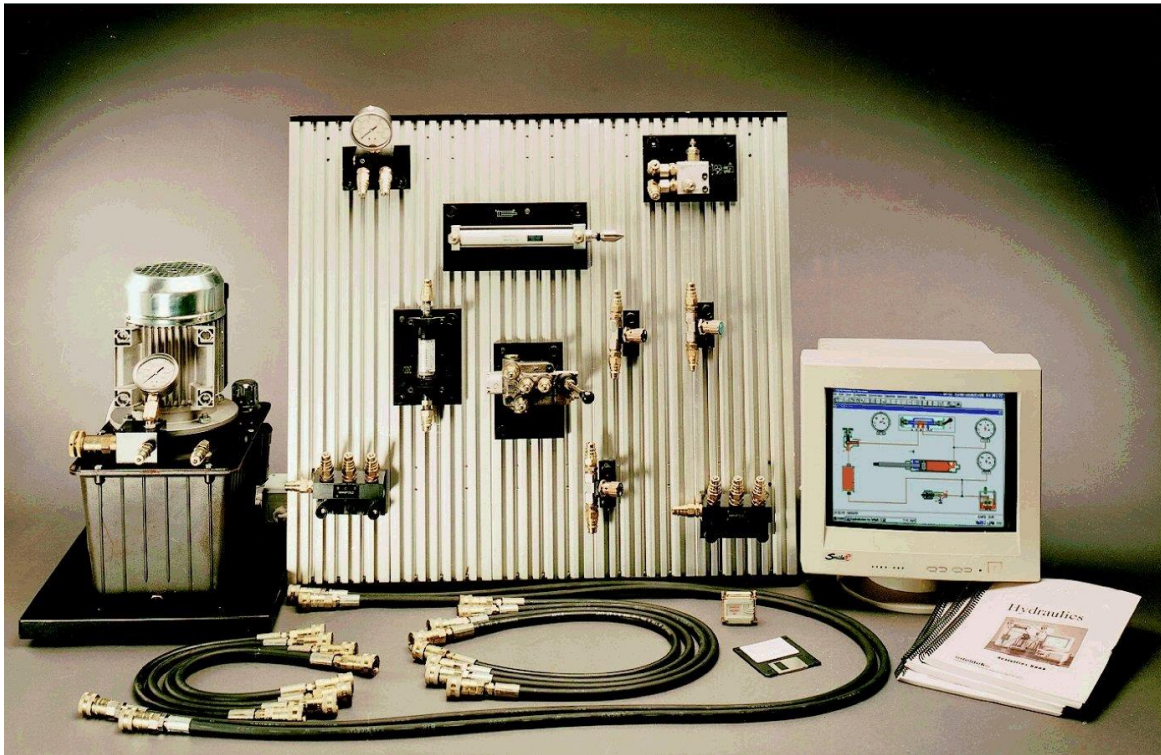


# HydraFlex



USER MANUAL

*Catalog #100129 Rev. 1*

intelitek ®

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HydraFlex User Manual

Catalog No. 100129 Rev. I

October 2014

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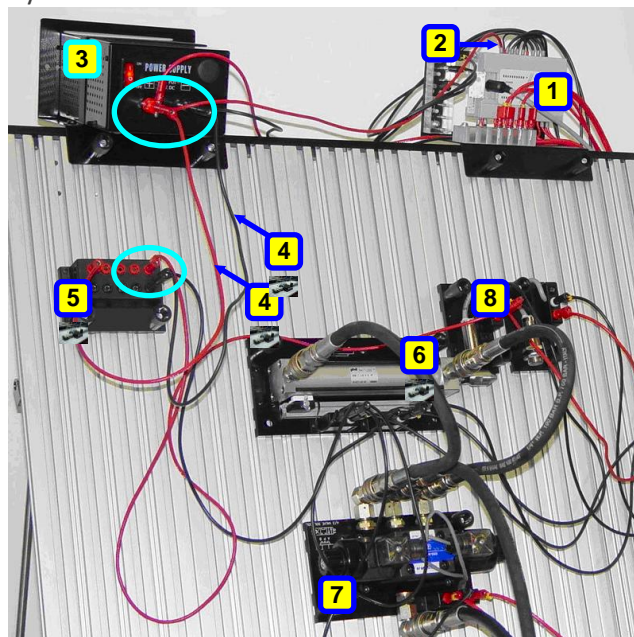
## Contents

1.	Installation .....	1
1.1.	Setting Up the Panel .....	2
1.2.	Attaching Components to Panel .....	3
1.3.	Connecting Components .....	4
1.4.	Connecting the Hydraulic Power Pack .....	6
1.4.1.	Setup.....	7
1.4.2.	Fill Up.....	7
1.4.3.	Operation.....	8
1.5.	Installing Electro-Hydraulic System Components (PLC MicroLogix) .....	9
1.5.1.	HydraFlex Wiring Connections (to Power Supply and PLC MicroLogix).....	9
1.6.	Installing Electro-Hydraulic System Components (CP/C 2000A) .....	15
1.6.1.	HydraFlex Wiring Connections (to Power Supply and CP/C 2000A) .....	16
2.	Safety and Maintenance .....	19
2.1.	Safety.....	19
2.2.	Maintenance.....	19
3.	Components.....	20
3.1.	Terminology.....	20
3.2.	HydraFlex Packages .....	21
3.3.	HydraFlex Components.....	23

# 1. Installation

HydraFlex is an educational panel for the assembly of hydraulic circuits and systems. It can be used to teach the fundamentals of hydraulics at both basic and advanced levels.

The HydraFlex system may be ordered with either a single-sided or double-sided slotted aluminum panel. The single-sided panel can be laid flat or raised to any angle. Hydraulic components are attached to the panel. The components can easily be repositioned, coupled and uncoupled, to form a variety of hydraulic or electro-hydraulic circuits.



1. PLC MicroLogix
2. PLC to Power Supply Cable
3. Power Supply Connections
4. Power Supply Cables (Red and Black) to Electrical Distributor
5. Electrical Distributor
6. Double Acting Cylinder with Magnetic Sensors
7. 4/3 Sol-sol Control Valve
8. Inductive Proximity

*Figure 1: HydraFlex Panel (with PLC MicroLogix)*

## 1.1. SETTING UP THE PANEL

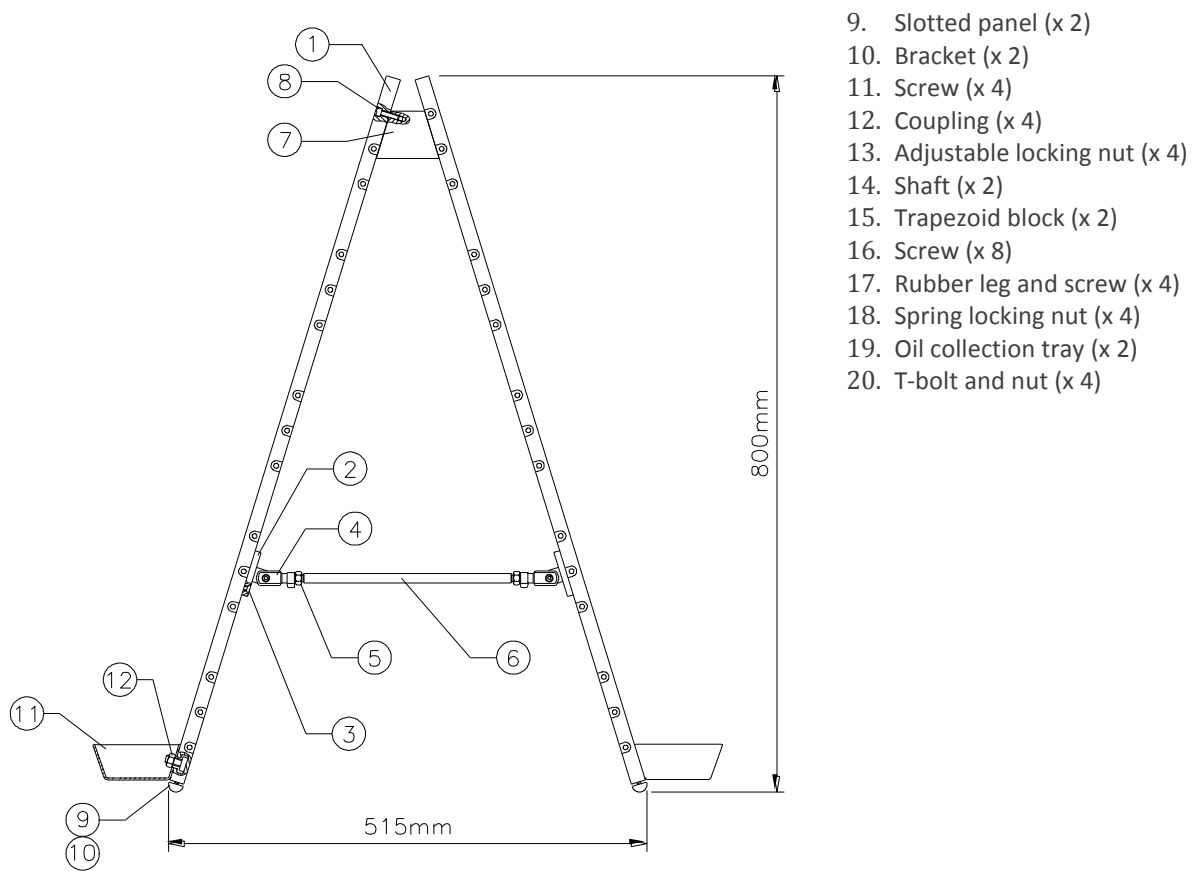
### Single-sided panel:

1. Place the HydraFlex panel on a sturdy surface and unfold the legs.
2. Adjust the panel to the desired position and angle and then tighten the bolts which fix the legs in place.

### Double-sided panel (refer to the diagram below):

1. Loosely connect the two sides of the panel by means of the shafts (6). Do not yet tighten the locking nuts (5).
2. Connect the tops of the two sides by means of the trapezoid blocks (7), and tighten the screws.
3. Tighten the shaft locking nuts (5).

If your unit includes an oil collection tray (11), slide the T-bolts (12) on the side of the panel into the connection slots on the tray. Tighten the bolts.



**Figure 2: Double-Sided Panel**

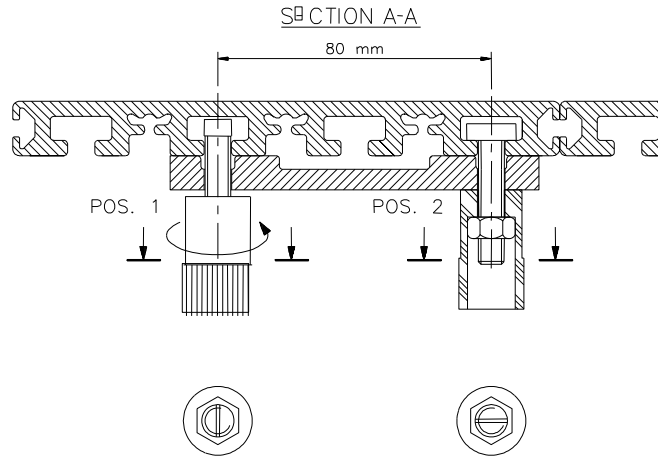
## 1.2. ATTACHING COMPONENTS TO PANEL

HydraFlex components are easily attached to the panel.

