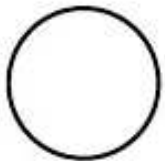


*-Instrumentation
Symbology-*

PIPING AND INSTRUMENTATION DIAGRAM (P&ID)

Instrumentation Symbology



Instruments that are field mounted.

-Instruments that are mounted on process plant (i.e sensor that mounted on pipeline or process equipments).

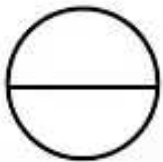


Field
mounted on
pipeline



PIPING AND INSTRUMENTATION DIAGRAM (P&ID)

Instrumentation Symbology



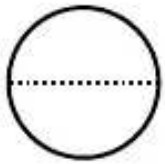
Instruments that are board mounted

-Instruments that are mounted on control board.



PIPING AND INSTRUMENTATION DIAGRAM (P&ID)

Instrumentation Symbology



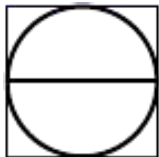
Instruments that are board mounted (invisible).

-Instruments that are mounted behind a control panel board.



PIPING AND INSTRUMENTATION DIAGRAM (P&ID)

Instrumentation Symbolology



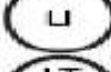
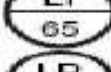
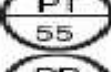
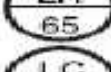
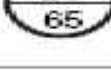
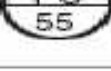
Instruments that are functioned in Distributed Control System (DCS)

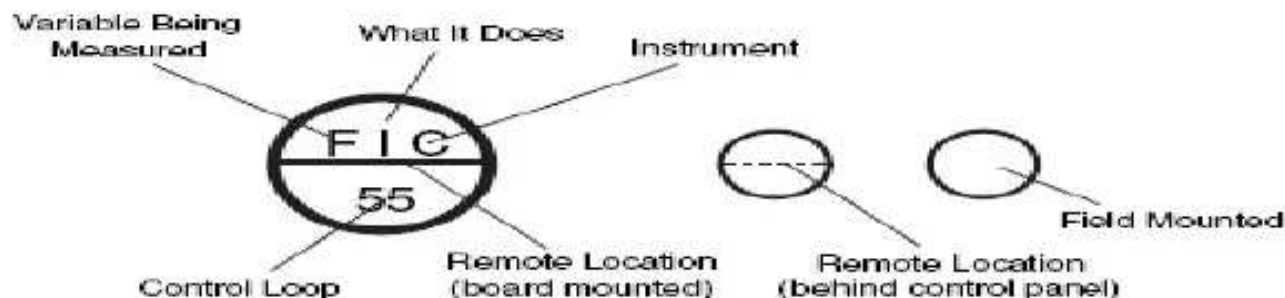
- A **distributed control system** (DCS) refers to a [control system](#) usually of a [manufacturing system](#), [process](#) or any kind of [dynamic system](#), in which the [controller](#) elements are not central in location (like the [brain](#)) but are distributed throughout the system with each component sub-system controlled by one or more controllers. The entire system of controllers is connected by networks for communication and monitoring.



PIPING AND INSTRUMENTATION DIAGRAM (P&ID)

Instrumentation Symbolology

 TI	Temp Indicator	 FI	Flow Indicator		Transducer
 TT	Temp Transmitter	 FT	Flow Transmitter	 PIC 105	Pressure Indicating Controller
 TR	Temp Recorder	 FR	Flow Recorder	 PRC 40	Pressure Recording Controller
 TC	Temp Controller	 FC	Flow Controller	 LA 25	Level Alarm
 LI	Level Indicator	 PI	Pressure Indicator	 FE	Flow Element
 LT 65	Level Transmitter	 PT 55	Pressure Transmitter	 TE	Temperature Element
 LR 65	Level Recorder	 PR 55	Pressure Recorder	 LG	Level Gauge
 LC 65	Level Controller	 PC 55	Pressure Controller	 AT	Analyzer Transmitter



PIPING AND INSTRUMENTATION DIAGRAM (P&ID)

•FC	Flow Controller	PT	Pressure Transmitter
•			
•EF	Flow Element	PTD	Pressure Transducer
•FI	Flow Indicator		
•FT	Flow Transmitter	LC	Level Controller
•FS	Flow Switch	LG	Level Gauge
•FIC	Flow Indicating Controller	LR	Level Recorder
•FCV	Flow Control Valve	LT	Level Transmitter
•FRC	Flow Recording Controller	LS	Level Switch
		LIC	Level Indicating Controller
•PC	Pressure Controller	LCV	Level Control Valve
•PG	Pressure Gauge	LRC	Level Recording Controller
•PI	Pressure Indicator		
•PR	Pressure Recorder	TE	Temperature Element

PIPING AND INSTRUMENTATION DIAGRAM (P&ID)

