

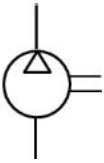
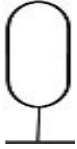
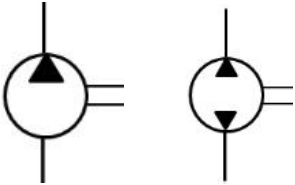
Earlier the ports were designated with letter system. Now as per ISO5599 the ports are designated based on number system. The port designations are shown in table 5.7.1

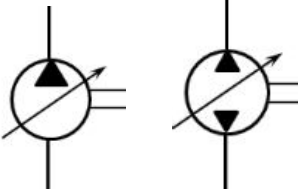
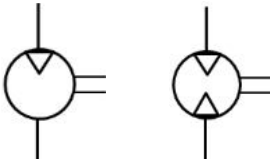
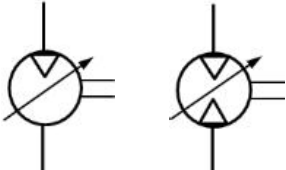
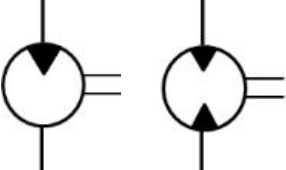
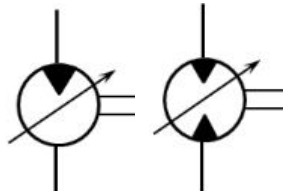
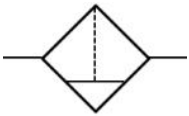
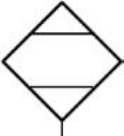
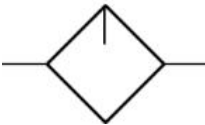
Table 5.7.1 Symbols for ports

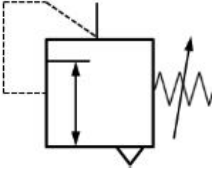
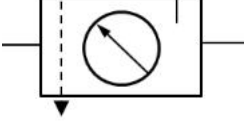
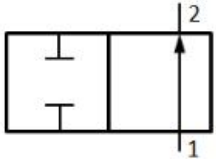
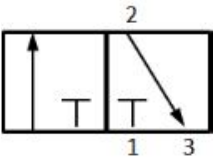
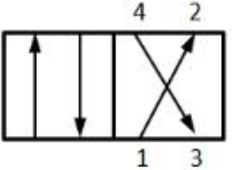
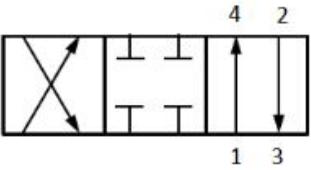
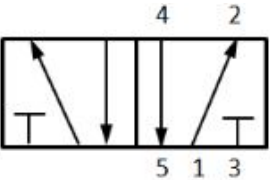
Port	Letter system	Number system
Pressure port	P	1
Working port	A	4
Working port	B	2
Exhaust port	R	5
Exhaust port	S	3
Pilot port	Z	14
Pilot port	Y	12

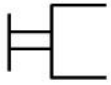
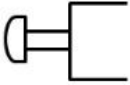
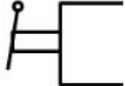
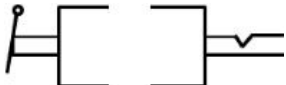
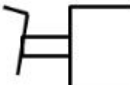
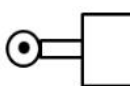
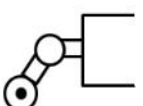

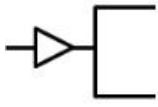


The graphical representation, designation and explanation of various components and equipments used in hydraulic and pneumatic system are given in table 5.7.2. Readers are suggested to study these representations carefully.