The hydraulic components are mounted on special plates which are attached to the panel. *Do not remove the components from these plates.*

The plates have either two or four pairs of bolts and nuts. The nuts are mounted in black plastic casings which allow them to be tightened and loosened by hand, without a tool. The heads of the bolts are shaped to fit into the slots of the panel.

To attach a component to the panel, slide the bolt head into the slot, as shown in the Section A-A diagram (Pos.1). When the component has been positioned as desired, turn the casing clockwise to tighten the bolt and lock the component in place (Pos.2).

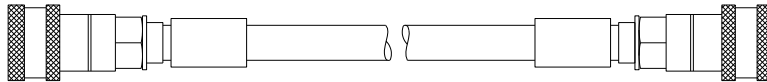


To remove a component from the panel, turn the bolt casing counter-clockwise to loosen the bolt. An Allen key (hex wrench) can also be used for tightening and loosening the bolts.

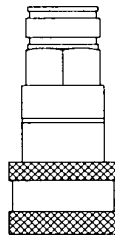
### 1.3. CONNECTING COMPONENTS

Hydraulic components are connected by means of 1/4" hoses provided with the system. The hoses come in three lengths: 200 cm, 80 cm and 50 cm.

Quick couplers are used for easy connection and disconnection of the hoses.



- All hoses have female couplers (sockets). The sockets have a spring loaded sliding collar, and an internal ball bearing ring. Retracting the collar loosens the internal ball bearings and allows the plug to be inserted or released. When the plug and socket are coupled the female ball bearing contracts and holds the head of the male coupler, thus allowing hydraulic fluid to flow between the components.



*Female coupler*

- All the ports on the hydraulic components have male couplers (plugs).

The plugs have a partially exposed ball bearing. The ball bearing is spring loaded which prevents hydraulic fluid and system pressure from leaking when the plug is not in use or not properly connected.



*Male coupler*

To connect a hose to a component:

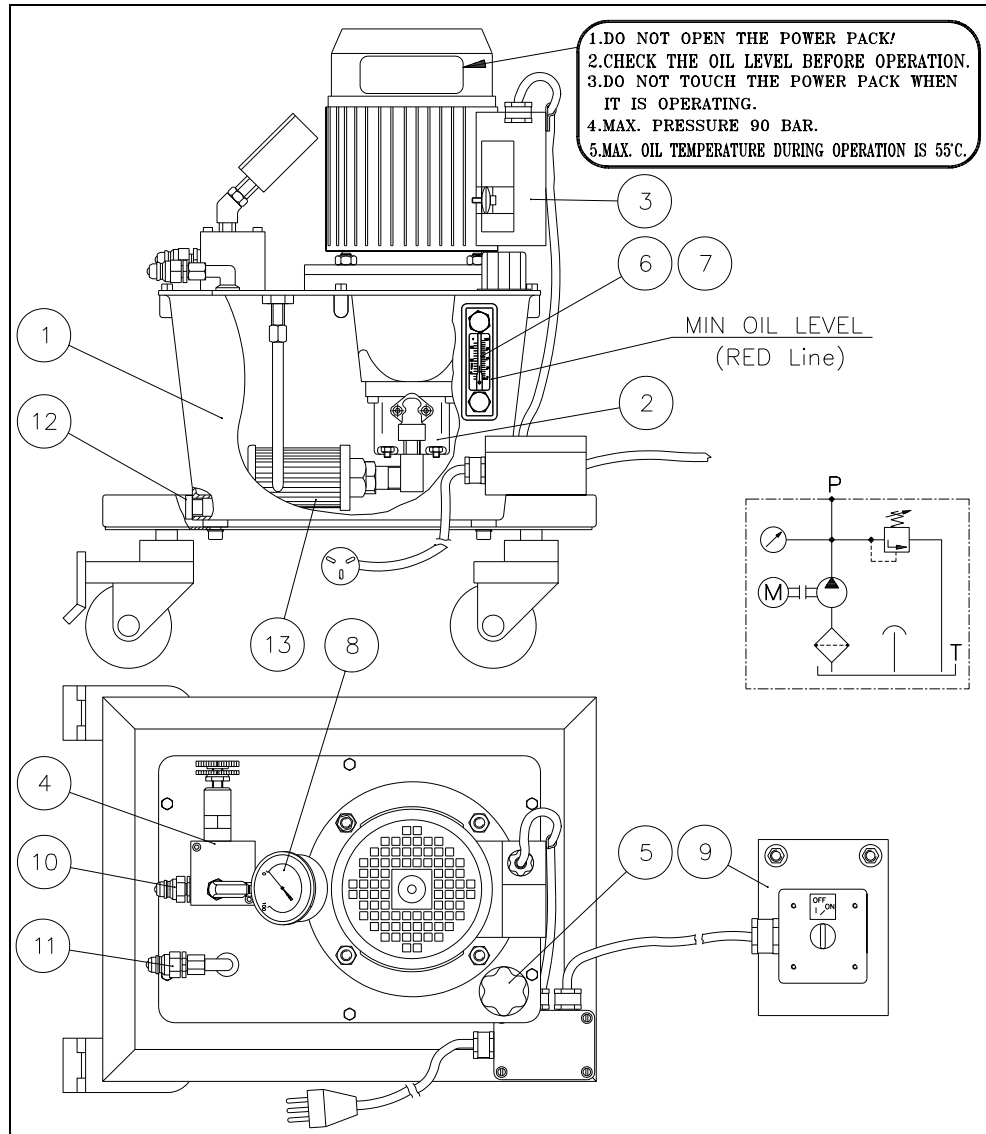
- Hold the female coupler and slide back its collar.
- Fit the female coupler onto the male coupler and release the collar.

To disconnect a hose from a component, simply grasp and slide back the collar of the female coupler.



## 1.4. CONNECTING THE HYDRAULIC POWER PACK

The trolley-mounted hydraulic power pack powers the HydraFlex hydraulic components.



**Figure 3: Hydraulic Power Pack Connections**

### 1.4.1. Setup

1. *Keep the power pack in its upright position.* (A small amount of oil, which remains in the tank after factory testing, may leak out if the unit is tilted or turned over.)
2. Make sure the power pack's voltage rating matches your power supply.
3. Attach the hydraulic power pack's On/Off Switch unit to the panel at an easily reached spot. This unit is mounted on a plate with bolts which slide into the slots on the panel, like all other HydraFlex components.
4. Connect hoses from the panel to the power pack's Return Line valve and Pressure Relief valve.
5. Connect the power pack power cable to a grounded AC power supply outlet.

### 1.4.2. Fill Up

**Warning:** The power pack is supplied without hydraulic fluid. Do not operate the power pack until it has been filled with hydraulic fluid.

Use hydraulic fluid only. Type SADOL S-300 or 10W is recommended; viscosity 20–50 mm<sup>2</sup>/s.

Open the tank cap (5), and use a funnel for pouring the oil into the tank.

The power pack oil tank has a 10 liter capacity. While filling the tank, pay attention to the oil level gauge (6).

- The maximum oil level is about 5 mm below the top of the gauge.
- The minimum oil level is about the mid-point of the gauge.

Check the oil level daily, and refill as necessary. Note that the oil level in the tank will drop when fluid flows into new components and hoses which are connected to the system.

Completely change the hydraulic fluid in the tank once a year.

### 1.4.3. Operation

**Warning:** Do not operate the power pack when no consumers are connected — doing so will cause the unit to operate under high pressure.

1. Place the hydraulic power pack in a position which will allow you to continually observe the oil level/temperature gauge.
2. Attach the hydraulic power pack's On/Off Switch unit (9) to the HydraFlex panel at an easily reached spot. The On/Off Switch unit is mounted on a plate with bolts which slide into the slots on the panel, like all other HydraFlex components.
3. Make sure all the hoses which connect components on the panel are securely fastened.
4. Connect the hoses from the power pack's Return Line valve (11) and Pressure Relief valve (10) to the components on the HydraFlex panel.
5. Connect the power pack's power cable to a grounded AC power supply outlet.
6. Turn on the On/Off switch. The unit will begin operating and building pressure.
7. Make sure the pressure gauge (8) does not exceed an operating pressure of 60 bar (i.e., the maximum pressure allowed when the unit is operating but not pumping oil.)

If necessary, adjust the pressure level to 60 bar by turning the knob on the relief valve (4). Use the locking nut on the knob to loosen and tighten the knob.

8. During power pack operation, check the oil level/temperature gauge (6/7). Make sure that oil temperature does not exceed 55°C.

If the temperature exceeds 55°C, turn off the power pack and wait for it to cool down.

9. Turn off the power pack's On/Off switch when you are finished working with the panel.

Never leave the power pack operating unnecessarily or unattended.

## 1.5. INSTALLING ELECTRO-HYDRAULIC SYSTEM COMPONENTS (PLC MICROLOGIX)

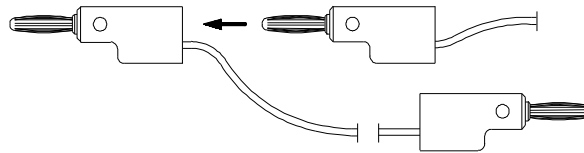
These instructions are for Electro-Hydraulic systems only.

This section describes how to install the electro-hydraulic components for systems using PLC MicroLogix.

The Electro-HydraFlex unit requires a 24Vdc/3A power supply unit to provide the electricity for the electro-hydraulic components. (If more than two solenoids will be activated at the same time, an additional power supply is required.)

Before you make any connections, make sure the voltage rating of the 24 Vdc power supply unit and the PLC MicroLogix matches your power supply.

All connections are by means of cables with banana plugs. The banana plugs can be stacked one into another, as shown in the figure below.



### 1.5.1. HydraFlex Wiring Connections (to Power Supply and PLC MicroLogix)

The HydraFlex wiring connections are performed by first connecting the power supply to the electrical distributor on the panel, and then connecting the PLC MicroLogix to the electrical distributor, as described in the procedures below.

The unused banana cables can be stored in the Wire Holder (refer to # 8, in **Error! Reference source not found.**). The 24VDC power supply should be connected to the HydraFlex panel and PLC MicroLogix.

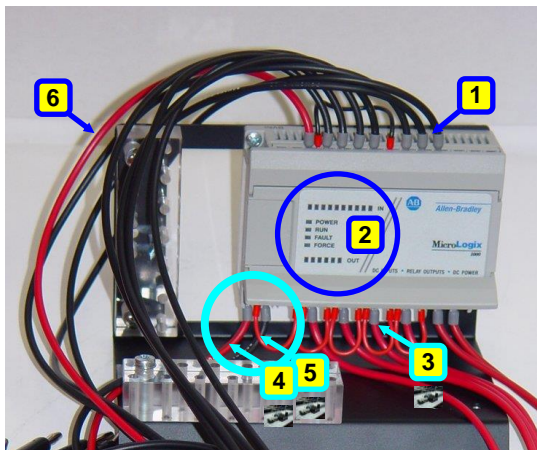
**Note:** The PLC MicroLogix cables are labeled, as follows: **(+), (-), COM, #1-#8** (input cables) and **#1-#6** (output cables). Refer to these labels when performing the electrical connections in this guide.