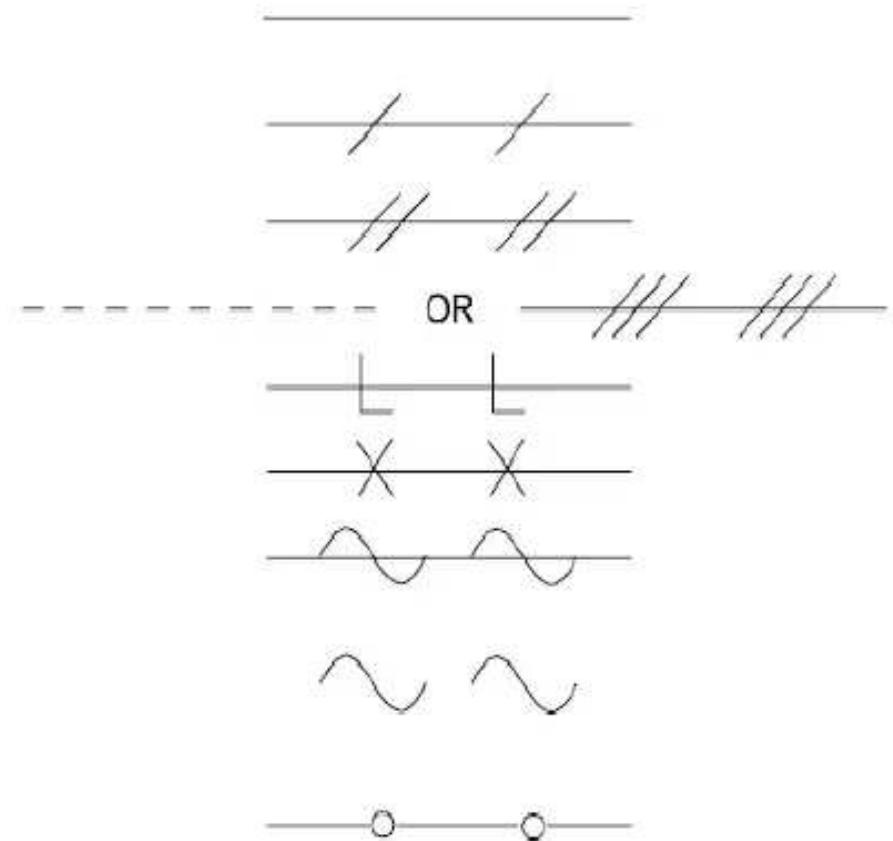
•PS	Pressure Switch	TI	Temperature Indicator
•PIC	Pressure Indicating Controller	TR	Temperature Recorder
•PCV	Pressure Control Valve	TS	Temperature Switch
•			
•PRC	Pressure Recording Controller	TC	Temperature Controller
•PDI	Pressure Differential Indicator	TT	Temperature Transmitter
•PDR	Pressure Differential Recorder		
•PDS	Pressure Differential Switch		
•PDT	Pressure Differential Transmitter		

	FIRST-LETTER (4)		SUCCEEDING-LETTERS (3)		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	Analysis (5,19)		Alarm		
B	Burner, Combustion		User's Choice (1)	User's Choice (1)	User's Choice (1)
C	User's Choice (1)			Control (13)	
D	User's Choice (1)	Differential (4)			
E	Voltage		Sensor (Primary Element)		
F	Flow Rate	Ratio (Fraction) (4)			
G	User's Choice (1)		Glass, Viewing Device (9)		
H	Hand				High (7, 15, 16)
I	Current (Electrical)		Indicate (10)		
J	Power	Scan (7)			
K	Time, Time Schedule	Time Rate of Change (4, 21)		Control Station (22)	
L	Level		Light (11)		Low (7, 15, 16)
M	User's Choice (1)	Momentary (4)			Middle, Intermediate (7,15)
N	User's Choice (1)		User's Choice (1)	User's Choice (1)	User's Choice (1)
O	User's Choice (1)		Orifice, Restriction		
P	Pressure, Vacuum		Point (Test) Connection		
Q	Quantity	Integrate, Totalize (4)			
R	Radiation		Record (17)		
S	Speed, Frequency	Safety (8)		Switch (13)	
T	Temperature			Transmit (18)	
U	Multivariable (6)		Multifunction (12)	Multifunction (12)	Multifunction (12)
V	Vibration, Mechanical Analysis (19)			Valve, Damper, Louver (13)	
W	Weight, Force		Well		
X	Unclassified (2)	X Axis	Unclassified (2)	Unclassified (2)	Unclassified (2)
Y	Event, State or Presence (20)	Y Axis		Relay, Compute, Convert (13, 14, 18)	
Z	Position, Dimension	Z Axis		Driver, Actuator, Unclassified Final Control Element	

PIPING AND INSTRUMENTATION DIAGRAM (P&ID)

