P & I Diagrams

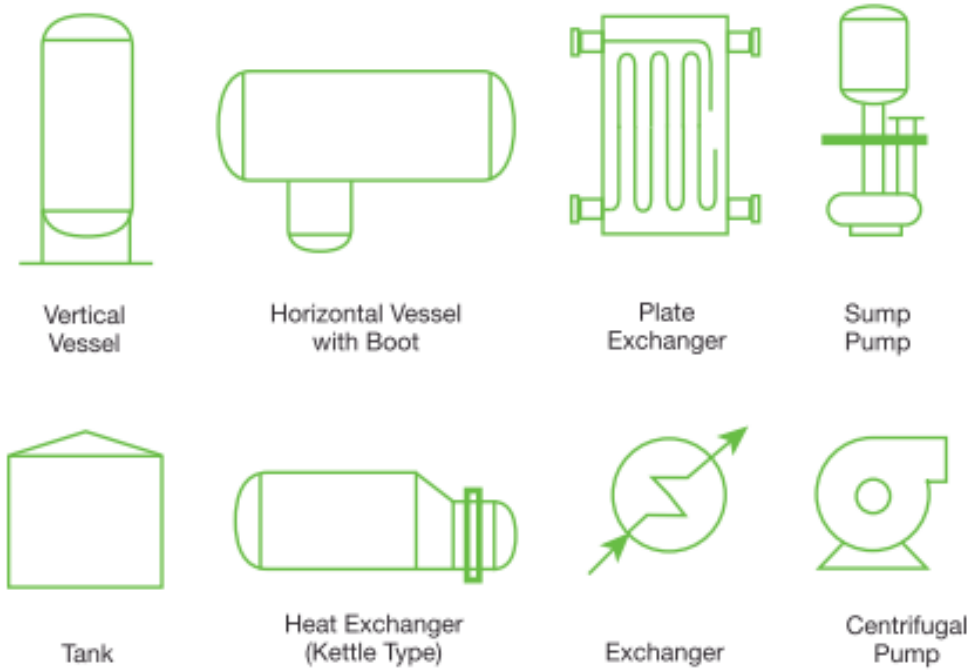
I&CE, MIT, Manipal

Equipment designation:

- Equipment numbering allows instant identification of equipment by its unique number. For example, an equipment identifier may consist of a letter and five numerals — e.g., X-00000.
- The letter designates the type of equipment, such as: V = vessel, E = heat exchanger, HE = heater (electrical), P = pump, and T = tank.
- The first two numerals could be the system code, for example: 30 = process gas, 60 = fuel gas, and 33 = gas dehydration.
- The final three numerals are a sequential identification number, from 001 to 999.

Equipment designation:

- Thus, a piece of equipment identified as V-30456 is a vessel (V) in the gas processing service (30), and is uniquely indentified with a sequential number of 456.



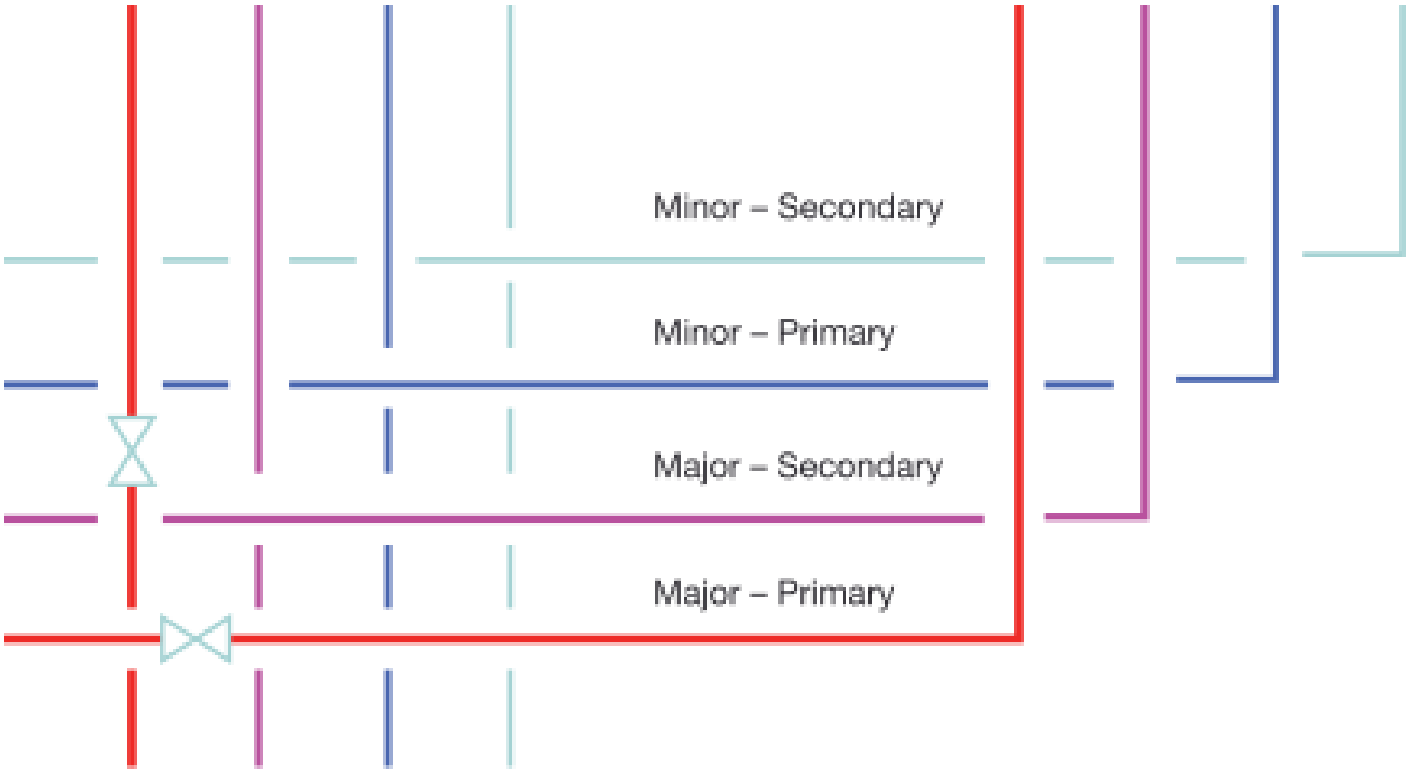
Line designation:

- Similar nomenclature rules apply to process and utility lines as shown in the figure, which are accompanied by an identification number, such as 00″-XX-00000-X0X-X0″.
- These fields convey a wealth of information at a glance. In this example, the first field is the line size (e.g., 24″).
- This is followed by two letters that indicate the process commodity in the line — for example, VA = vent, CU = condensate, PG = process hydrocarbons gas, etc.
- The third field is a five-digit number, the first two a gas system code (30 = process gas, 60 = fuel gas, and 33 = gas dehydration), and the last three a sequential identifier from 001 to 999.

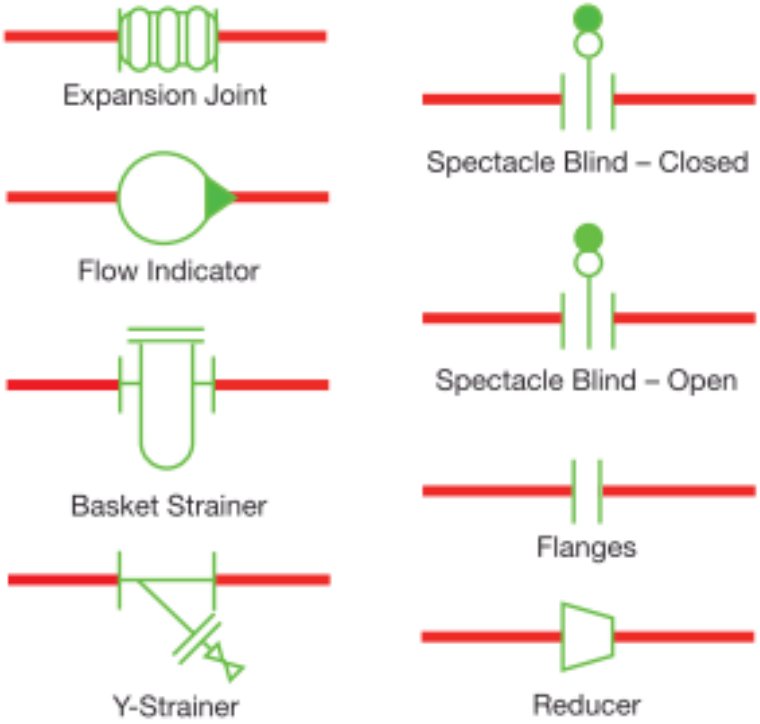
Line designation:

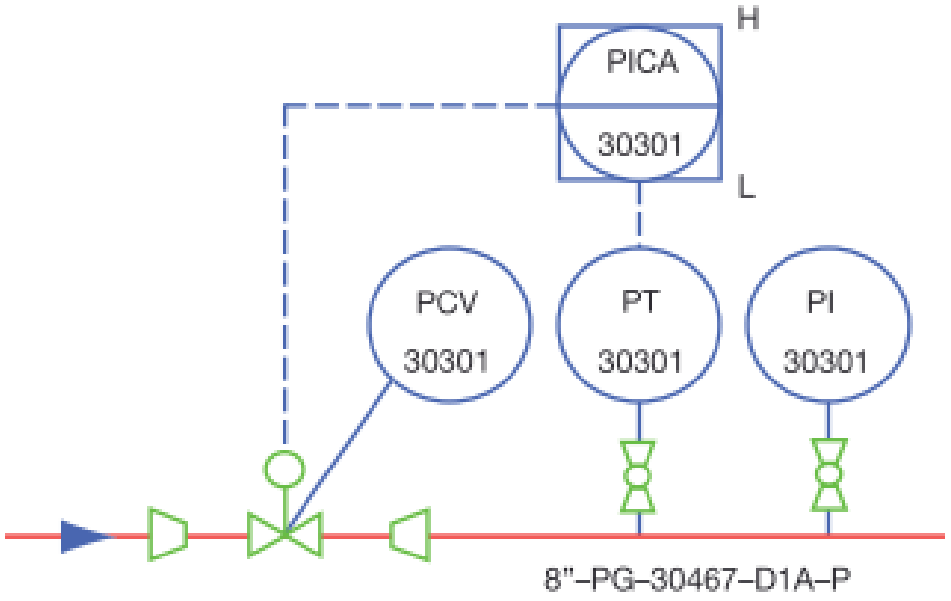
- The next segment is an alphanumeric sequence indicating the type of pipe specification (X0X), (e.g., A1, B1B, D1A, etc.).
- The last segment designates insulation information, with a letter indicating class (e.g., P = personnel protection, H = heat conservation, and T = tracing), followed by a number indicating thickness (e.g.,1″).
- Thus, a line labelled 24″-PG-30123-D1A-P1″ is a 24-in.dia. pipe carrying gaseous process hydrocarbons (PG) in the process gas system (30) with a unique identification number of 123; the line is to be designed to piping specification D1A with 1-in.-thick personnel protection insulation.