To connect the Power Supply to the Electrical Distributor (ED) on the HydraFlex Panel:

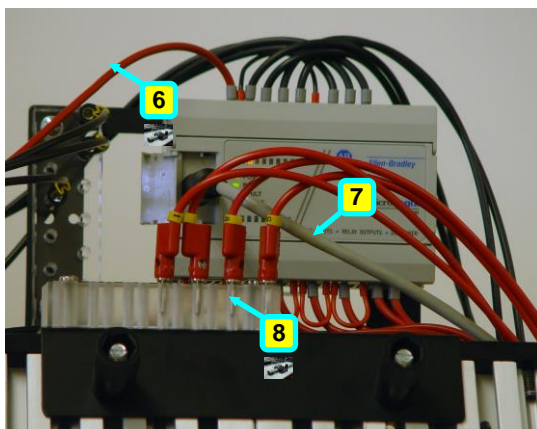
1. Connect the red power supply cable to a red socket on the Electrical Distributor.
2. Connect the black power supply cable to a black socket on the Electrical Distributor.

To connect the PLC MicroLogix to the Electrical Distributor (ED) on the HydraFlex Panel:

1. From the PLC MicroLogix, connect the black banana cable (#5, in figure 4), labeled as (-), to a black socket on the Electrical Distributor.
2. From the PLC MicroLogix, connect the red banana cable (#4, in figure 4), labeled as (+), to a red socket on the Electrical Distributor.
3. From the PLC MicroLogix, connect the red COM cable (#6, in figure 4), labeled as **COM** to a red socket on the Electrical Distributor.



21. 8 Digital Inputs with Banana Cables
22. Indication LEDs
23. 6 Relay Outputs with Banana Cables
24. Red Power Supply Cable (+)
25. Black Power Supply Cable(-)
26. Red COM Cable\*
27. Communication Cable
28. Wire Holder



*Figure 4: PLC MicroLogix Components*

\* Note: The MicroLogix inputs can be configured in one two ways:

- The input energizes when high-level voltage is applied to the input terminal (known as sinking or *active high*).
- The input energizes when low-level voltage is applied to the input terminal (known as sourcing or *active low*).

In the first case scenario, the MicroLogix DC COM terminal must be connected to the VDC(-).

In the second case scenario, the MicroLogix DC COM terminal must be connected to the VDC(+).

In this tekLINK, you must connect the MicroLogix DC COM terminal to the VDC(+) and work in *Active low* mode.

#### **1.5.1.1. 4/3 Double Solenoid Valve Connections**

To connect the 4/3 sol-sol valve to the PLC MicroLogix and Power Supply:

1. Connect the one end of a black banana cable to a black socket on the Electrical Distributor (-) and connect the other end of the black banana cable to the black socket on the 4/3 sol-spring valve.
2. From the PLC MicroLogix, connect an output cable (#1 for example) to the right red socket of the 4/3 sol-sol valve.
3. From the PLC MicroLogix, connect an output cable (#2 for example) to the left red socket of the 4/3 sol-sol valve.

#### **1.5.1.2. 2/2 Solenoid Valve Connections**

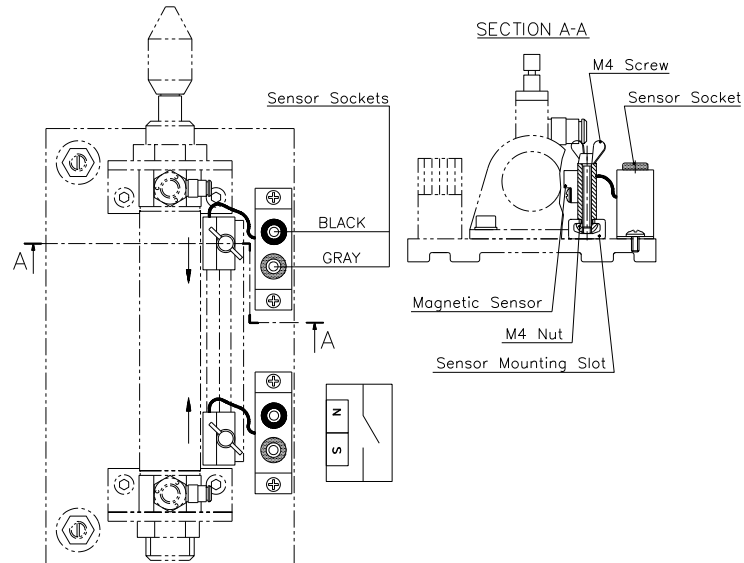
To connect the 2/2 sol-spring valve to the PLC MicroLogix and Power Supply:

4. Connect the one end of a black banana cable to a black socket on the Electrical Distributor (-) and connect the other end of the black banana cable to the black socket on the 2/2 sol-spring valve.
5. From the PLC MicroLogix, connect an output cable (#3 for example) to the right red socket of the 2/2 sol-sol valve.

### 1.5.1.3. Magnetic Sensor Connections

To attach the magnetic sensors:

Refer to the diagram below.



1. Insert the M4 nut into the sensor slot alongside the cylinder.
2. Fit the bracket cover onto the sensor socket bracket.
3. Using 2 Phillips screws, attach the sensor socket bracket to the cylinder's mounting plate.
4. Fit the M4 screw through the bore in the sensor housing, and attach it to the M4 nut in the sensor slot. Position the sensor as desired, and tighten the screw.
5. Repeat Steps 1 through 4 for a second sensor, if desired.

### Connecting the two magnetic sensors to the PLC MicroLogix and Power Supply

1. Connect the one end of a black banana cable to a black socket on the Electrical Distributor (-) and connect the other end of the black banana cable to the grey socket of the (a0) sensor.
2. From the PLC MicroLogix, connect an input cable (#1 for example) to the right black socket of the (a0) sensor.
3. From the PLC MicroLogix, connect an input cable (#2 for example) to the left black socket of the (a1) sensor.
4. Using a black banana cable connect the (a0) sensor's grey socket to the (a1) sensor's grey socket.

#### 1.5.1.4. Proximity Sensor Connections

To connect the proximity sensors to the PLC MicroLogix and Power Supply:

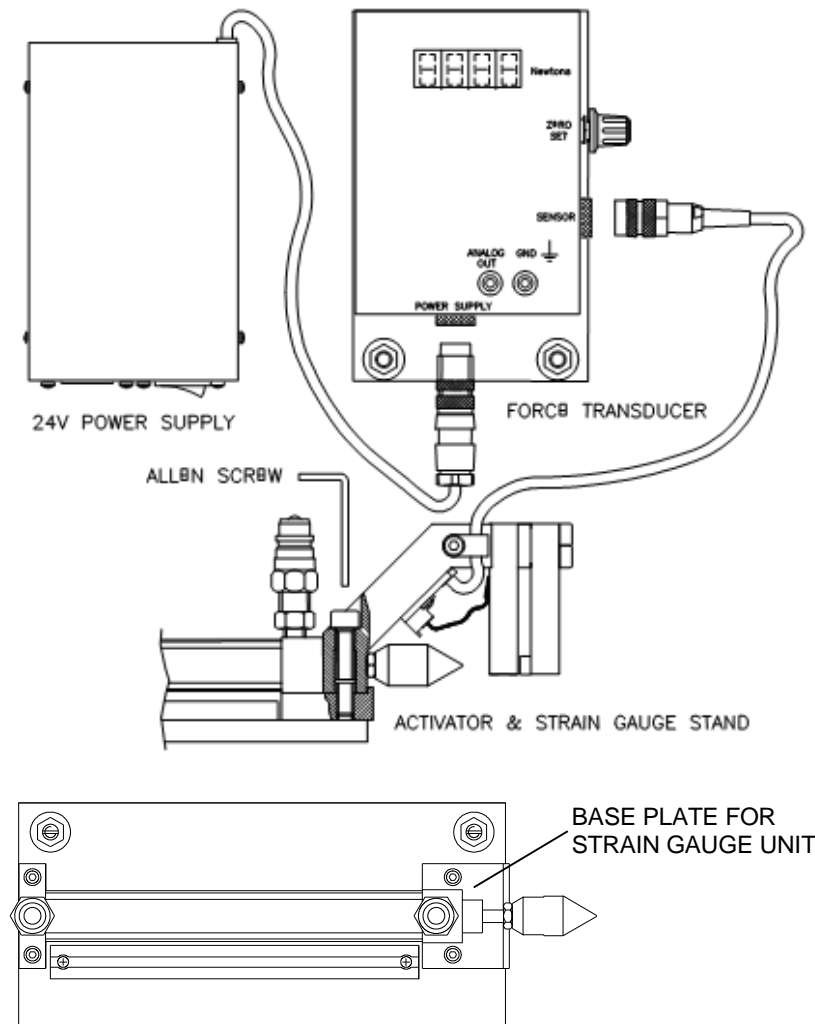
1. Connect the one end of a black banana cable to a black socket on the Electrical Distributor (-) and connect the other end of the black banana cable to the black socket on the (b0) proximity sensor.
2. Connect the one end of a red banana cable to a red socket on the Electrical Distributor (+) and connect the other end of the red banana cable to the red socket on the (b0) proximity sensor.
3. Connect the one end of a black banana cable to a black socket on the Electrical Distributor (-) and connect the other end of the black banana cable to the black socket on the (b1) proximity sensor.
4. Connect the one end of a red banana cable to a red socket on the Electrical Distributor (+) and connect the other end of the red banana cable to the red socket on the (b1) proximity sensor.
5. Connect the PLC MicroLogix to the proximity sensors (b0 and b1), as follows:
  - Connect an input cable (#3 for example) to the gray socket of the left proximity sensor (b0).
  - Connect an input cable (#4 for example) to the gray socket of the right proximity sensor (b1).



### 1.5.1.5. Force Meter Connections

The force meter can be installed only on the  $\varnothing$  3/4" double-acting cylinder (Cat.#25431). The base plate for the strain gauge unit is factory-installed on this cylinder's mounting plate. Refer to the diagrams below.

1. Use the two Allen screws to attach the strain gauge unit to the base plate.
2. Connect the the force transducer power supply inlet to the 24 Vdc power supply unit.
3. Connect the strain gauge to the force transducer sensor inlet.
4. Connect the 24 Vdc power supply unit to a grounded AC power supply outlet.



## **1.6. INSTALLING ELECTRO-HYDRAULIC SYSTEM COMPONENTS (CP/C 2000A)**

These instructions are for Electro-Hydraulic systems only.

This section describes how to install the electro-hydraulic components for systems using the CP/C 2000A control unit.

The Electro-HydraFlex unit requires a 24Vdc/3A power supply unit to provide the electricity for the electro-hydraulic components. (If more than two solenoids will be activated at the same time, an additional power supply is required.)

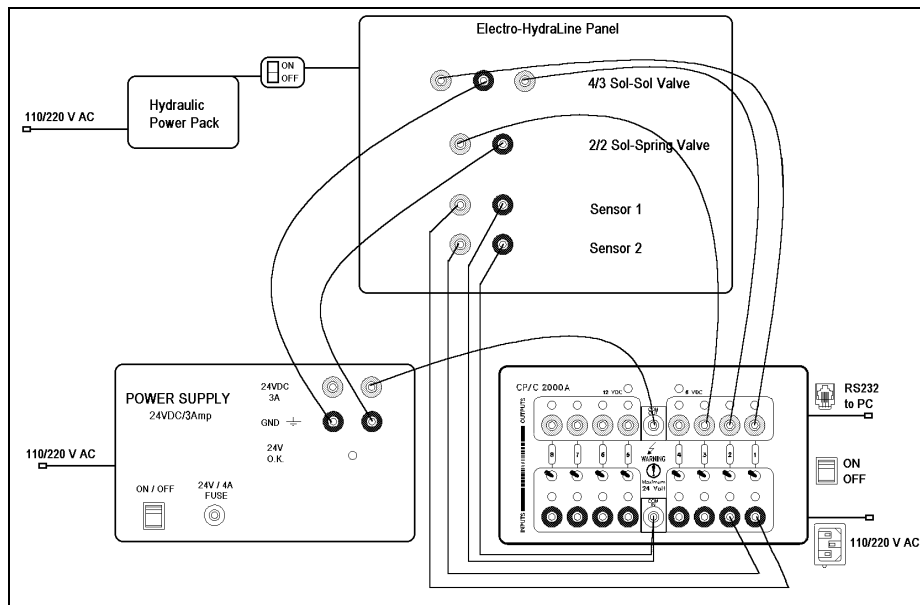
Before you make any connections, make sure the voltage rating of the 24 Vdc power supply unit and the CP/C2000A matches your power supply.

