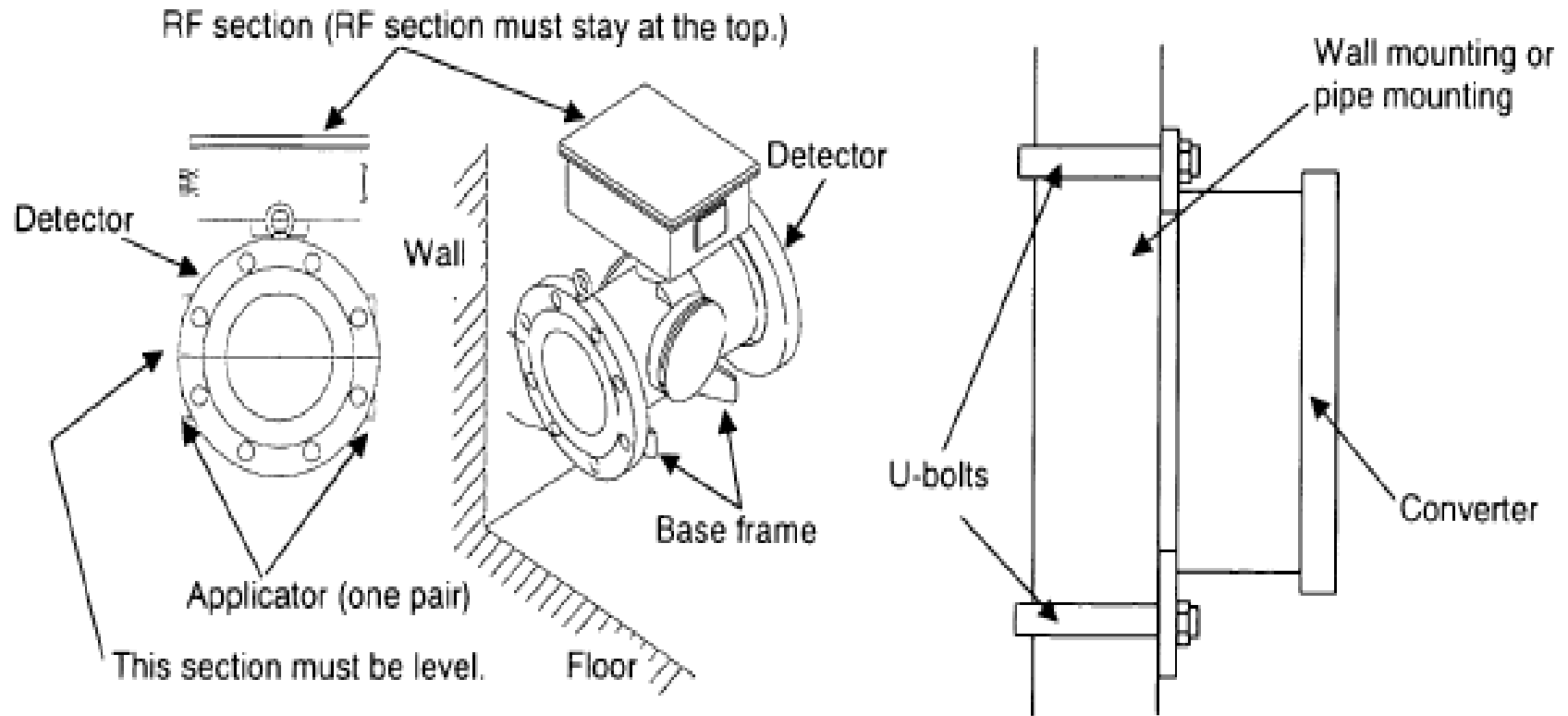




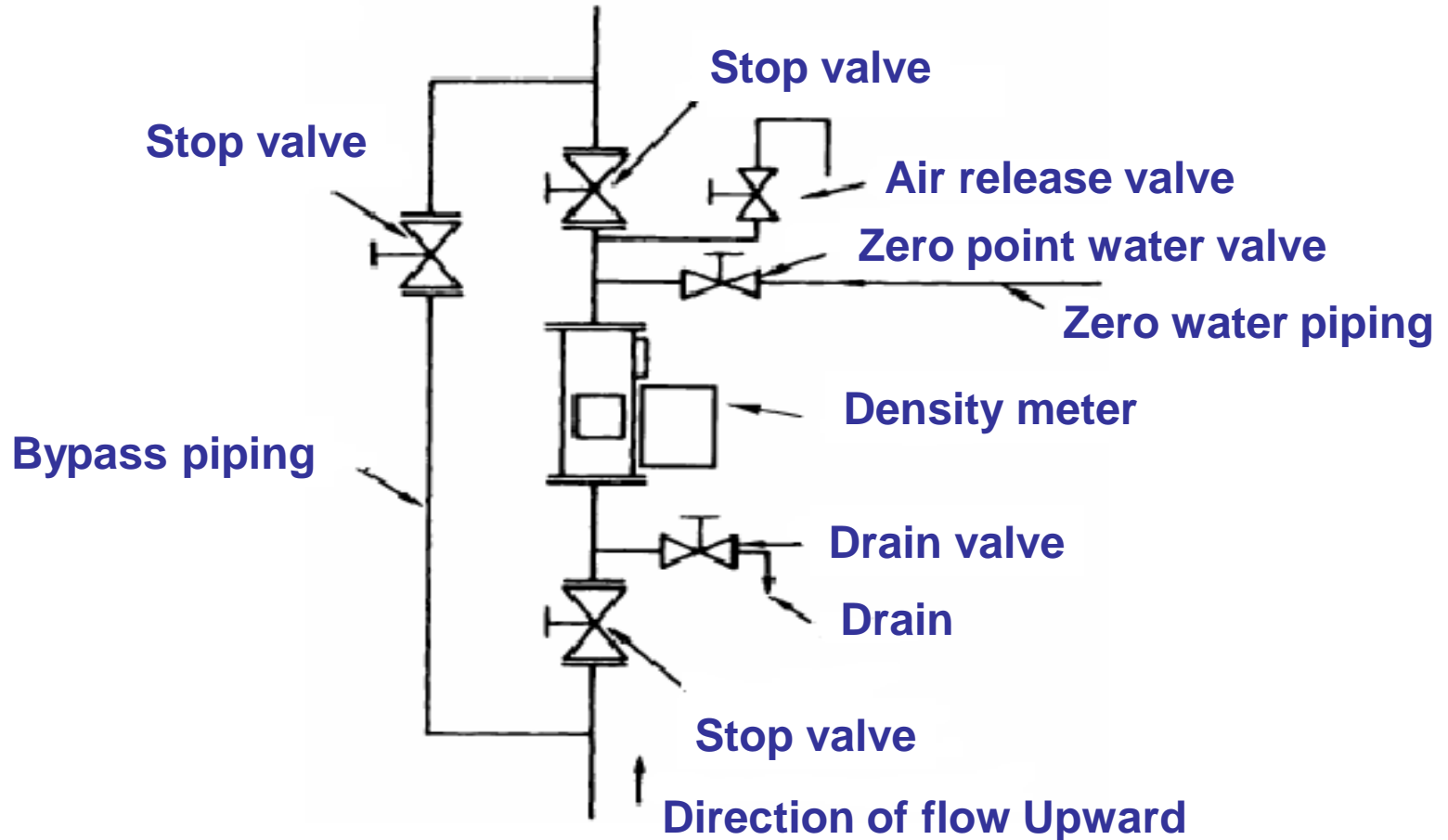
Horizontal

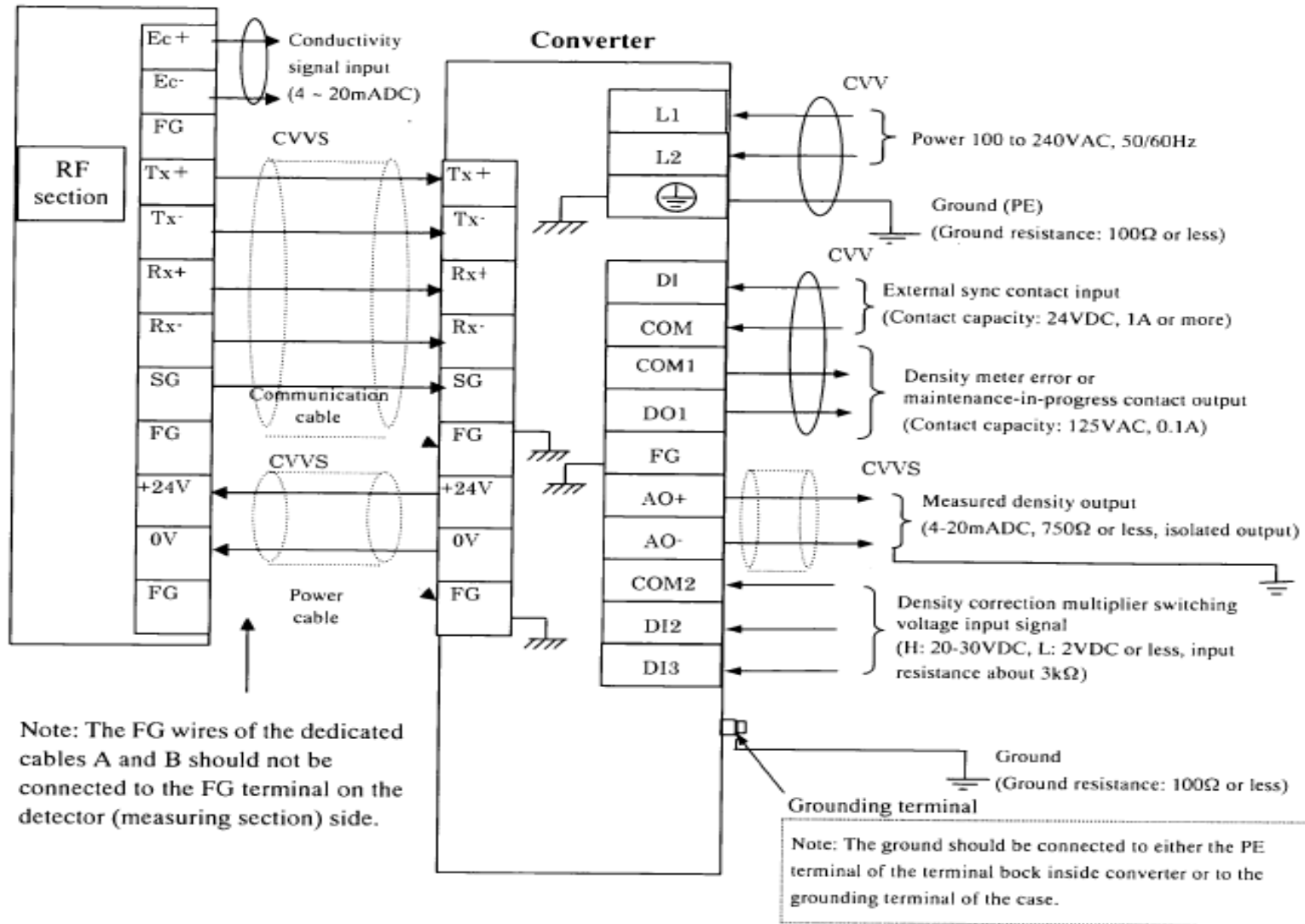


Horizontal

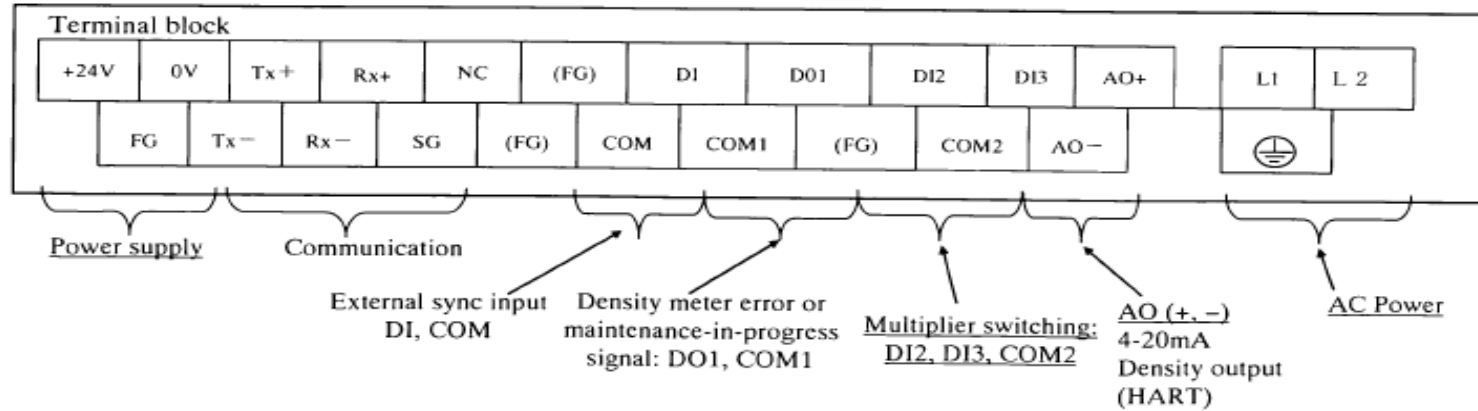


Vertical

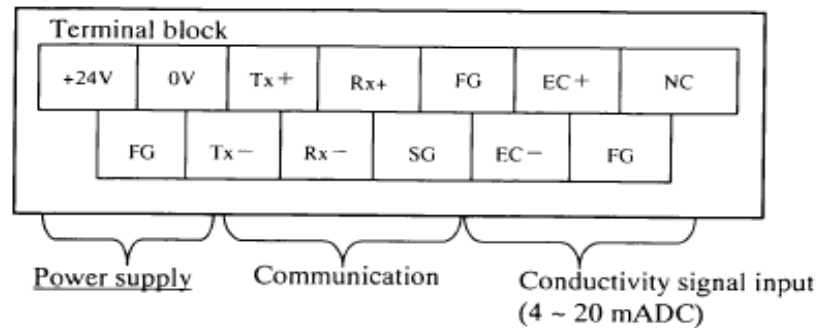




Terminal block of converter



Terminal block in RF unit



Start-up Inspection sheet (On-site Adjustment Inspection sheet)

On-site Adjustment Inspection Sheet (1/2)

Overall pass/fail			
User name			
Product/part name	Density (consistency) meter	Model	LQ300A
Serial NO.		Measurement range	
TAG NO.		Output	4-20mA dc
Loop name		JOB NO.	
Test date		Tested by	

Check column = "G": Good, "NG": No Good, "N/A": Not applicable

1. Installation Check		Check