Line designation:

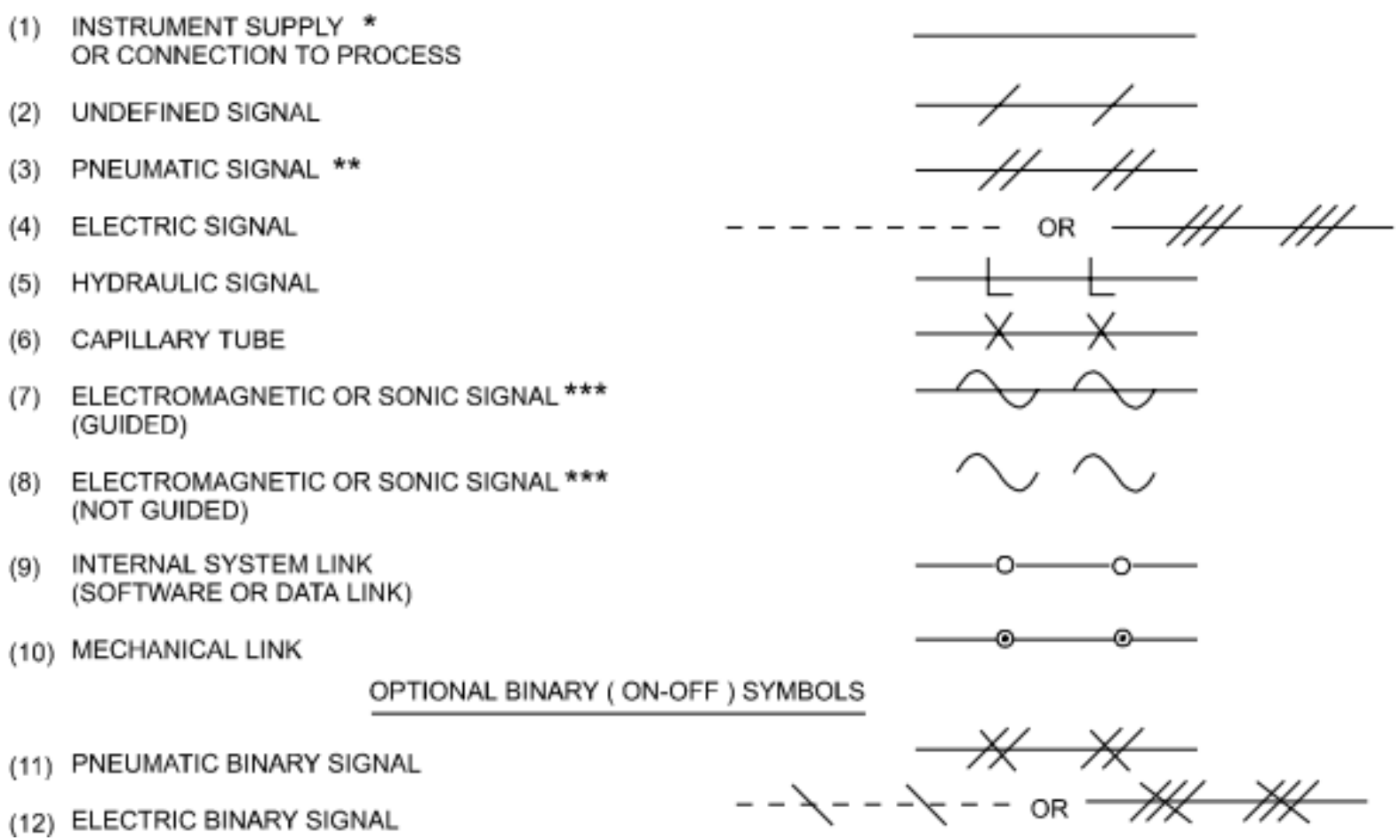


Line designation:





Instrument line symbols:



Typical Letter Combinations:

First-Letters	Initiating or Measured Vaiable	Controllers				Readout Devices		Switches and Alarm Devices*			Transmitters			Solenoids, Relays, Computing Devices	Primary Element	Test Point	Well or Probe	Viewing Device, Glass	Safety Device	Final Element
		Recording	Indicating	Blind	Self-Actuated Control Valves	Recording	Indicating	High**	Low	Comb	Recording	Indicating	Blind							
A	Analysis	ARC	AIC	AC		AR	AI	ASH	ASL	ASHL	ART	AIT	AT	AY	AE	AP	AW			AV
B	Burner/Combustion	BRC	BIC	BC		BR	BI	BSH	BSL	BSHL	BRT	BIT	BT	BY	BE		BW	BG		BZ
C	User's Choice																			
D	User's Choice																			
E	Voltage	ERC	EIC	EC		ER	EI	ESH	ESL	ESHL	ERT	EIT	ET	EY	EE					EZ
F	Flow Rate	FRC	FIC	FC	FCV, FICV	FR	FI	FSH	FSL	FSHL	FRT	FIT	FT	FY	FE	FP		FG		FV
FQ	Flow Quantity	FQRC	FQIC			FQR	FQI	FQSH	FQSL			FQIT	FQT	FQY	FQE					FQV
FF	Flow Ratio	FFRC	FFIC	FFC		FFR	FFI	FFSH	FFSL						FE					FFV
G	User's Choice																			
H	Hand		HIC	HC						HS										HV
I	Current	IRC	IIC			IR	II	ISH	ISL	ISHL	IRT	IIT	IT	IY	IE					IZ
J	Power	JRC	JIC			JR	JI	JSH	JSL	JSHL	JRT	JIT	JT	JY	JE					JV
K	Time	KRC	KIC	KC	KCV	KR	KI	KSH	KSL	KSHL	KRT	KIT	KT	KY	KE					KV
L	Level	LRC	LIC	LC	LCV	LR	LI	LSH	LSL	LSHL	LRT	LIT	LT	LY	LE		LW	LG		LV
M	User's Choice																			
N	User's Choice																			
O	User's Choice																			
P	Pressure/ Vacuum	PRC	PIC	PC	PCV	PR	PI	PSH	PSL	PSHL	PRT	PIT	PT	PY	PE	PP			PSV, PSE	PV
PD	Pressure, Differential	PDRC	PDIC	PDC	PDCV	PDR	PDI	PDSH	PDSL		PDRT	PDIT	PDT	PDY	PE	PP				PDV

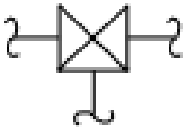
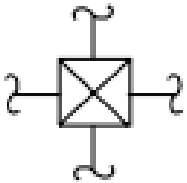
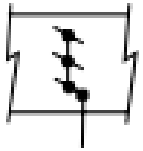
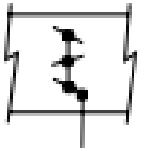
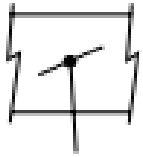
Typical Letter Combinations:

Q	Quantity	QRC	QIC			QR	QI	QSH	QSL	QSHL	QRT	QIT	QT	QY	QE				QZ
R	Radiation	RRC	RIC	RC		RR	RI	RSH	RSL	RSHL	RRT	RIT	RT	RY	RE		RW		RZ
S	Speed/Frequency	SRC	SIC	SC	SCV	SR	SI	SSH	SSL	SSHL	SRT	SIT	ST	SY	SE				SV
T	Temperature	TRC	TIC	TC	TCV	TR	TI	TSH	TSL	TSHL	TRT	TIT	TT	TY	TE	TP	TW	TSE	TV
TD	Temperature, Differential	TDRC	TDIC	TDC	TDCV	TDR	TDI	TDSH	TDSL		TDRT	TDIT	TDT	TDY	TE	TP	TW		TDV
U	Multivariable					UR	UI							UY					UV
V	Vibration/Machinery Analysis					VR	VI	VSH	VSL	VSHL	VRT	VIT	VT	VY	VE				VZ
W	Weight/Force	WRC	WIC	WC	WCV	WR	WI	WSH	WSL	WSHL	WRT	WIT	WT	WY	WE				WZ
WD	Weight/Force, Differential	WDRC	WDIC	WDC	WDCV	WDR	WDI	WDSH	WDSL		WDRT	WDIT	WDT	WDY	WE				WDZ
X	Unclassified																		
Y	Event/State/Presence		YIC	YC		YR	YI	YSH	YSL				YT	YY	YE				YZ
Z	Position/Dimension	ZRC	ZIC	ZC	ZCV	ZR	ZI	ZSH	ZSL	ZSHL	ZRT	ZIT	ZT	ZY	ZE				ZV
ZD	Gauging/Deviation	ZDRC	ZDIC	ZDC	ZDCV	ZDR	ZDI	ZDSH	ZDSL		ZDRT	ZDIT	ZDT	ZDY	ZDE				ZDV