Signal Lines Symbolology

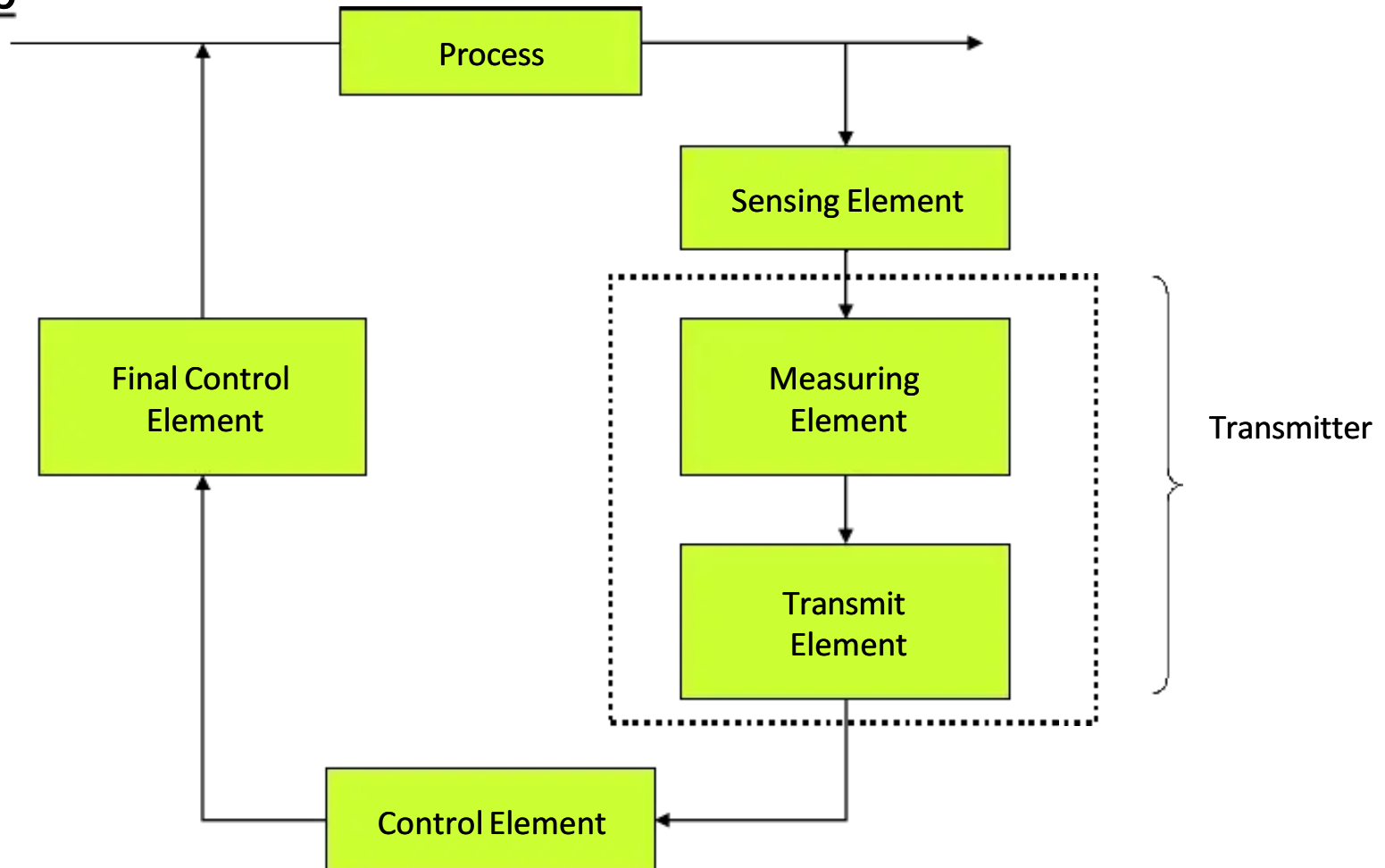
- (1) INSTRUMENT SUPPLY *
OR CONNECTION TO PROCESS
- (2) UNDEFINED SIGNAL
- (3) PNEUMATIC SIGNAL **
- (4) ELECTRIC SIGNAL
- (5) HYDRAULIC SIGNAL
- (6) CAPILLARY TUBE
- (7) ELECTROMAGNETIC OR SONIC SIGNAL ***
(GUIDED)
- (8) ELECTROMAGNETIC OR SONIC SIGNAL ***
(NOT GUIDED)
- (9) INTERNAL SYSTEM LINK
(SOFTWARE OR DATA LINK)