1.1 Appearance check (Check to make sure there is no coating peel-off, case deformation, scratch, or loose or incorrectly-positioned joint between the converter and the main pipe.)		
1.2 Wiring case check (Check to make sure the converter cable ground is reliably fastened by means of pecking.)		
1.3 Wiring check (Check to make sure that the wiring is connected in accordance with the pin configuration and correctly crimped.)		
1.4 Earth check (Check to make sure the grounding is 100 ohms or less from the converter terminal block PG terminal or that of the case.)		
1.5 Mounting state check (Is the piping free from air pockets?) Mounting posture: (Horizontal / Vertical)		
1.6 Others (Should be free from excessive passes and strong vibrations. Check the installation of sun-blinds outdoors.)		
2. Preparation for Operation		
2.1 Specification check (Record the model name; check the correspondence with Serial NO.)		
2.2 Converter power supply check (100V to 240VAC) Measured value: AC V		
2.3 Others (In 30 minutes after power supply, the pipe should be full and the ALARM indicator lamp should not be ON.)		
3. Verifying Functions		
3.1 Measurement condition and set value check (Record on the following page)		
<ul style="list-style-type: none"> Simulated-output-during-maintenance check (The value which is set when in setting mode should be output) Use of external synchronized operation function (Yes/No) External synchronized operation check (Density measurement should start after specified time with the external synchronized contact signal being ON; and density measurement should stop with the external synchronized contact signal being OFF) Current output during external synchronized operation shutdown (Immediately preceding value; 4mA; set value) 		
3.2 Density signal output check (Write in the table below (Density signal output check).)		
3.3 Implementation only when necessary- Zero point adjustment (Press the SET button on Menu 6 while the pipe is full of zero water.)		
3.4 Span calibration (Run the object to be measured, gather samples when reading values indicated on the density meter and analyze them manually.)		