All connections are by means of cables with banana plugs. The banana plugs can be stacked one into another, as shown on page 9.

### 1.6.1. HydraFlex Wiring Connections (to Power Supply and CP/C 2000A)

The following connections are required for all electro-hydraulic components.

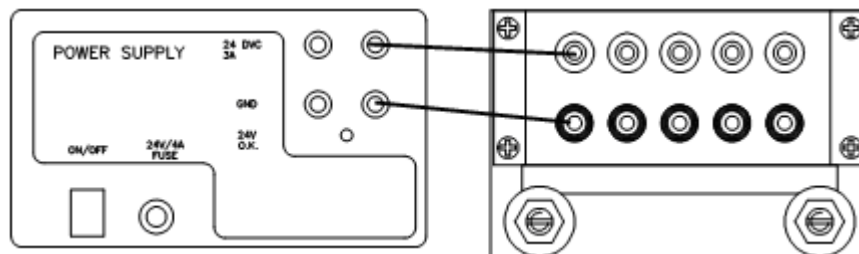
1. Connect the 24 Vdc power supply unit to a grounded AC power supply outlet.
2. Connect the CP/C2000A to a grounded AC power supply outlet.
3. Connect the 24 Vdc power supply unit's 24 Vdc outlet (+) to the COM OUT socket of the CP/C2000A.



*Figure 5: Electro-HydraFlex Connections*

#### 1.6.1.1. Electrical Distributor Connections

Connect the electrical distributor (Cat.#10024, shown at right) to the power supply unit, as shown in the example below.



### 1.6.1.2. 4/3 Double Solenoid Valve Connections

1. Connect the middle (black) socket of the 4/3 double solenoid valve to the 24 Vdc power supply unit's GND (-).
2. Connect the two outer (red) sockets of the 4/3 double solenoid valve to two available output sockets on the CP/C2000A.

### 1.6.1.3. 2/2 Solenoid Valve Connections

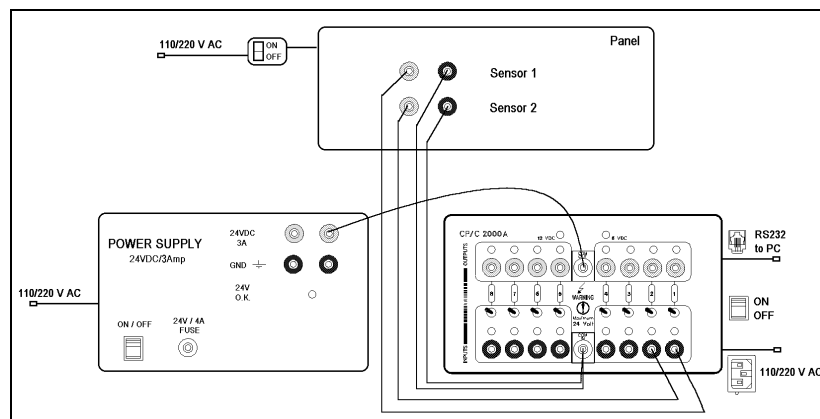
1. Connect the black socket of the 2/2 solenoid valve to the 24 Vdc power supply unit's GND (-).
2. Connect the red socket of the 2/2 solenoid valve to an available output socket on the CP/C2000A.

### 1.6.1.4. Magnetic Sensors Connections

For additional details on connecting the magnetic sensors, refer to the diagram on page 12.

1. Insert the M4 nut into the sensor slot alongside the cylinder.
2. Fit the bracket cover onto the sensor socket bracket.
3. Using 2 Phillips screws, attach the sensor socket bracket to the cylinder's mounting plate.
4. Fit the M4 screw through the bore in the sensor housing, and attach it to the M4 nut in the sensor slot. Position the sensor as desired, and tighten the screw.
5. Repeat Steps 1 through 4 for a second sensor, if desired.

Refer to the diagram below.



6. Connect the 24 Vdc power supply unit to a grounded AC power supply outlet.
7. Connect the CP/C2000A to a grounded AC power supply outlet.

8. Connect the 24 Vdc power supply unit's 24 Vdc outlet (+) to the COM OUT socket of the CP/C2000A.
9. Using the banana cables, connect both black (or both gray) sockets of the magnetic sensors to the COM IN socket of the CP/C2000A. (The banana plugs are stackable they can be inserted one into another and then into the socket.)
10. Connect both gray (or both black) sockets of the magnetic sensors to two available input sockets on the CP/C2000A.

#### **1.6.1.5. Proximity Sensor Connections**

1. Connect the 24 Vdc power supply unit's GND (–) socket to the COM IN socket of the CP/C2000A.
2. Connect the black socket of the proximity sensor to the 24 Vdc power supply unit's GND (–). (The banana plugs can be inserted one into another and then into the GND socket.)
3. Connect the red socket of the proximity sensor to the 24 Vdc power supply unit's 24 Vdc outlet (+).
4. Connect the gray socket of the proximity sensor to an available input socket on the CP/C2000A.

#### **1.6.1.6. Force Meter Connections**

The force meter can be installed only on the  $\varnothing$  3/4" double-acting cylinder (Cat.#25431). The base plate for the strain gauge unit is factory-installed on this cylinder's mounting plate.

Refer to the diagrams on page 14, for additional details on connecting the Force meter.

1. Use the two Allen screws to attach the strain gauge unit to the base plate.
2. Connect the the force transducer power supply inlet to the 24 Vdc power supply unit.
3. Connect the strain gauge to the force transducer sensor inlet.
4. Connect the 24 Vdc power supply unit to a grounded AC power supply outlet.

## 2. Safety and Maintenance

### 2.1. SAFETY

For your personal safety, make sure you observe the following safety guidelines:

- Always wear safety glasses and protective clothing when working with the HydraFlex system.
- Before activating the system, make sure the bolts which attach components to the panel are securely fastened.
- Do not attempt to disconnect or connect components when the power pack is switched on.
- Do not tamper with the power pack's pressure relief valve. Its factory setting of 60bar should not be altered.
- Immediately clean up any oil spills.
- Never leave the power pack operating unnecessarily or unattended.

### 2.2. MAINTENANCE

The HydraFlex requires little maintenance. However, to ensure safe and proper operation, make sure you comply with the following:

- Check hoses regularly for twisting, cracking, splitting or leakage. Replace any hose which shows signs of damage.
- Maintain the recommended level of hydraulic fluid in the tank.
- Replace the hydraulic fluid once a year.
- Refill the tank only with hydraulic fluid of type 10W or SADOL S-300; viscosity 20-50 mm<sup>2</sup>/s.
- Do not allow the hydraulic fluid temperature to exceed 55°C. If it does, switch off the system and allow it to cool down.

## 3. Components

### 3.1. TERMINOLOGY

The following are definitions of terms used in this manual as they relate to hydraulics and the HydraFlex training unit.

<b>Controller</b>	An element which controls a particular function of a device. A controller can be pneumatic, hydraulic, electric or mechanical, and may be operated manually or by a control signal.
<b>Cylinder</b>	A cylindrical chamber in which a piston moves.
<b>Hydraulic Fluid</b>	A fluid of low viscosity, such as oil, whose primary function is to transmit power in a hydraulic system.
<b>Piston</b>	A disk or round part which fits tightly and moves within a cylinder. The piston compresses or moves the hydraulic fluid within the cylinder, or it transforms the energy imparted by the fluid entering or expanding inside the cylinder into a mechanical force, usually by means of a connecting rod.
<b>Port</b>	Openings in hydraulic components which enable hydraulic fluid to flow in and out. The following codes are generally used to identify ports: <b>P:</b> Pressure Input, usually connected to the pump. <b>T:</b> Return Line, usually connected to the collection tank. <b>A, B:</b> Device Connections, such as cylinder ports.
<b>Position</b>	A defined status of a component or valve.
<b>Pressure</b>	The ratio of a force to the area on which the force is exerted. Pressure is measured in bar or Pascal units.
<b>Pump</b>	A device which converts mechanical energy into hydraulic energy. A pump produces a flow. Pressure is the result of resistance to that flow.
<b>Solenoid</b>	An electric conductor wound in such a way that a magnetic field is created when electric current flows through the windings. Solenoids can be used for electric control of hydraulic valves. Abbreviated as sol.
<b>Tank</b>	Reservoir; stores the hydraulic fluid, and keeps it clean, free of air, and relatively cool.
<b>Valve</b>	A device which controls the flow or pressure of the liquid in the hydraulic system. A valve can regulate pressure, control the direction of flow, or provide a constant flow regardless of changes in pressure.  The term 4/3 (four-by-three) valve, for example, indicates that the valve has four ports and three possible positions.

### 3.2. HYDRAFLEX PACKAGES

Illustrations and descriptions of the HydraFlex components appear on the following pages. Items which are not designated as belonging to the Basic, Advanced or Electro-HydraFlex packages are optional components which can be purchased separately for use with HydraFlex.