-Principal of P&ID-

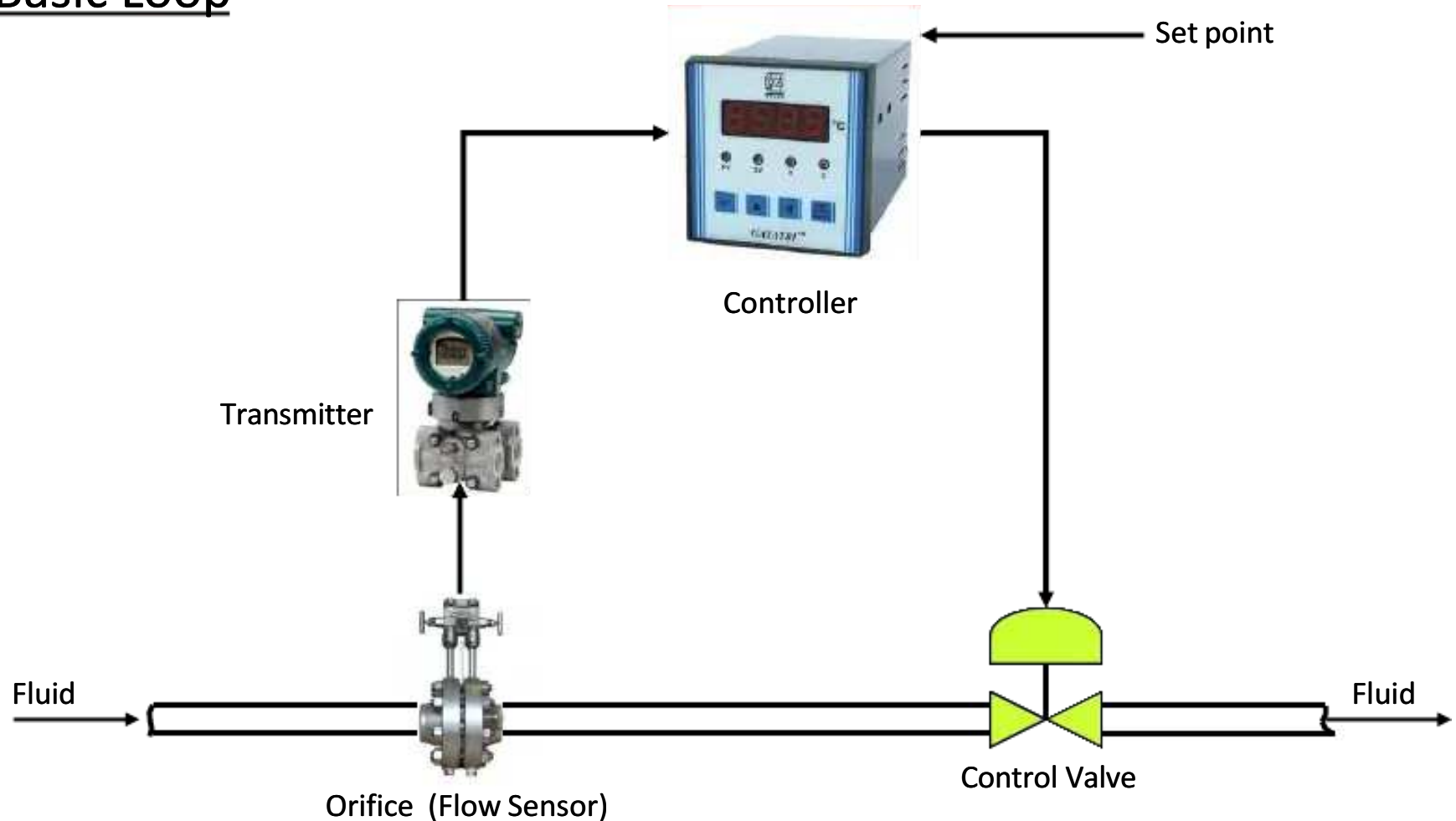
PIPING AND INSTRUMENTATION DIAGRAM (P&ID)

Basic Loop



PIPING AND INSTRUMENTATION DIAGRAM (P&ID)

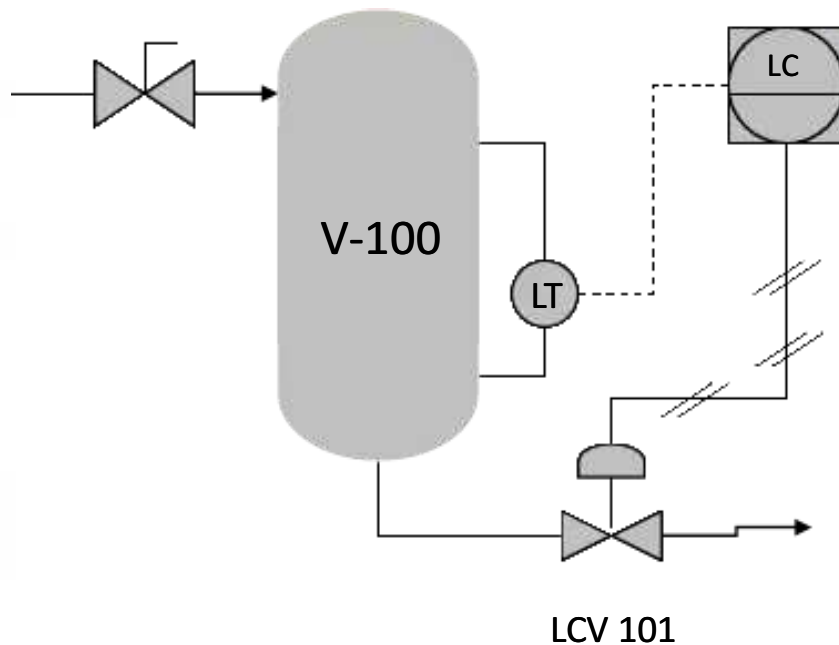
Basic Loop



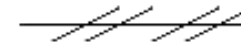
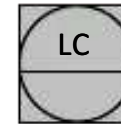
PIPING AND INSTRUMENTATION DIAGRAM (P&ID)