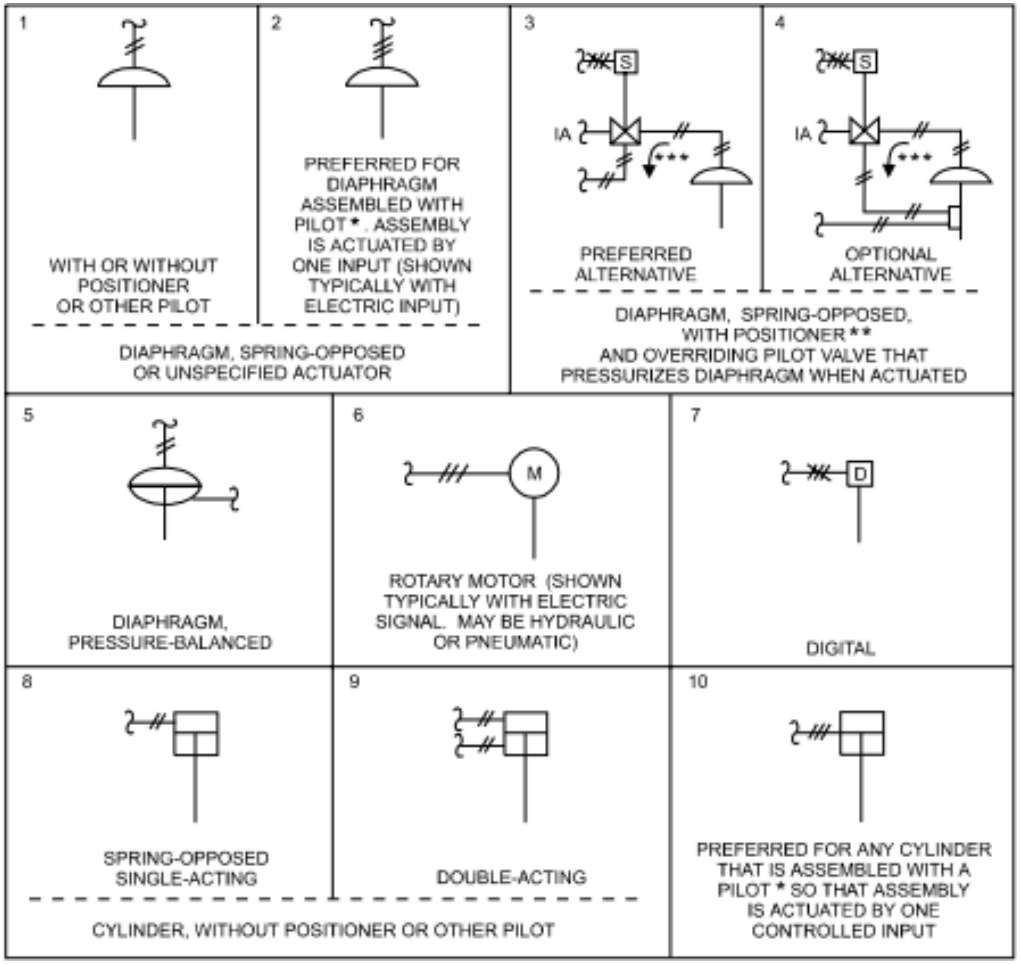
General instrument or function symbols:

	PRIMARY LOCATION ***NORMALLY ACCESSIBLE TO OPERATOR	FIELD MOUNTED	AUXILIARY LOCATION ***NORMALLY ACCESSIBLE TO OPERATOR
DISCRETE INSTRUMENTS	1 	2 	3 
SHARED DISPLAY, SHARED CONTROL	4 	5 	6 
COMPUTER FUNCTION	7 	8 	9 
PROGRAMMABLE LOGIC CONTROL	10 	11 	12 

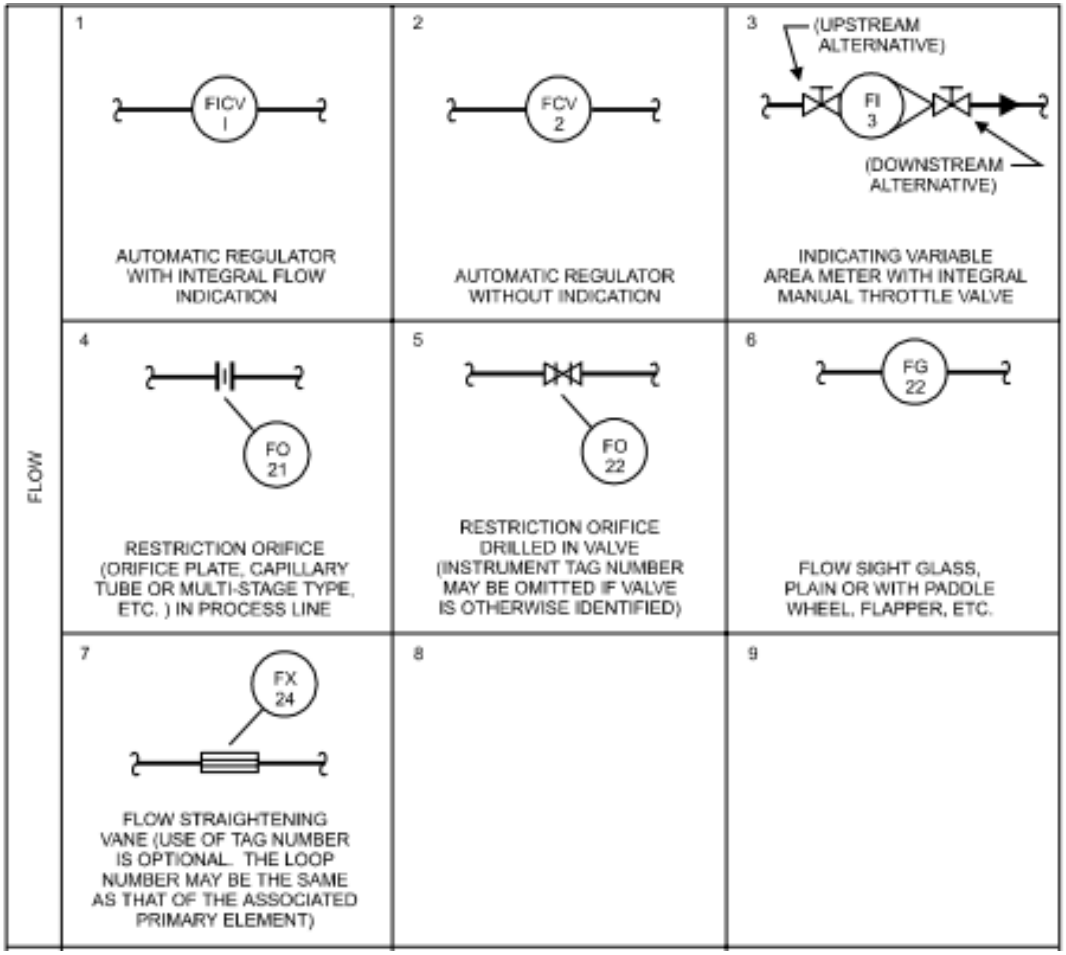
Control valve body symbols, damper symbols:

1  GENERAL SYMBOL	2  ANGLE	3  BUTTERFLY	4  ROTARY VALVE
5  THREE-WAY	6  FOUR-WAY	7  GLOBE	8
9  DIAPHRAGM	10  DAMPER OR LOUVER	11 	12 

Actuator symbols:



Symbols for self-actuated regulators, valves, and other devices:



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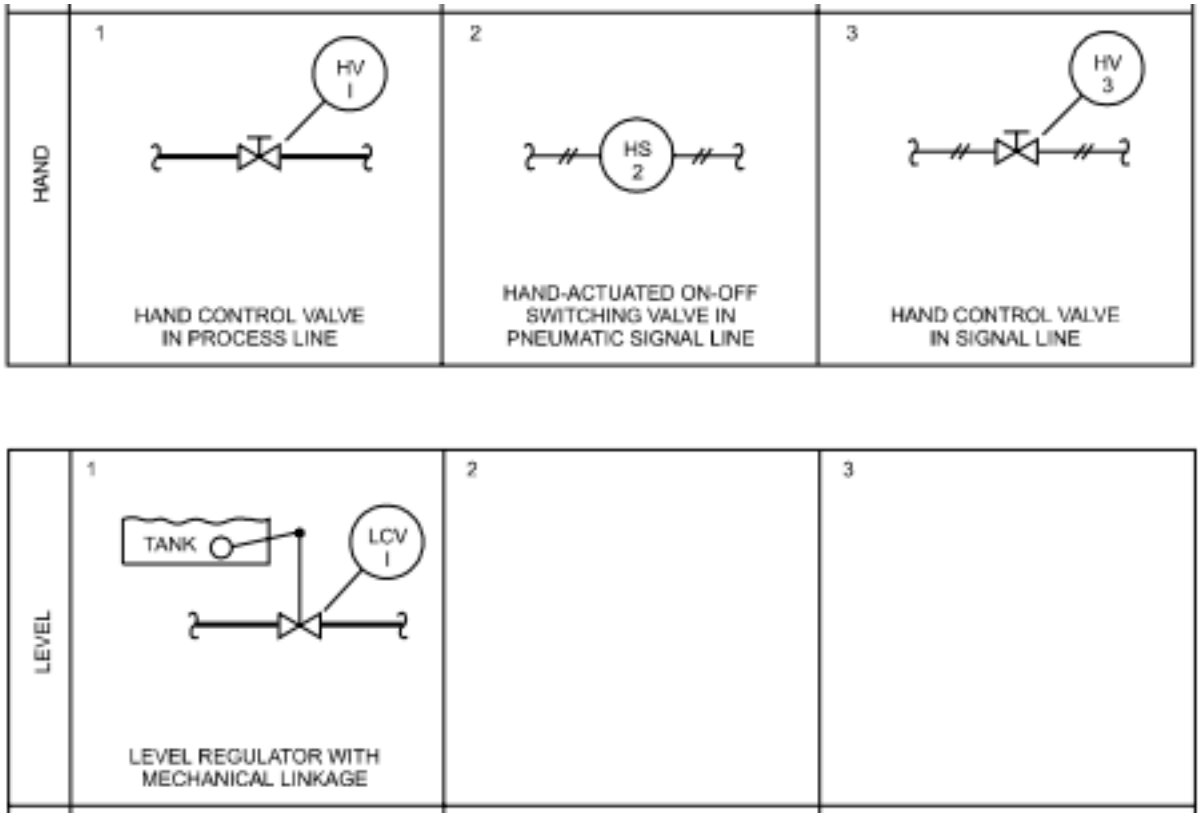
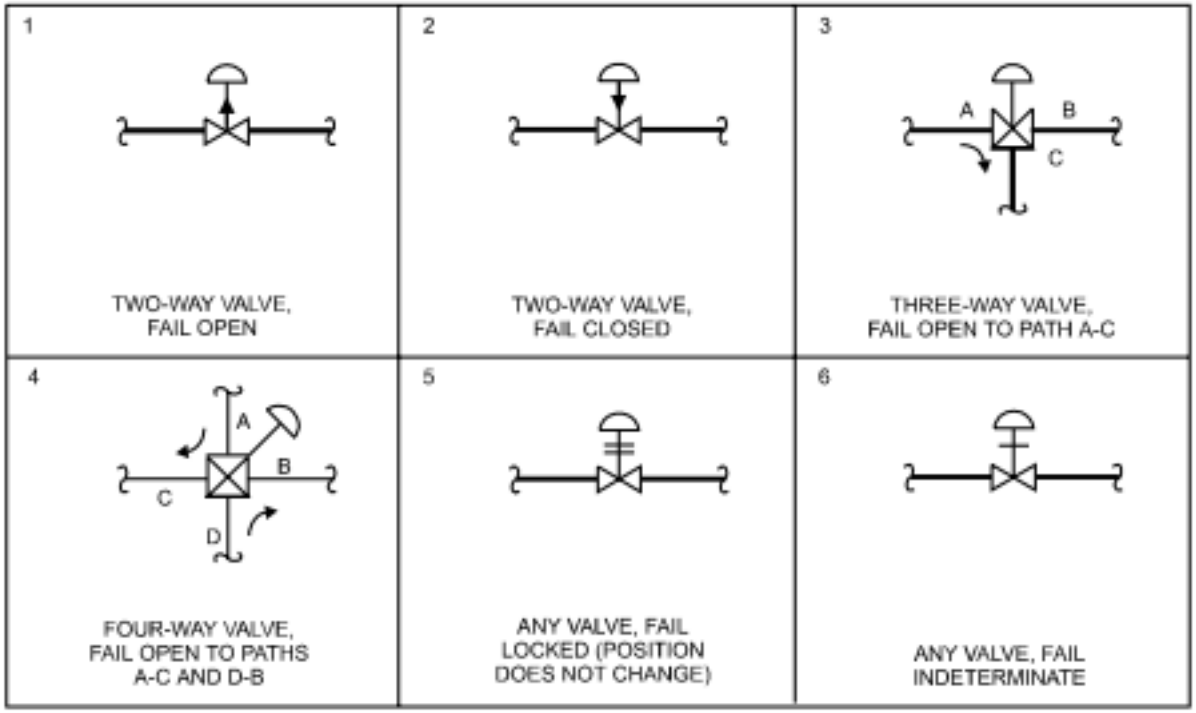
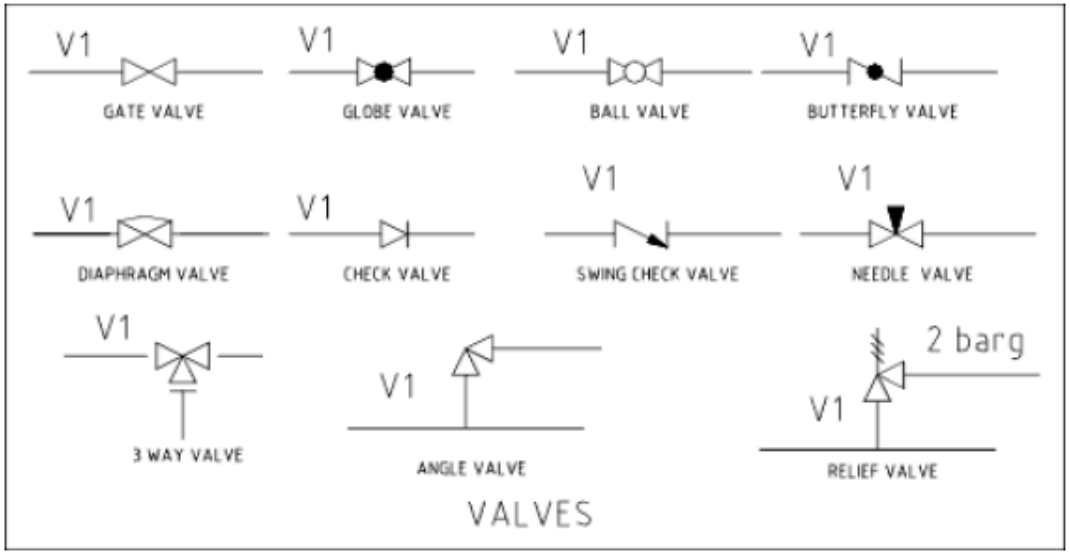
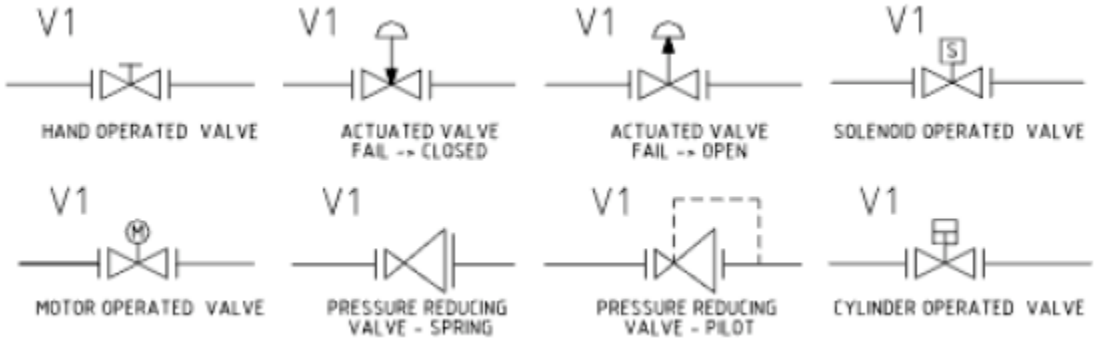