**Table 1: Catalog #2015: Basic Hydraulics: Package H1**

Not Included in Package	25401 25434	Hydraulic Power Pack - 220 V Hydraulic Power Pack - 110 V
-------------------------	----------------	--

Qty	Catalog #	Part Name (Alternate Name)
1	25320	Slotted Panel, one-sided
1	25402	Double-Acting Cylinder Ø 1-1/8"
1	25414	4/3 Selector Valve, Closed Center (4/3 Directional Valve [Closed Center])
1	25404	Two-Way Flow Control Valve Bi-Directional Flow Control Valve
2	25405	One-Way Flow Control Valve (Uni-Directional Flow Control Valve)
1	25437	Pressure Relief Valve
1	25408	Flow Meter
2	25409	Pressure Gauge
2	25424	T-Connector
2	25411	Hoses - 2 m
4	25412	Hoses - 80 cm
4	25413	Hoses - 50 cm

**Table 2: Catalog #2016: Advanced Hydraulics: Package H2**

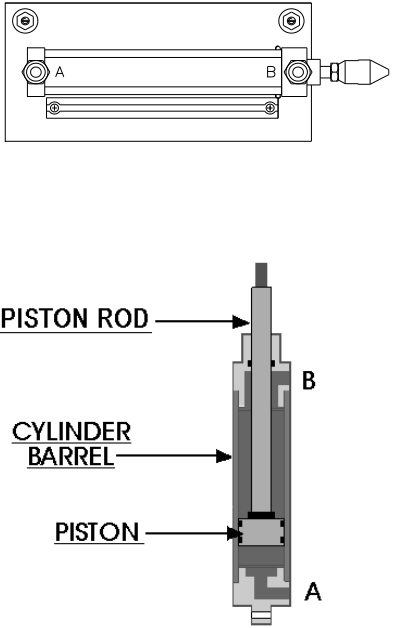
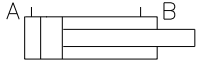
Qty	Catalog #	Part Name (Alternate Name)
1	25431	Double-Acting Cylinder Ø 3/4"
1	25403	4/3 Selector Valve, Open Center (4/3 Directional Valve [Open Center])
1	25415	Pressure Reducing Valve
2	25410	Manifold
1	25428	Coiled Hoses
1	25419	Temperature Gauge
2	25412	Hoses - 80 cm

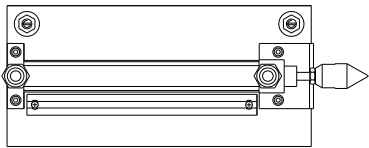
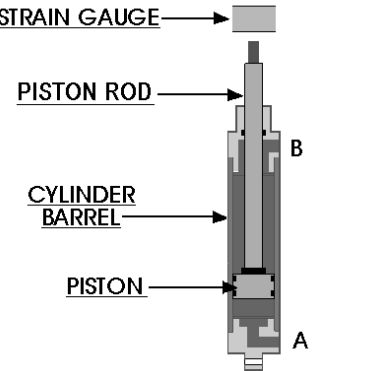
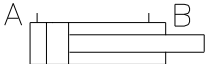
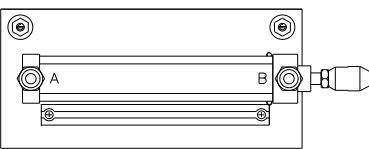
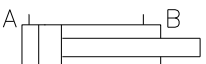
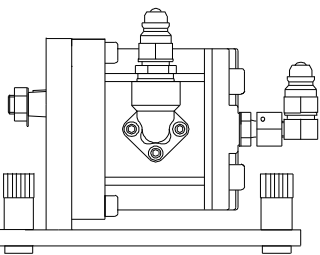



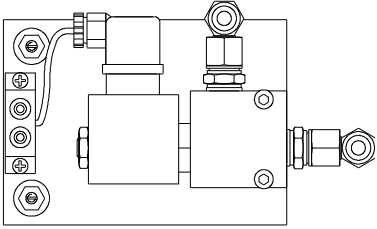
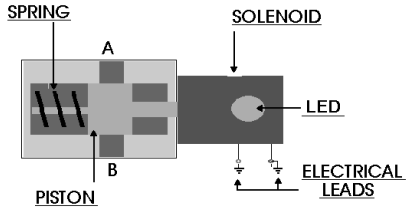
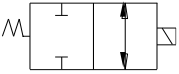
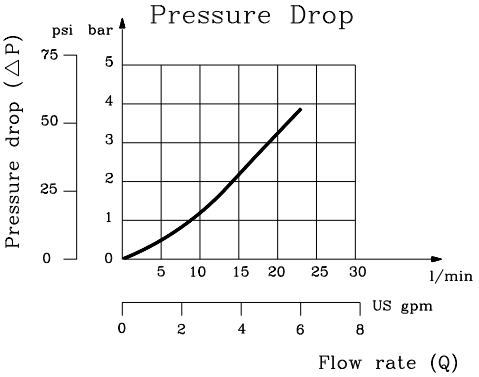
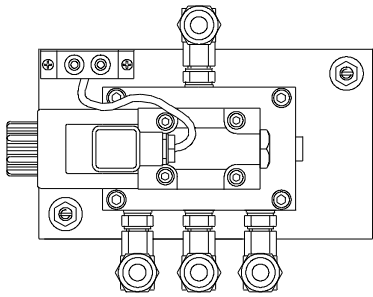
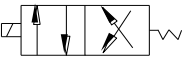
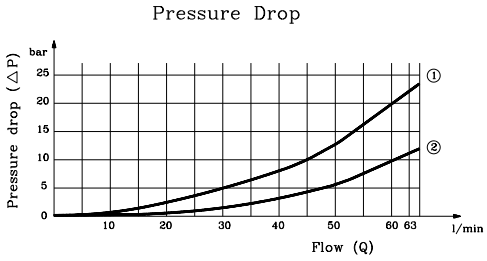
**Table 3: Catalog #2017: Electro-Hydraulics: Package H3**

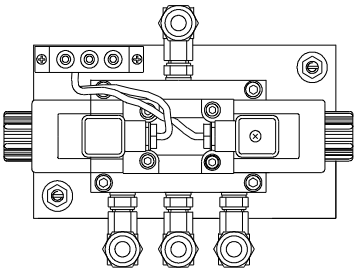
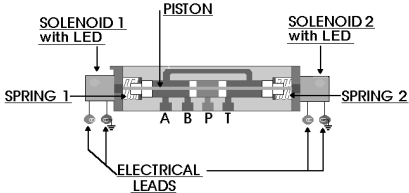
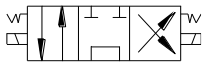
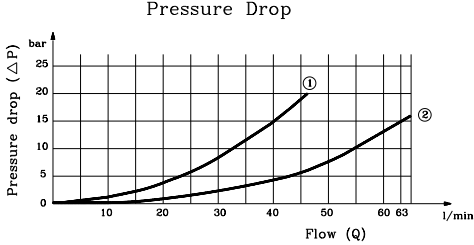
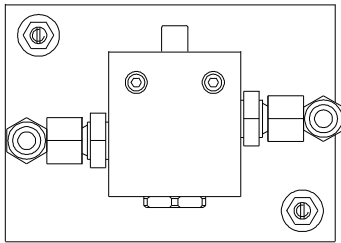
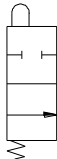
Qty	Catalog #	Part Name (Alternate Name)
1	25421	4/3 Double Solenoid Valve (4/3 Sol-Sol Valve–Tandem Center)
1	25433	2/2 Solenoid Valve (2/2 Sol-Spring Valve)
1	25323	Inductive Proximity Sensor (pair)
3	411649	Banana Plug Cables: Red 24" (610mm)
3	411650	Black 24" (610mm)
1	411651	Gray 24" (610mm)
3	411652	Red 48" (1220mm)
3	411653	Black 48" (1220mm)
1	411654	Gray 48" (1220mm)
1	10024	Electrical Distributor

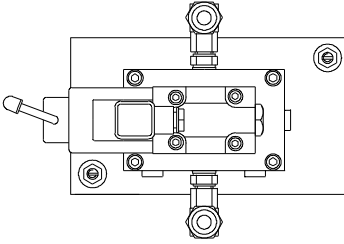
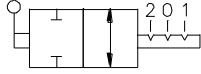
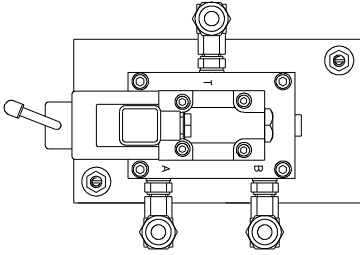
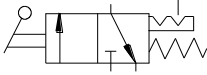
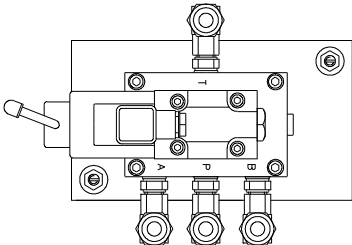
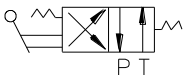
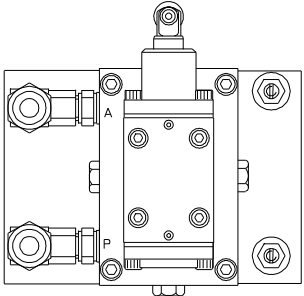
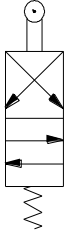
### 3.3. HYDRAFLEX COMPONENTS

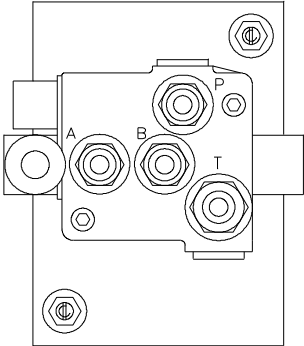
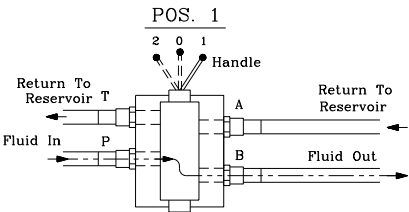
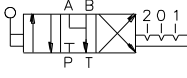
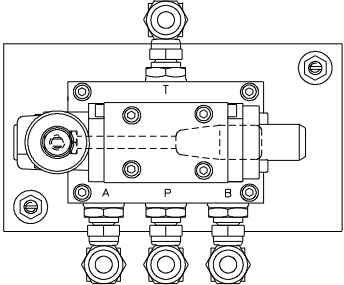
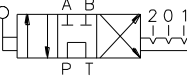
Cat #	Name	Schematic	Description
<b>Cylinders, Drives, Actuators</b>			
<p><b>25402</b></p> <p><b>BASIC</b></p>	<p><b>Double-Acting Cylinder</b>  <math>\text{Ø}1\text{-}1/8\text{'}</math></p> 		<p>Double-acting magnetic cylinder                  Piston <math>\text{Ø} 1\text{-}1/8\text{'}</math> (28.5 mm)                  Piston rod <math>\text{Ø} 9.5\text{ mm}</math>                  Stroke: 6" (152 mm)                  Max. pressure: 100 bar</p> <p>This cylinder converts potential and kinetic fluid energy into mechanical force. As a double acting cylinder, it is both extended and retracted by hydraulic power, and both its outgoing and return movements can be used as working strokes.</p> <p>This component is equipped with a T-slot track to enable the attachment of Magnetic Sensors (Cat.#25323).</p> <p>Example of use : Pressurized hydraulic fluid flows through port A into the housing on the piston side. The piston and piston rod are moved. The fluid displaced in the piston rod chamber is discharged through port B. After reversal, fluid flows through port B and pushes the piston with piston rod into the initial position (return movement). Fluid is discharged through port A.</p>

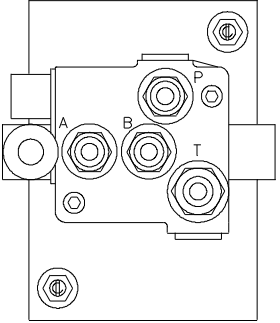
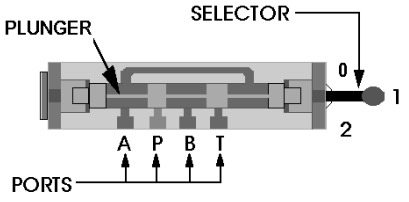
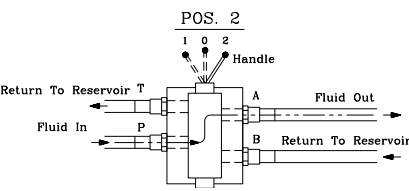
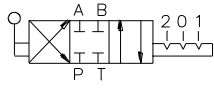
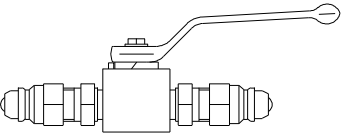