Principal of P&ID

Example 1



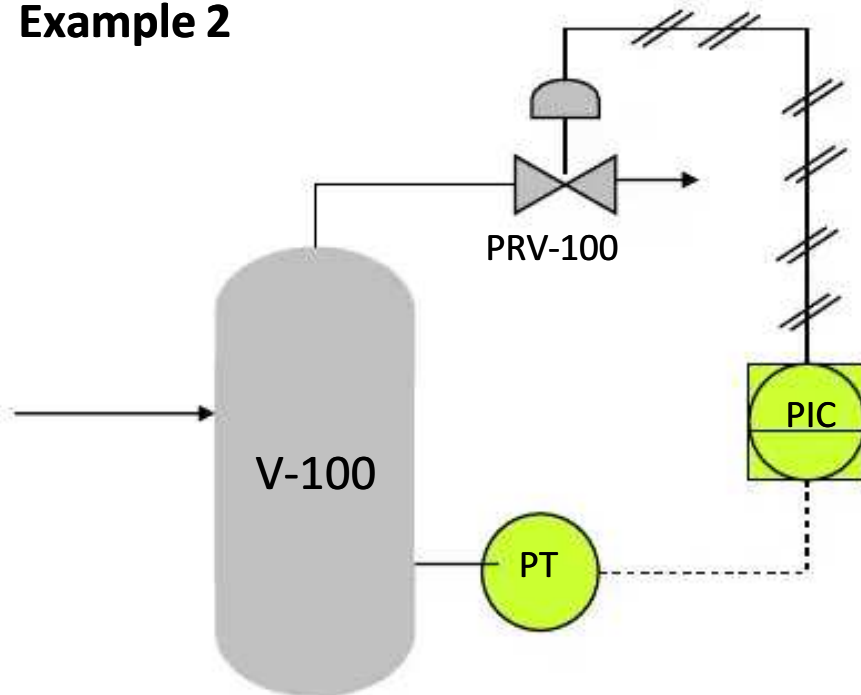
With using these following symbols;



Complete control loop for LCV 101

PIPING AND INSTRUMENTATION DIAGRAM (P&ID)

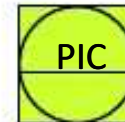
Example 2



With using these following symbology;



Where PT is locally mounted on V-100

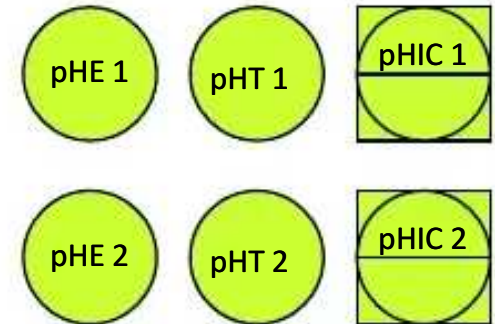
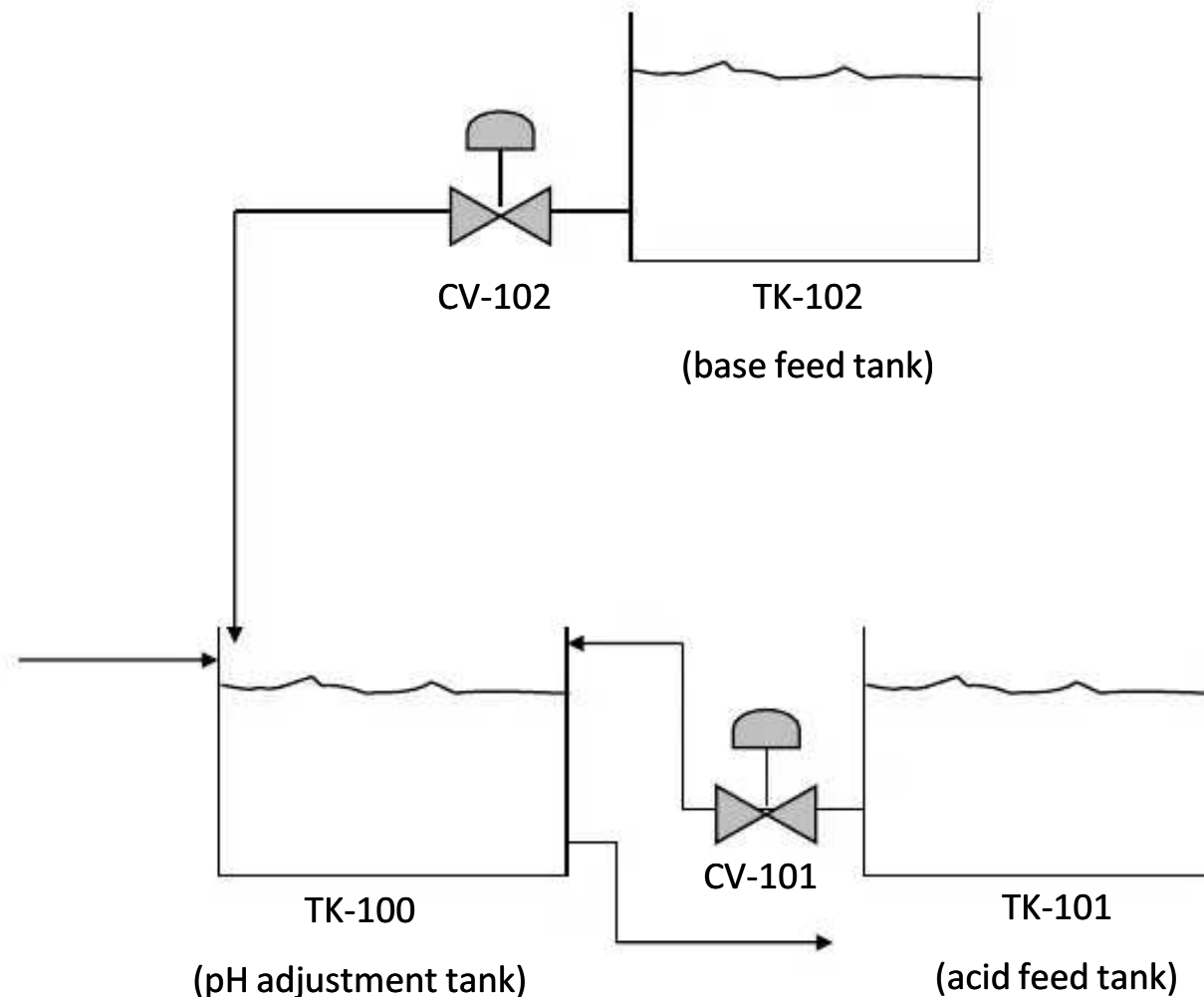