	Density (Consistency) meter indicator Setting	Set value (%TSS)	Density adjusted from current output	Error (%FS)
Zero	Lower-limit value of measurement range			
1/2FS	Middle value of measurement range			
FS	Upper-limit value of measurement range			

FS: Full scale

«Remarks»

1st page

On-site Adjustment Inspection Sheet (2/2)

<Tables of parameters' initial set values and set values at adjustment: For LQ300>

NO.	Parameter	Setting range	Initial set value *	Adjustment set value
C	Density multiplier	0.998 to 9.999		
L.R	Measurement range (Upper)	1.0 to 99.9		
L.L	Measurement range (Lower)	0.0 to 99.5		
A	Density line slope (%TSS/degree)	-0.2000 to 0.2000		
b	Density intercept	-99.99 to 99.99		
OL	Density test output (Simulated output) during setting mode (%TSS)	0.00 to 99.9		
DL	Delay time in external synchronized operation (min)	0.1 to 99.9		
CT	Fluid temperature correction factor (degree/°C)	0.00 to 30.00		
Zp	Zero-point phase value (degree)	0.00 to 359.99		
ZT	Zero-point fluid temperature (°C)	0.00 to 160.00		
CG	RF compensation factor	-9.99 to 9.999		
ZC	Zero-point RF constant	0.00 to 100.00		
Mt	Max. measuring times	1 to 99		
DX	Permissible width of charge-rate limit	0.00 to 9.99		
DL	Limit times of charge-rate limit	0 to 99		

* Enter the set value of the rear side of the converter lid.

Diameter (mm)	80 (3")	100 (4")	150 (6")	200 (8")	250 (10")	300 (12")
Density line slope	0.165	0.084	0.056	0.042	0.034	0.028

*Z: At the time of zero-point calibration (only when implemented)
*S: When the object to be measured has filled up the pipe

Symbol	Display item	Numerical range	Indicated value
SL	Microwave input signal level	Normal range -90 to -40dBm	Z*
F	Microwave coefficient	Normal range 1825 to 1975	S*
G	RF constant	Normal range +10.0 to +80.0	
J	ACV voltage (V)	Normal range 4.5 to 5.5	
PH	Reference phase error (degrees)	Normal range -6.3 to +9.5	
Me	Memory check	"Normal" displays	

Symbol	Display item	Indicated value
UF1	Upper range	
SL	Lower range	
N	Number of rotations	

Symbol	Display item	Data
P	Phase	(N=)
T	Fluid temperature	
X	Density instructions	

Symbol	Display item	Indicated value	Symbol	Display item	Indicated value
LA	Break-point density A		r	Electric conductivity correction factor	
LB	Break-point density B		zE	Zero water conductivity	(MANU / LINE)
K1	Coefficient K1		EC	Electric conductivity	(MANU / LINE)
K2	Coefficient K2				
K3	Coefficient K3				

Symbol	Display item	Indicated value
AP	Availability of additive correction	

Symbol	Display item	Indicated value
ho	Output at coasted OFF in external synchronized operation	
DI	Density multiplier switching	
C2	Density multiplier C2	
C3	Density multiplier C3	
C4	Density multiplier C4	
NA	Automatic adjustment of angle rotation	

2nd page

Why is this sheet so important?

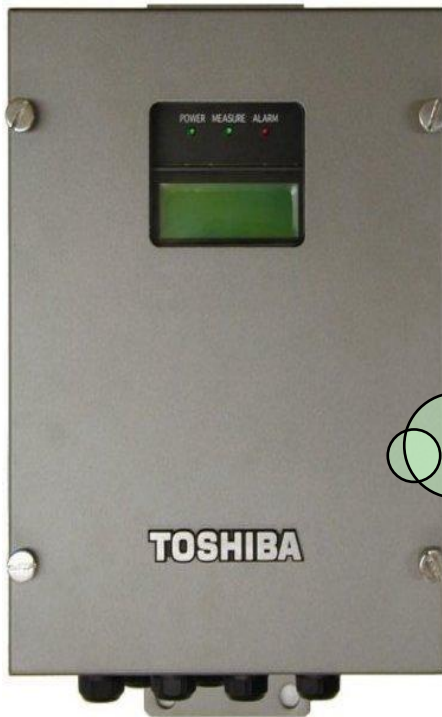
- A sign of start-up operation of LQ500 being done successfully.
- Easy to recognize a problem with the LQ500 by comparing this data as default with the current data.

<Note>

Need to use this sheet every time when you check the condition of LQ500 or calibrating.