Cat #	Name	Schematic	Description
<p><b>25431</b></p> <p><b>ADVANCED</b></p>	<p><b>Double-Acting Cylinder</b>  <math>\varnothing \frac{3}{4}"</math></p>  		<p>Double-acting magnetic cylinder                      Piston <math>\varnothing \frac{3}{4}"</math> (19 mm)                      Piston rod <math>\varnothing \frac{1}{4}"</math> (6.35 mm)                      Stroke length: 6" (152 mm)                      Max. pressure: 100 bar</p> <p>This cylinder converts potential and kinetic fluid energy into mechanical force. As a double acting cylinder, it is both extended and retracted by hydraulic power, and both its outgoing and return movements can be used as working strokes.</p> <p>An optional digital display force meter (Cat. #25429), which registers the force of impact (measured in Newtons, N) on a strain gauge, can be used with this cylinder. During the outgoing stroke, the head of the piston rod makes contact with a force meter, whose strain gauge registers the force of impact.</p>
<p><b>25452</b></p>	<p><b>Double-Acting Cylinder</b>  <math>\varnothing 1\text{-}3/8"</math></p> 		<p>Double-acting magnetic cylinder                      Piston <math>\varnothing 1\text{-}3/8"</math> (35 mm)                      Stroke: 8" (203 mm)</p>
<p><b>25425</b></p>	<p><b>Hydraulic Rotary Drive</b></p> 		<p>Hydraulic motor                      Bi-directional                      Displacement: 6.2 cm<sup>3</sup>                      Flow rate: 6 l/min</p>

Cat #	Name	Schematic	Description															
<b>Electrically Activated Valves</b>																		
<p><b>25433</b></p> <p><b>ELECTRO</b></p>	<p><b>2/2 Solenoid Valve</b></p> <p><b>[2/2 Sol-Spring Valve]</b></p>  		<p>2/2 directional control valve Solenoid actuated, spring return Changeover contact Pressure range: 0-210 bar Flow rate: 23 l/min Operating voltage: 24 Vdc</p>  <p>Refer to Chapter 1 for instructions on connecting this valve.</p>															
<p><b>25422</b></p>	<p><b>4/2 Solenoid Valve</b></p> 		<p>4/2 directional control valve Solenoid actuated, spring return Pressure range: 0-120 bar Nominal pressure: 60 bar Flow rate: 25 l/min Operating voltage: 24 Vdc</p> <table border="1" data-bbox="992 1329 1243 1493"> <thead> <tr> <th colspan="5">FLOW CODE</th> </tr> </thead> <tbody> <tr> <td>P→A</td> <td>B→T</td> <td>P→B</td> <td>A→T</td> <td>P→T</td> </tr> <tr> <td>①</td> <td>①</td> <td>②</td> <td>②</td> <td>-</td> </tr> </tbody> </table> 	FLOW CODE					P→A	B→T	P→B	A→T	P→T	①	①	②	②	-
FLOW CODE																		
P→A	B→T	P→B	A→T	P→T														
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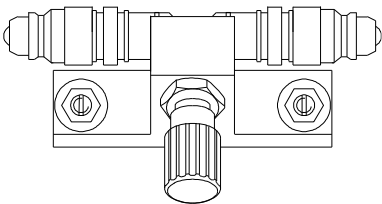
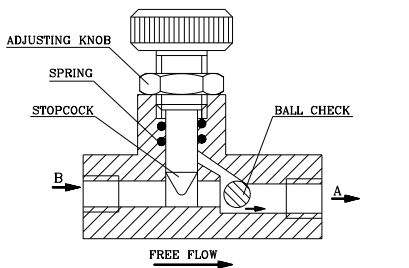
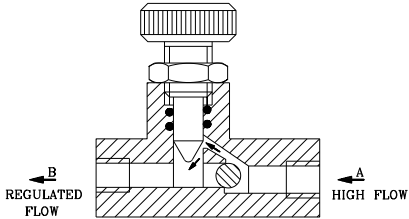
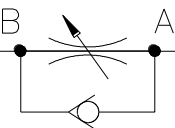
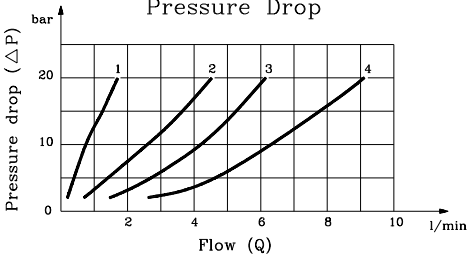
Cat #	Name	Schematic	Description															
<p><b>25421</b></p> <p><b>ELECTRO</b></p>	<p><b>4/3 Double Solenoid Valve</b></p> <p><b>[4/3 Sol-Sol Valve (Tandem Center)]</b></p>  		<p>4/3 directional control valve Solenoid actuated, both sides Spring centered Pressure range: 0–120 bar Nominal pressure: 60 bar Flow rate: 25 l/min Operating voltage: 24 Vdc</p> <table border="1" data-bbox="987 583 1243 743"> <thead> <tr> <th colspan="5">FLOW CODE</th> </tr> </thead> <tbody> <tr> <td>P→A</td> <td>B→T</td> <td>P→B</td> <td>A→T</td> <td>P→T</td> </tr> <tr> <td>①</td> <td>①</td> <td>①</td> <td>①</td> <td>②</td> </tr> </tbody> </table>  <p>Refer to Chapter 1 for details on connecting this valve.</p>	FLOW CODE					P→A	B→T	P→B	A→T	P→T	①	①	①	①	②
FLOW CODE																		
P→A	B→T	P→B	A→T	P→T														
①	①	①	①	②														
<b>Manually and Mechanically Activated Valves</b>																		
<p><b>25440</b></p>	<p><b>2/2 Roller Valve</b></p> 		<p>2/2 directional control valve Roller actuated, spring return Pressure range: 0-250 bar Nominal pressure: 60 bar Flow rate: 0.5-30 l/min</p>															

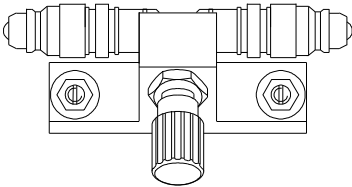
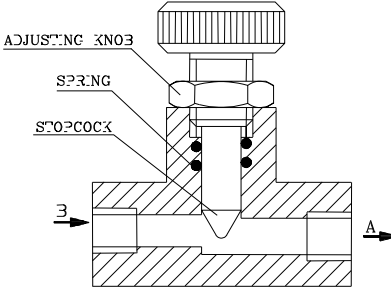
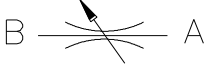
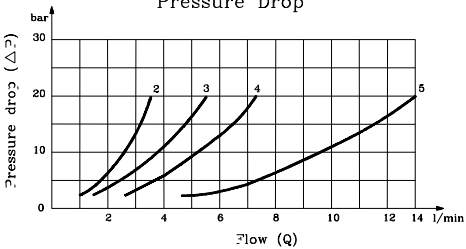
Cat #	Name	Schematic	Description
25454	2/2 Selector Valve 		2/2 directional control valve Manual lever actuated Detent (operating position retained upon actuation) Pressure range: 0-250 bar Nominal pressure: 60 bar Flow rate: 0.5-30 l/min
25453	3/2 Selector Valve 		3/2 directional control valve Manual lever actuated Detent (operating position retained upon actuation) Pressure range: 0-250 bar Nominal pressure: 60 bar Flow rate: 0.5-40 l/min
25446	4/2 Selector Valve 		4/2 directional control valve Manual lever actuated, spring return Pressure range: 0-250 bar Nominal pressure: 60 bar Flow rate: 0.5-40 l/min
25456	4/2 Roller Valve 		4/2 directional control valve Roller actuated, spring return Pressure range: 0-250 bar Nominal pressure: 60 bar Flow rate: 0.5-30 l/min

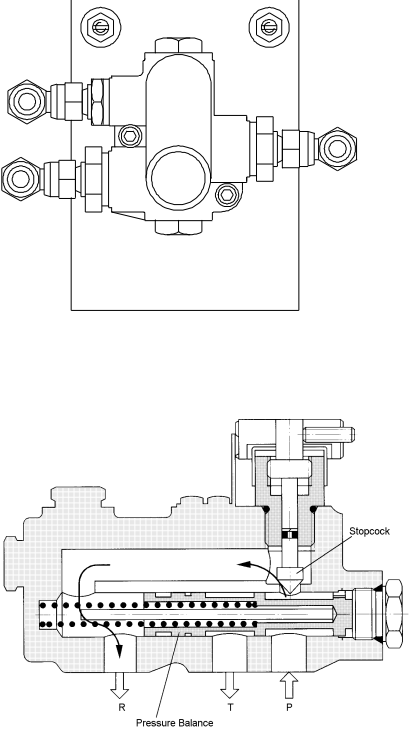
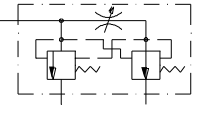
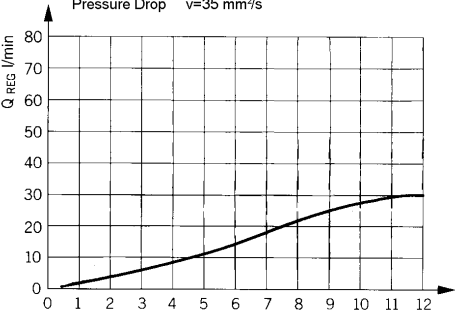
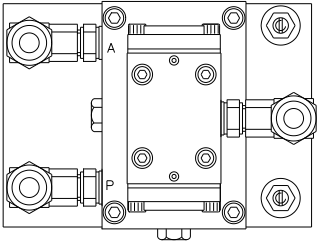
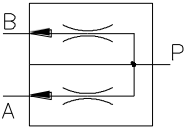
Cat #	Name	Schematic	Description									
<p><b>25403</b></p> <p><b>ADVANCED</b></p>	<p><b>4/3 Selector Valve, Open Center</b></p> <p><b>[4/3 Directional Valve (Open Center)]</b></p>  		<p>4/3 directional control valve Manual lever actuated Detent (operating position retained upon actuation) Valve relief in center position Nominal pressure: 60 bar Max. pressure: 210 bar</p> <table border="1" data-bbox="987 569 1352 716"> <thead> <tr> <th>POS 2</th> <th>POS 0</th> <th>POS 1</th> </tr> </thead> <tbody> <tr> <td>P ► A</td> <td>P CLOSED</td> <td>P ► B</td> </tr> <tr> <td>B ► T</td> <td>A,B,T CONNECT.</td> <td>A ► T</td> </tr> </tbody> </table> <p>The valve position is controlled by a manually operated lever. Pushing the lever to position 1 or position 2 moves the spool, thereby changing the path of the fluid flow from one line to another.</p> <p>This valve is used for operating two separate hydraulic devices.</p>	POS 2	POS 0	POS 1	P ► A	P CLOSED	P ► B	B ► T	A,B,T CONNECT.	A ► T
POS 2	POS 0	POS 1										
P ► A	P CLOSED	P ► B										
B ► T	A,B,T CONNECT.	A ► T										
<p><b>25438</b></p>	<p><b>4/3 Selector Valve, Tandem Center</b></p> <p><b>[4/3 Directional Valve (Tandem Center)]</b></p> 		<p>4/3 directional control valve Manual lever actuated Detent (operating position retained upon actuation) Recirculating in center position Pressure range: 0–250 bar Nominal pressure: 60 bar Flow rate: 0.5–40 l/min</p> <table border="1" data-bbox="987 1434 1336 1581"> <thead> <tr> <th>POS 2</th> <th>POS 0</th> <th>POS 1</th> </tr> </thead> <tbody> <tr> <td>P ► A</td> <td>A,B CLOSED</td> <td>P ► B</td> </tr> <tr> <td>B ► T</td> <td>P,T CONNECT.</td> <td>A ► T</td> </tr> </tbody> </table> <p>The valve position is controlled by a manually operated lever. Pushing the lever to position 1 or position 2 moves the spool, thereby changing the path of the fluid flow from one line to another.</p> <p>This valve is used when the pump stays running.</p>	POS 2	POS 0	POS 1	P ► A	A,B CLOSED	P ► B	B ► T	P,T CONNECT.	A ► T
POS 2	POS 0	POS 1										
P ► A	A,B CLOSED	P ► B										
B ► T	P,T CONNECT.	A ► T										