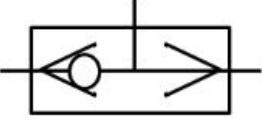
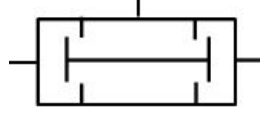
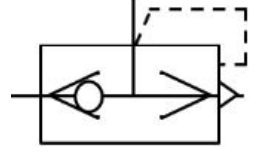

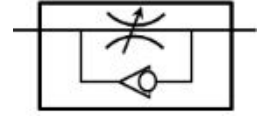
Table 5.7.2 Graphical symbols of hydraulic / pneumatic elements and equipments

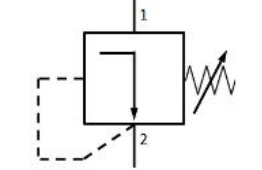
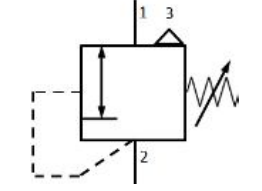
SYMBOL	DESIGNATION	EXPLANATION
Energy supply		
	Air compressor	One direction of rotation only with constant displacement volume
	Air receiver	Compressed air from the compressor is stored and diverted to the system when required
		One direction and two direction of rotation with constant displacement volume

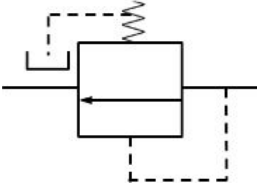
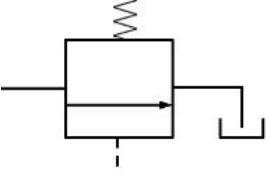
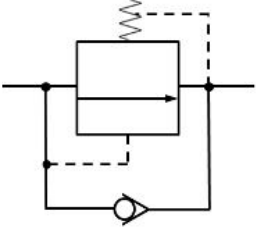


	<p>Hydraulic pump</p>	<p>One direction and two direction of rotation with variable displacement</p>
<p>Rotary actuators</p>		
	<p>Pneumatic motor</p>	<p>One direction and two direction of rotation with constant displacement volume</p>
		<p>One direction and two direction of rotation with variable displacement</p>
	<p>Hydraulic motor</p>	<p>One direction and two direction of rotation with constant displacement volume</p>
		<p>One direction and two direction of rotation with variable displacement</p>
<p>Service units</p>		
	<p>Air filter</p>	<p>This device is a combination of filter and water separator</p>
	<p>Dryer</p>	<p>For drying the air</p>
	<p>Lubricator</p>	<p>For lubrication of connected devices, small amount of oil is added to</p>

		the air flowing through this device
	Regulator	To regulate the air pressure
	FRL unit	Combined filter, regulator and lubricator system
Direction control valves (DCVs)		
	2/2 way valve	Two closed ports in the closed neutral position and flow during actuated position
	3/2 way valve	In the first position flow takes place to the cylinder In the second position flow takes out of the cylinder to the exhaust (Single acting cylinder)
	4/2 way valve	For double acting cylinder all the ports are open
	4/3 way valve	Two open positions and one closed neutral position
	5/2 way valve	Two open positions with two exhaust ports

Direction control valve actuation methods		
	General manual actuation	Manual operation of DCV
	Push button actuation	
	Lever actuation	
	Detent lever actuation	
	Foot pedal actuation	Mechanical actuation of DCV
	Roller lever actuation	
	Idle return roller actuation	
	Spring actuation	
	Direct pneumatic actuation	Pneumatic actuation of DCV
Non return valves		
	Check valve	Allows flow in one direction and blocks flow in other direction
	Spring loaded check valve	

	<p>Shuttle/ OR valve</p>	<p>When any one of the input is given the output is produced</p>
	<p>AND valve</p>	<p>Only when both the inputs are given output is produced</p>
	<p>Quick exhaust valve</p>	<p>For quick exhaust of air to cause rapid extension/retraction of cylinder</p>
<p>Flow control valves</p>		
	<p>Flow control valve</p>	<p>To allow controlled flow</p>
	<p>Flow control valve with one way adjustment</p>	<p>To allow controlled flow in one direction and free flow in other</p>

<p>Pressure control valves</p>		
	<p>Pressure relieving valve</p>	<p>Non relieving type</p>
		<p>Relieving type with overload being vented out</p>