Symbols for actuator action in event of actuator power failure (shown typically for diaphragm-actuated control valve):

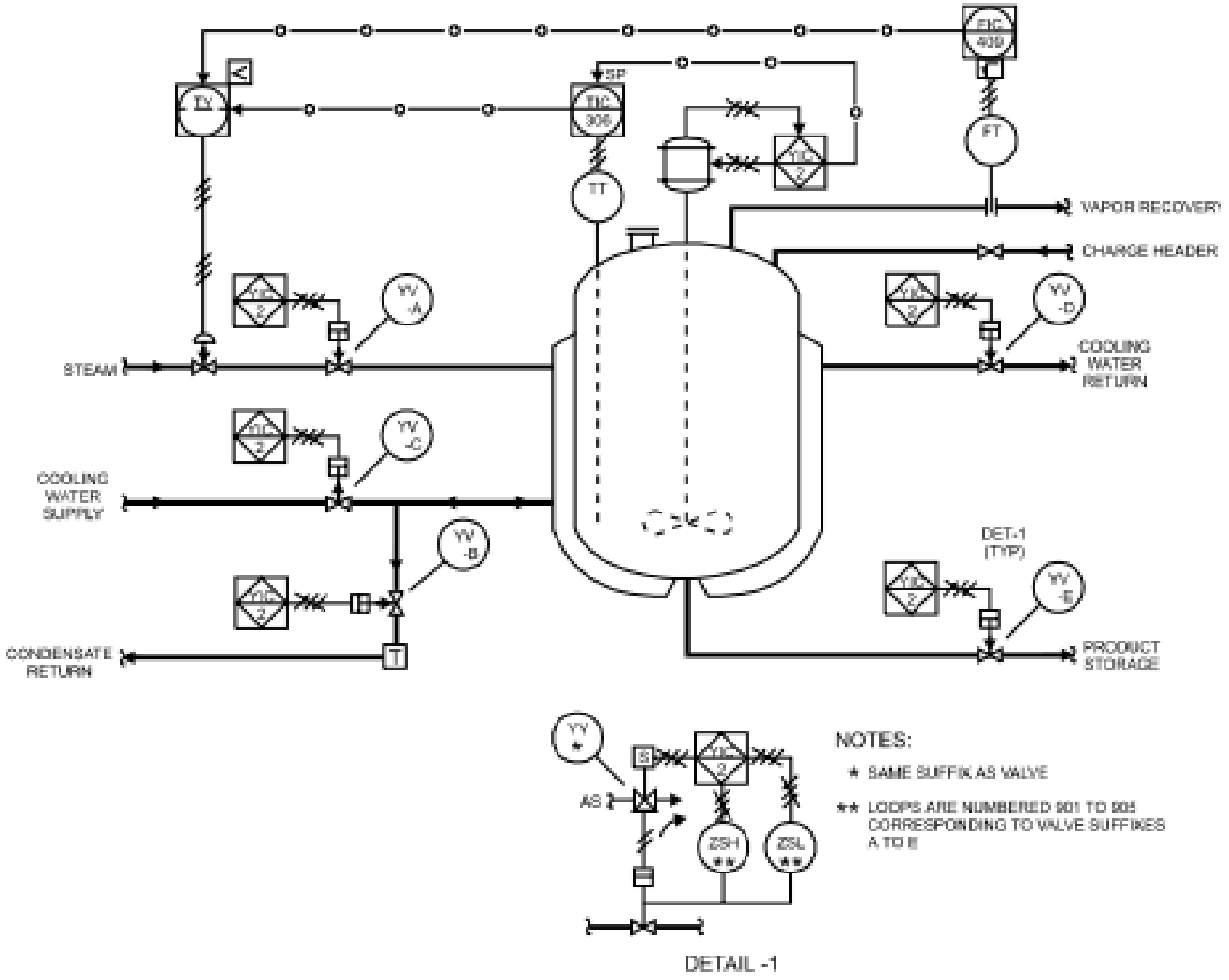


Summary:


V1
GATE VALVE
V1
GLOBE VALVE
V1
BALL VALVE
V1
BUTTERFLY VALVE
V1
DIAPHRAGM VALVE
V1
CHECK VALVE
V1
SWING CHECK VALVE
V1
NEEDLE VALVE
V1
3 WAY VALVE
V1
ANGLE VALVE
2 barg
V1
RELIEF VALVE
VALVES


V1
HAND OPERATED VALVE
V1
ACTUATED VALVE
FAIL -> CLOSED
V1
ACTUATED VALVE
FAIL -> OPEN
V1
S
SOLENOID OPERATED VALVE
V1
M
MOTOR OPERATED VALVE
V1
PRESSURE REDUCING
VALVE - SPRING
V1
PRESSURE REDUCING
VALVE - PILOT
V1
CYLINDER OPERATED VALVE

Example — complex combinations:



DETAIL -1

References:

- ANSI/ISA-5.1-1984 (R1992), Instrumentation Symbols and Identification, ISA – The Instrumentation, Systems, and Automation Society.
- CEP (Chemical Engineering Progress), May 2009