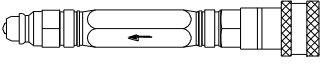
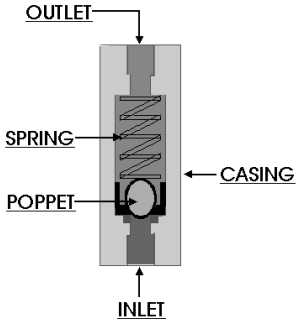
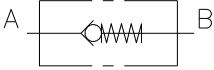
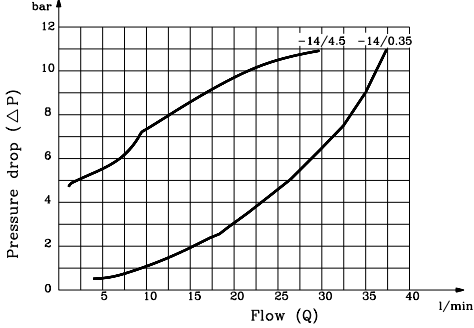
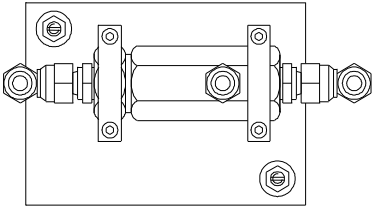
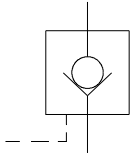
Cat #	Name	Schematic	Description									
<p><b>25414</b></p> <p><b>BASIC</b></p>	<p><b>4/3 Selector Valve, Closed Center</b></p> <p><b>[4/3 Directional Valve (Closed Center)]</b></p>   		<p>4/3 directional control valve Manual lever actuated Detent (operating position retained upon actuation) Closed in center position Nominal pressure: 60 bar Max. pressure: 210 bar Max. flow: 20 l/min</p> <table border="1" data-bbox="990 598 1372 766"> <thead> <tr> <th>POS 1</th> <th>POS 0</th> <th>POS 2</th> </tr> </thead> <tbody> <tr> <td>P ► B</td> <td>A-B-P-T</td> <td>P ► A</td> </tr> <tr> <td>A ► T</td> <td>CLOSED</td> <td>B ► T</td> </tr> </tbody> </table> <p>The valve position is controlled by a manually operated lever. Pushing the lever to position 1 or position 2 moves the plunger, thereby changing the path of the fluid flow from one line to another.</p> <p>This valve is used when running multiple valves in series from one pump.</p>	POS 1	POS 0	POS 2	P ► B	A-B-P-T	P ► A	A ► T	CLOSED	B ► T
POS 1	POS 0	POS 2										
P ► B	A-B-P-T	P ► A										
A ► T	CLOSED	B ► T										
<p><b>25406</b></p>	<p><b>Shut-Off Valve</b></p> 		<p>Shut-off valve Nominal pressure: 60 bar Max. pressure: 210 bar</p>									

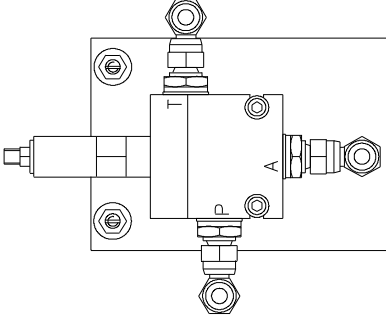
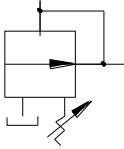
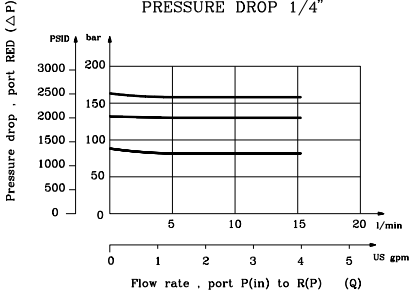


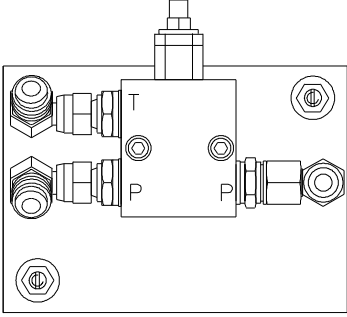
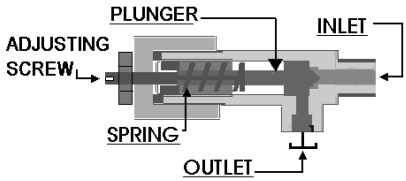
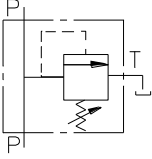
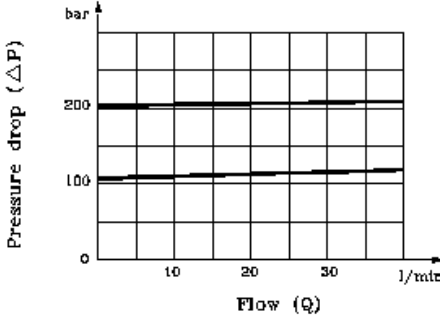
Cat #	Name	Schematic	Description
<b>Flow, Non-Return, Regulating Valves</b>			
<p>25405</p> <p>BASIC</p>	<p><b>One-Way Flow Control Valve</b></p> <p><b>[Uni-Directional Flow Control Valve]</b></p>   		<p>One-way flow control valve              Adjustable              Opening pressure: 0.8 bar              Nominal pressure: 60 bar              Max. pressure: 210 bar</p> <p style="text-align: center;"><b>Pressure Drop</b></p>  <p>This manually operated control valve is used to regulate the flow of hydraulic fluid in one direction, from port A to port B. The flow rate in the other direction, from port B to port A, is not controlled by the valve.</p> <p>When the knob is rotated clockwise, the stopcock blocks the pipe and restricts the flow of hydraulic fluid.</p> <p>When the knob is rotated counter-clockwise, the stopcock retracts, and the flow of hydraulic fluid increases.</p> <p>Rotating the knob has no effect on the flow rate from port B to port A.</p>

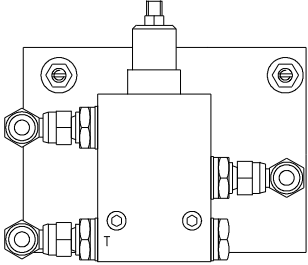
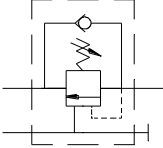
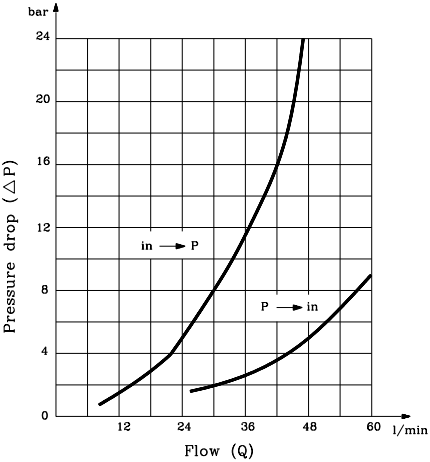
Cat #	Name	Schematic	Description
<p><b>25404</b></p> <p><b>BASIC</b></p>	<p><b>Two-Way Flow Control Valve</b></p> <p><b>[Bi-Directional Flow Control Valve]</b></p>   <p>ADJUSTING KNOB              SPRING              STOPCOCK</p> <p>B →      ← A</p>		<p>Two-way flow control valve              Adjustable              Nominal pressure: 60 bar              Max. pressure: 210 bar              Max. flow: 20 l/min</p> <p style="text-align: center;">Pressure Drop</p>  <p>This manually operated control valve is used to regulate the flow of hydraulic fluids. This valve regulates flow in both directions; i.e., from port A to port B, and vice versa.</p> <p>When the knob is rotated clockwise, the stopcock blocks the pipe and restricts the flow of hydraulic fluid.</p> <p>When the knob is rotated counter-clockwise, the stopcock retracts, and the flow of hydraulic fluid increases.</p>

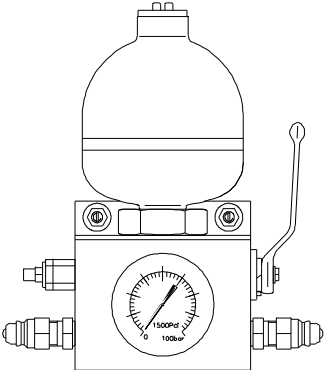
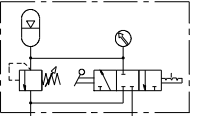
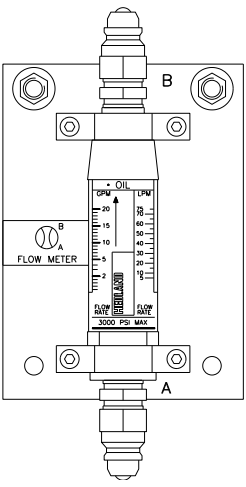

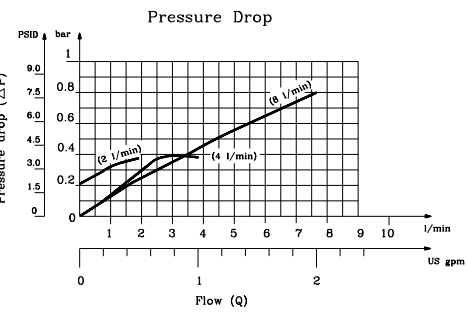
Cat #	Name	Schematic	Description
25416	<p><b>Three-Way Flow Control Valve</b></p> 		<p>Three-way flow control valve Adjustable Pressure range: 0–250 bar Nominal pressure: 60 bar Flow rate: 0.5-40 l/min</p>  <p>This valve controls flow and maintains a constant pressure from the pump P to the line R.</p> <p>When the knob is rotated clockwise, the stopcock blocks the pipe and restricts the flow of hydraulic fluid. Excess flow drains to the tank T.</p> <p>When the knob is rotated counter-clockwise, the stopcock retracts, and the flow of hydraulic fluid increases.</p>
25441	<p><b>Flow Divider Valve</b></p> 		<p>Flow divider valve Hydraulically actuated Distribution ratio: 50:50 Pressure range: 0-250 bar Nominal pressure: 60 bar Flow rate: 0.5-30 l/min</p>