Where PIC is function in DCS

Draw control loop to show that PRV-100 will be activated to relief pressure when the pressure in the V-100 is higher than desired value.

PIPING AND INSTRUMENTATION DIAGRAM (P&ID)

Exercise 1

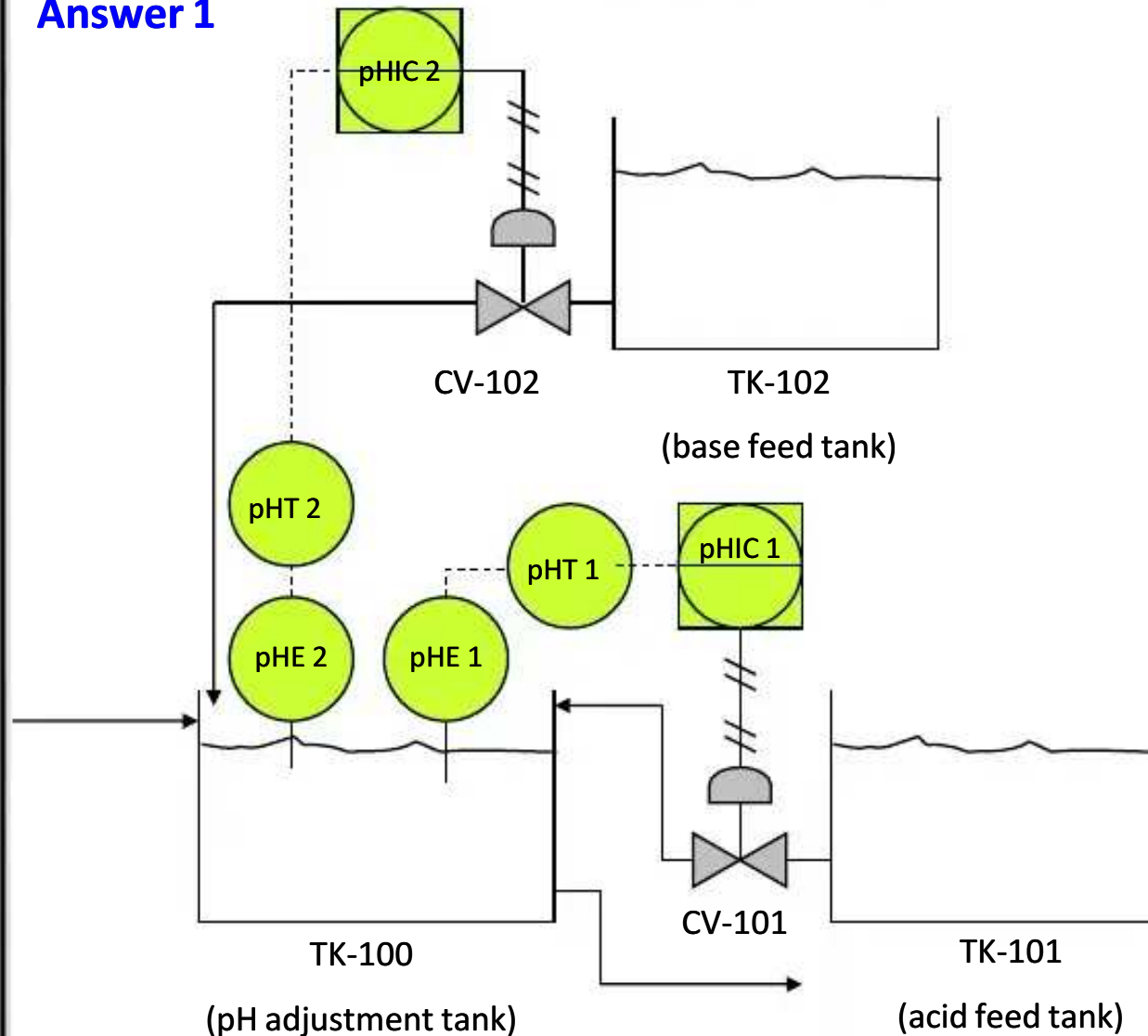


The diagram **shows pH adjustment**; part of waste water treatment process. With using above symbols, draw control loop where the process need is:

The process shall maintained at pH 6. When the process liquid states below pH 6, CV-102 will be opened to dosing NaOH to the tank TK-100. When the process liquid states above pH 6, CV-101 will be operated to dosing HCl.