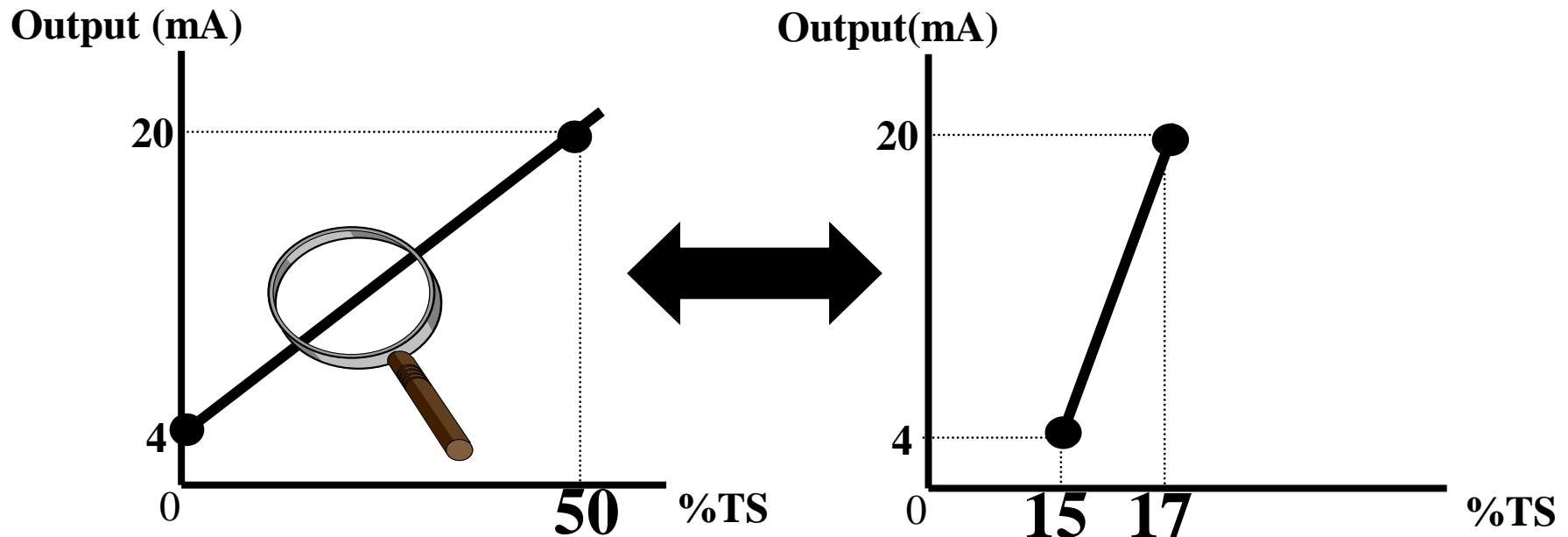


Easy Programming!