	<p>Pressure reducing valve</p>	<p>Maintains the reduced pressure at specified location in hydraulic system</p>
	<p>Unloading valve</p>	<p>Allows pump to build pressure to an adjustable pressure setting and then allow it to be discharged to tank</p>
	<p>Counter balance valve</p>	<p>Controls the movement of vertical hydraulic cylinder and prevents its descend due to external load weight</p>
<p>Actuators</p>		
	<p>Single acting cylinder</p>	<p>Spring loaded cylinder with retraction taking place by spring force</p>
	<p>Double acting cylinder</p>	<p>Both extension and retraction by pneumatic/hydraulic force</p>

Module 5: Hydraulic systems

Lecture 8

Design of Hydraulic Circuit

Case study 1

1.1 Problem Definition: Package lifting device

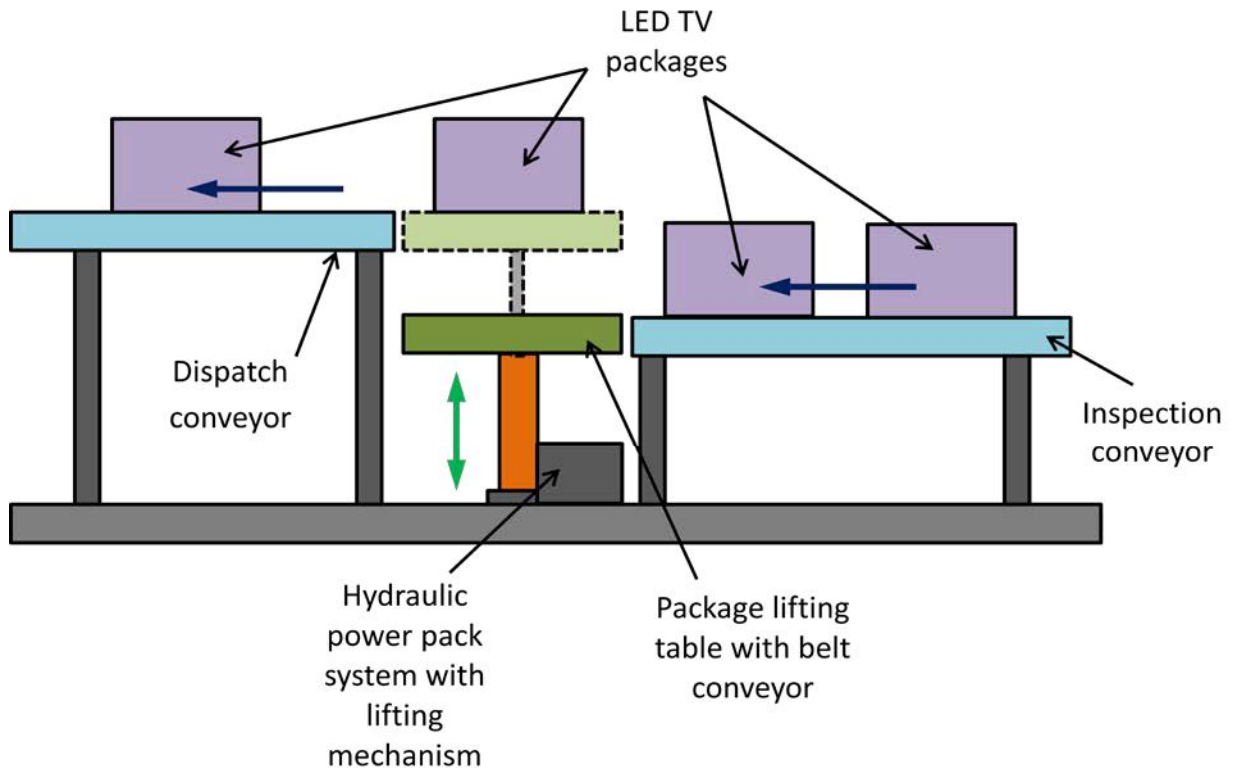


Figure 5.8.1 Schematic of a Package lifting system for LED TVs

For a dispatch station of a LED TV production house, design a package lifting device to lift packages containing 21” to 51” LED TVs from the inspection conveyor to the dispatch conveyor. Draw the hydraulic circuit diagram. List the components. Readers are requested to assume suitable data.