PIPING AND INSTRUMENTATION DIAGRAM (P&ID)

Answer 1

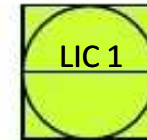
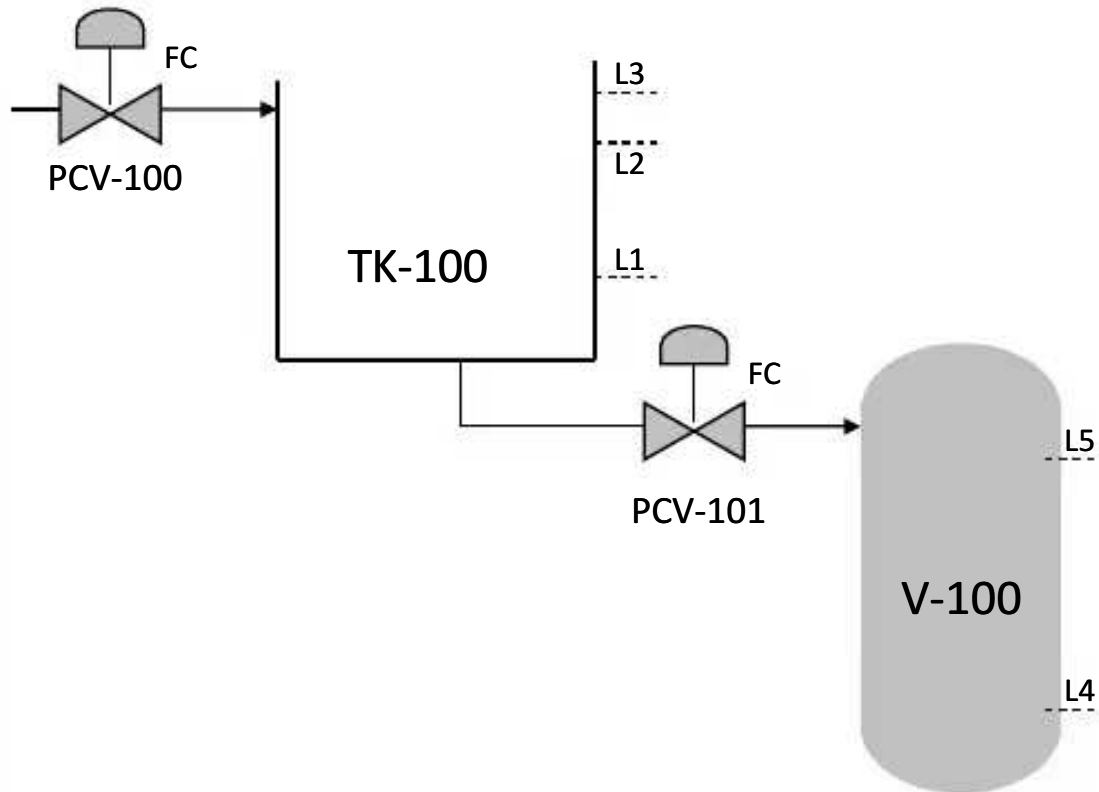


The diagram **shows pH adjustment**; part of waste water treatment process. With using above symbols, draw control loop where the process need is:

The process shall maintained at pH 6. When the process liquid states below pH 6, CV-102 will be opened to dosing NaOH in the base feed tank. When the process liquid states above pH 6, CV-101 will be operated to dosing HCl in the acid fed tank.