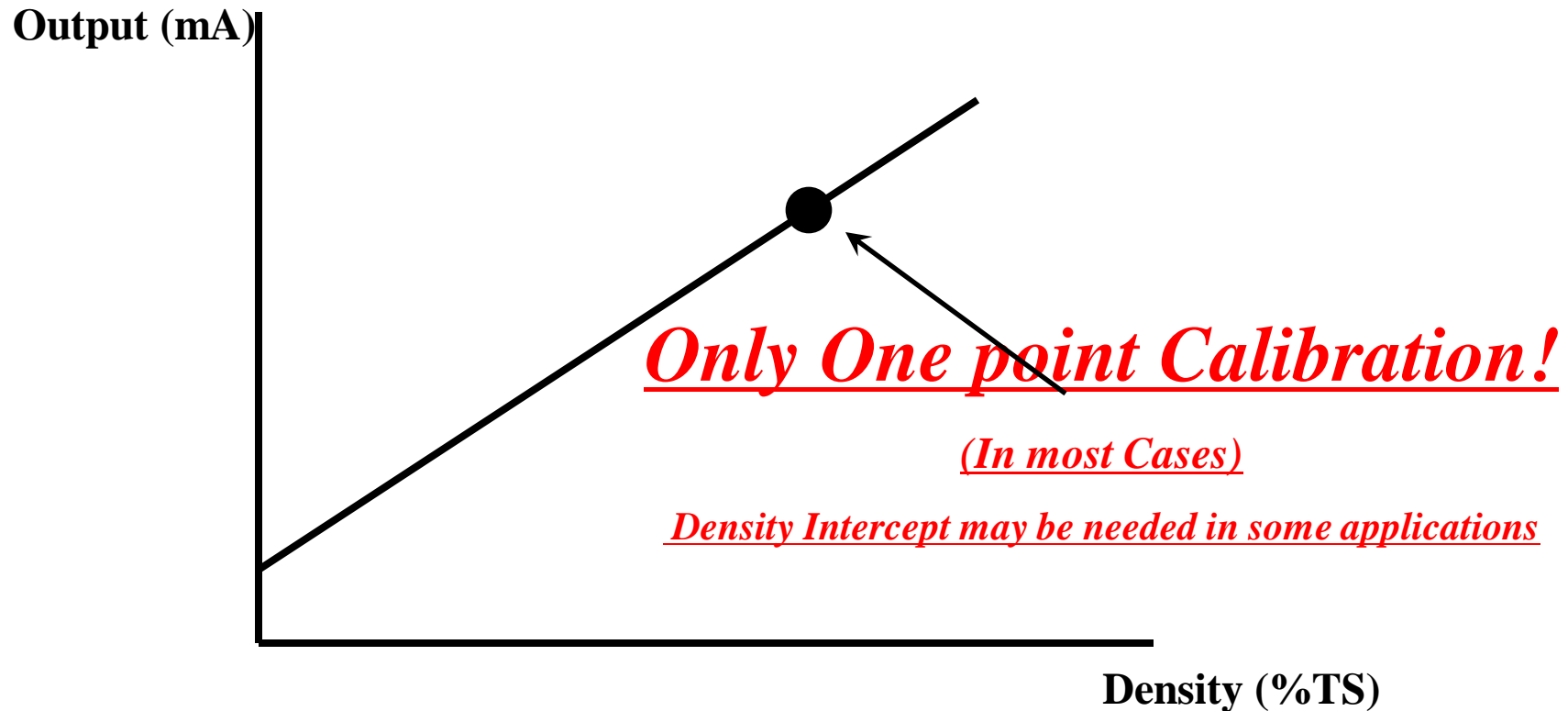
4-20 mA Range

- Wide Range Measurement !
- RL may be set at any TS less than RH !!



C = Density Multiplier

Easy Calibration!



Calculating C

Calibration.

- (a) Note the value of “density multiplier, (C)”.
(The default value of “C” is “1.000”.)
- (b) Wait until there is a stable indication on the LED.
- (c) Take a sample of fluid, and note the indicating value of LQ500 at the same time.
- (d) Manual analysis.
- (e) Calculate the value of “C”.
- (f) Input the value of “C” into the converter.

<Calculation for deciding “C”>

$$C = A / (M / C'(\text{old}))$$

C= density multiplier, A= result of manual analysis,

M= LQ500 indicated value when taking a sample.

C'(old)= density multiplier before span calibration.

Manual Analysis.

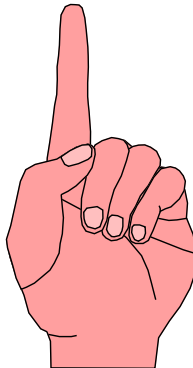
- Manual analysis and how it reflects on the LQ500.

- (1) Need to carry out the manual analysis several times (min 3 samples).
- (2) Calculate a “C” value based on the average of several samples.



<Notice>

An error of manual analysis links to the error of LQ500 indication. We normally work with the customer's lab. They must understand that accurate measurement is important. The LQ500 accuracy depends on this lab data



Parameter setting

- (a) Go to the “SETTING MENU”.
- (b) Input the measuring range. (UR & LR)
- (c) Go to “SPAN CALIB” and set C1 (Density Multiplier)