PIPING AND INSTRUMENTATION DIAGRAM (P&ID)

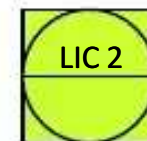
Exercise 2



Where LT 1 and LIC 1 to control
PCV-100 (failure close);

PCV-100 close when level reached
L 3

PCV-100 open when level below L3



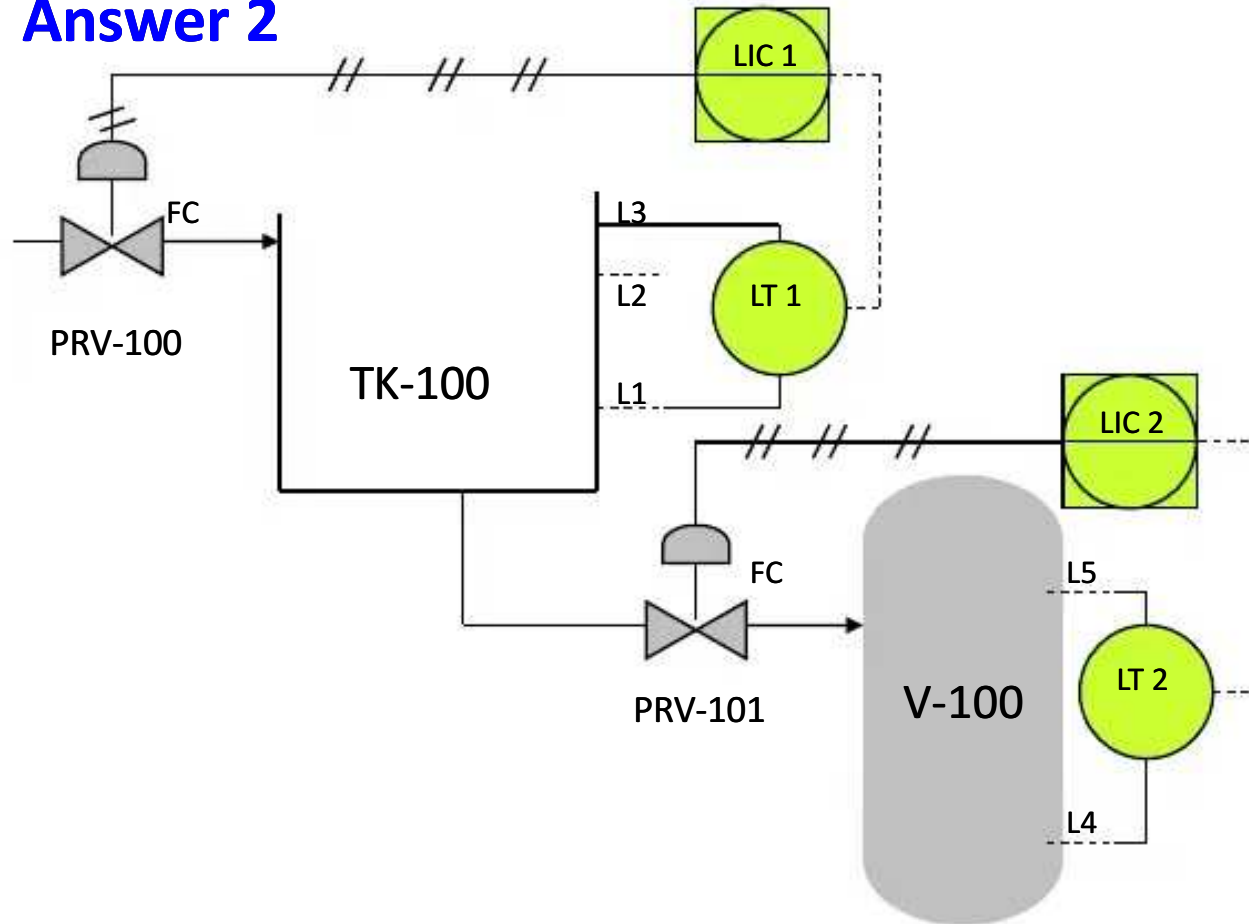
Where LT 2 and LIC 2 to control
PCV-101 (failure close);

PCV-101 close when level reached
L5

PCV-101 open when level below L5

PIPING AND INSTRUMENTATION DIAGRAM (P&ID)

Answer 2



Where LT 1 and LIC 1 to control PRV-100 (failure close);
PRV-100 close when level reached L 3
PRV-100 open when level below L3

Where LT 2 and LIC 2 to control PRV-101 (failure close);
PRV-101 close when level reached L5
PRV-101 open when level below L5

PIPING AND INSTRUMENTATION DIAGRAM (P&ID)

Instrumentation Numbering

□ **XYX CZZLL**

X represents a process variable to be measured.
(T=temperature, F=flow, P=pressure, L=level)

YY represents type of instruments.

C designates the instruments area within the plant.

ZZ designates the process unit number.

LL designates the loop number. (Optional)

PIPING AND INSTRUMENTATION DIAGRAM (P&ID)

Instrumentation Numbering

 FIC 82516

F = Flow shall be measured.

IC = Indicating controller

825 = Process unit no. 825 in the area of no. 8.

16 = Loop number 16

PIPING AND INSTRUMENTATION DIAGRAM (P&ID)

Instrumentation Numbering

 **LT 101**

L = Level shall be measured.

T = Transmitter.

100 = Process unit no. 101 in the area of no. 1