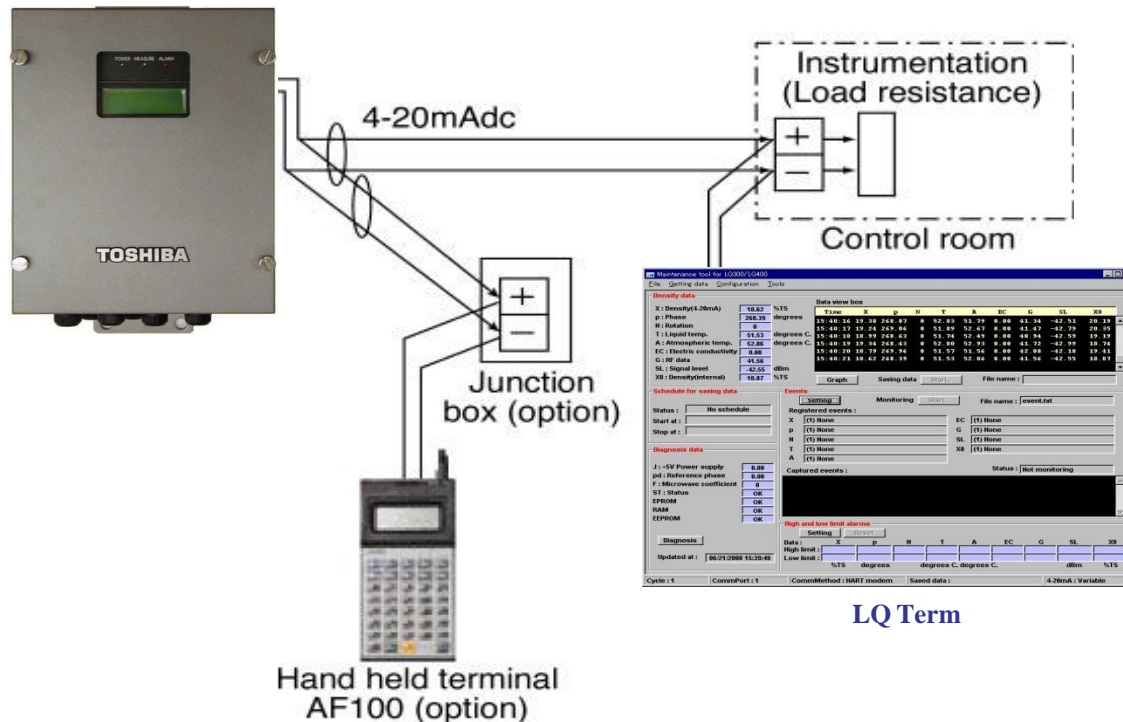


Main menu of converter

HART

Different Monitoring Methods Available !

(1) 4-20 mAdc (2) Hand Held (3) LQ Term



LQ Term

Maintenance tool (Option)

LQtermTM provides details of your consistency meter.

Density data

X : Density(4-20mA)	18.62	%TS
p : Phase	268.39	degrees
N : Rotation	0	
T : Liquid temp.	51.53	degrees C.
A : Atmospheric temp.	52.86	degrees C.
EC : Electric conductivity	0.00	
G : RF data	41.56	
SL : Signal level	-42.55	dBm
X0 : Density(internal)	18.87	%TS

Data view box

Time	X	p	N	T	R	EC	G	SL	X0
15:40:16	19.38	268.87	0	52.83	51.79	0.00	41.34	-42.51	20.19
15:40:17	19.24	269.06	0	51.89	52.67	0.00	41.47	-42.79	20.35
15:40:18	18.99	268.63	0	51.74	52.49	0.00	40.94	-42.59	19.19
15:40:19	19.34	268.43	0	52.80	52.93	0.00	41.72	-42.99	18.74
15:40:20	18.79	269.96	0	51.57	51.56	0.00	42.08	-42.18	19.41
15:40:21	18.62	268.39	0	51.53	52.86	0.00	41.56	-42.55	18.87

Schedule for saving data

Status: No schedule
Start at:
Stop at:

Diagnosis data

J : +5V Power supply	0.00
pd : Reference phase	0.00
F : Microwave coefficient	0
ST : Status	OK
EPROM	OK
RAM	OK
EEPROM	OK

Events

Registered events:

X	(1) None	EC	(1) None
p	(1) None	G	(1) None
N	(1) None	SL	(1) None
T	(1) None	X0	(1) None
A	(1) None		

Captured events: Status: Not monitoring

High and low limit alarms

Data :	X	p	N	T	A	EC	G	SL	X0
High limit :									
Low limit :									
	%TS	degrees		degrees C.	degrees C.			dBm	%TS

Updated at : 06/21/2000 15:39:49

Cycle : 1 CommPort : 1 CommMethod : HART modem Saved data : 4-20mA : Variable

Features

- Ability to choose HART or RS232C as communication protocol.
- Monitoring, and Parameters R/W.
- Simulating without changing set parameters.
- Analyzing received data.

Benefits

- Tool is PC compatible.
- Simulation function and Analyzing function will help you to choose the best parameters for your consistency measurement.

For Successful Applications:- Things to remember.

- ***Application data sheet***
 - ***very important, helps with unit selections***
- ***Commissioning and Training***
 - ***must be sold with all jobs***
- ***Technical support availability***
 - ***both before and after job***
- ***View LQ500 as an analyzer, instead of a meter***
 - ***No two products behave the same***
 - ***Density will vary from product to product***