Cat #	Name	Schematic	Description
25407	<p><b>Non-Return Check Valve</b></p>  		<p>Non-return check valve Opening pressure: 1 bar Nominal pressure: 60 bar Max. pressure: 210 bar</p> <p style="text-align: center;">Pressure Drop</p>  <p>Valve permits flow in one direction only: flow is blocked from B to A; flow is unrestricted from A to B.</p> <p>A spring loaded poppet controls the inlet. When the inlet pressure is greater than that of the spring, the spring contracts and the poppet moves to allow flow. When the outlet pressure equals or exceeds the inlet pressure, the spring expands, pushes the poppet against the intake opening and closes the valve.</p> <p>Non-return valves are used to prevent backflow in hydraulic systems.</p>
25442	<p><b>Non-Return Pilot Valve</b></p> 		<p>Non-return valve Pressure range: 0-250 bar Nominal pressure: 60 bar Flow rate: 0.5-30 l/min</p>

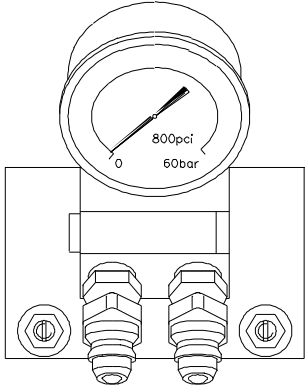

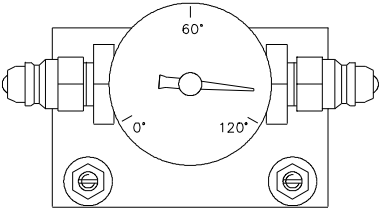

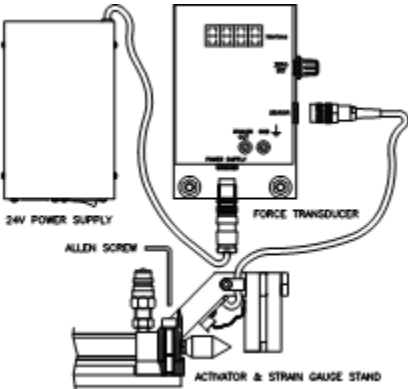
Cat #	Name	Schematic	Description
<p><b>25415</b></p> <p><b>ADVANCED</b></p>	<p><b>Pressure Reducing Valve</b></p> 		<p>Pressure reducing valve Adjustable Nominal pressure: 60 bar Max. pressure: 210 bar Max. flow: 20 l/min</p>  <p>This valve maintains a constant pressure at the valve outlet, port A. The valve outlet pressure can be regulated manually by means of an adjustment knob. The regulated pressure at the outlet should be set to a value which is lower than the pressure at inlet port P.</p> <p>Example of use: The valve is connected as follows: Port P is the pressure source; Port T drains the sensing line; Port A is the pressure-controlled outlet.</p> <p>The valve's spool is subject to a spring force on one side and hydraulic pressure on the other. When the pressure at port is A increased, the spool moves to the right, and restricts the flow from port P to port A, thus causing a pressure drop between the two ports (pressure at A is thus reduced). When the pressure at port A is reduced, the spool moves to the left, and the rate of flow increases, thereby reducing the pressure drop between P and A (pressure at A thus increases).</p>

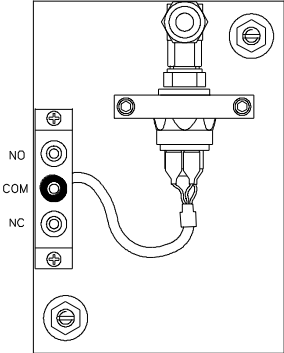
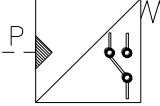
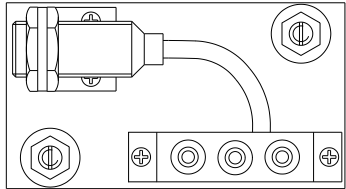
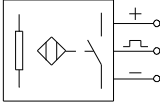
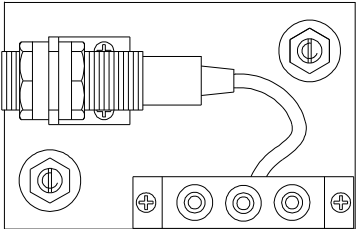
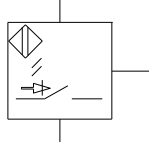
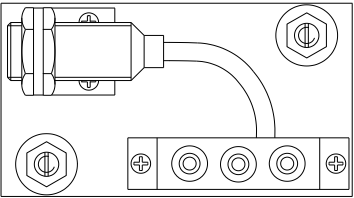
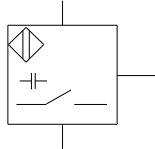
Cat #	Name	Schematic	Description
<p>25437</p> <p>BASIC</p>	<p><b>Pressure Relief Valve</b></p>  		<p>Pressure relief valve Adjustable Pilot actuated Pressure range: 0–250 bar Nominal pressure: 60 bar Flow rate: 0.5–40 l/min</p> <p style="text-align: center;"><b>Pressure Drop</b></p>  <p>This pressure relief valve limits the pressure in the system by releasing excess hydraulic fluid to the tank.</p> <p>The valve plunger is subjected to two forces: the spring force and the force exerted by the pressure at the inlet port. The pressure required to open the valve is set manually by means of a screw which adjusts the spring tension. If the force exerted by the fluid pressure at the inlet is less than the spring force, the valve remains closed. As pressure at the inlet increases, the force exerted on the valve plunger increases. When pressure increases above the set amount, the valve opens.</p> <p>This valve can also be used as sequencing valve.</p> <p>Since pressure in the HydraFlex system is limited to 60 bar, this valve will not function if it is set to a pressure greater than 60 bar. After the pressure limit has been set, the adjusting screw should be secured with the locking nut.</p>

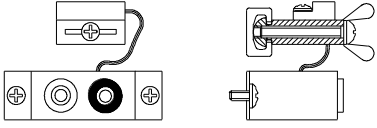
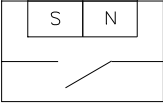
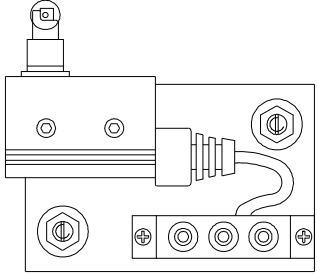
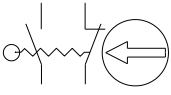
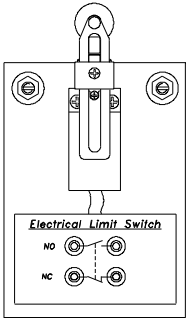
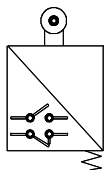
Cat #	Name	Schematic	Description
25420	<p data-bbox="326 296 673 323"><b>Pressure Relief Sequence Valve</b></p> 		<p data-bbox="987 327 1203 390">Pressure relief valve Adjustable</p> <p data-bbox="987 394 1271 422">Pressure range: 0–250 bar</p> <p data-bbox="987 426 1260 453">Nominal pressure: 60 bar</p> <p data-bbox="987 457 1239 485">Flow rate: 0.5–40 l/min</p> <p data-bbox="1105 506 1276 533">Pressure Drop</p>  <p data-bbox="987 1016 1422 1205">Also called a counterbalance valve, this valve is used in a system in which two hydraulic devices perform sequential operations. This valve allows the second operation to commence before the first operation has been completed.</p> <p data-bbox="987 1226 1458 1671">In this valve, the system pressure acts directly against the spring loaded poppet, which can be adjusted to the desired level. Hydraulic fluid enters the valve through the inlet, overcomes the spring force and flows out the valve outlet. When the hydraulic fluid pressure increases above the set amount, the valve opens more in order to accommodate the increase flow thus increasing the spring tension. When the pressure exceeds the desired predetermined level, the flow is diverted to another portion of the system to perform additional work.</p>

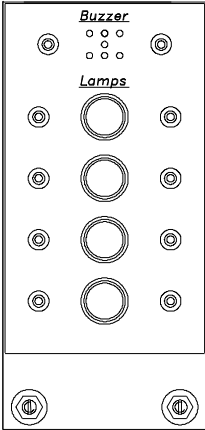
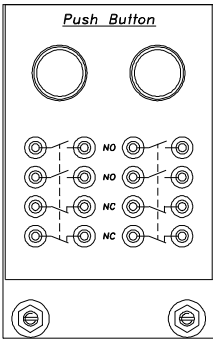
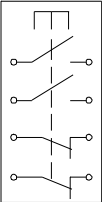
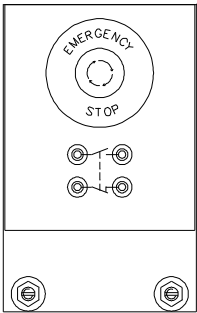
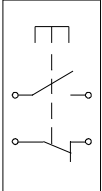
Cat #	Name	Schematic	Description
25447	<p><b>Pressure Accumulator</b></p> 		<p>Pressure accumulator With safety block Pressure relief valve Pressure gauge Shut-off valve</p>
<b>Sensors</b>			
25408 BASIC	<p><b>Flow Meter</b></p> 		<p>Flow meter Nominal pressure: 60 bar Max. pressure: 210 bar Flow rate: 0.2– 45 l /min</p>  <p>This flow meter is used to measure flow rate in the hydraulic system.</p> <p>Since this component is a rotameter, it should always be mounted vertically, with Port A at the bottom and Port B at the top.</p>

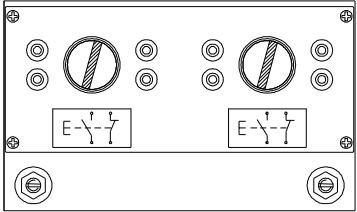
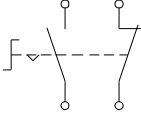
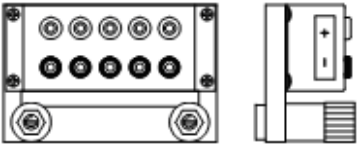
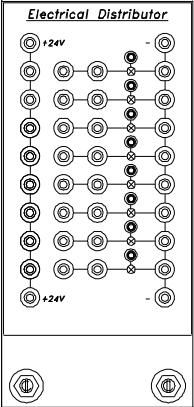


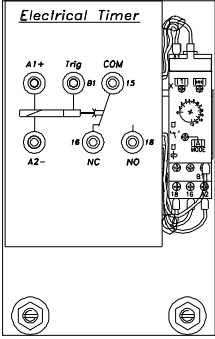
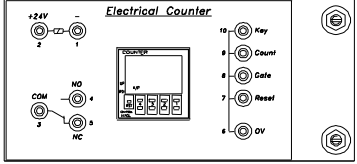
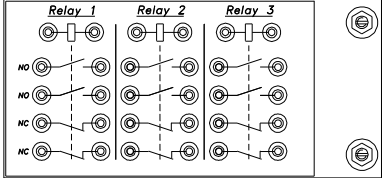
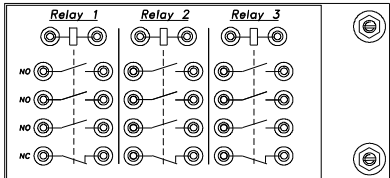
Cat #	Name	Schematic	Description
<p><b>25409</b>  <b>BASIC</b></p>	<p><b>Hydraulic Pressure Gauge</b></p> 		<p>Hydraulic pressure gauge Scale: bar/pci Pressure range: 0-100 bar / 0-1500 pci Nominal diameter: 63 mm Damping fluid: glycerin</p> <p>This gauge is used to measure the pressure of the hydraulic fluid at a specific point in a hydraulic system. This device is useful for the adjustment of various pressure valves.</p>
<p><b>25419</b>  <b>ADVANCED</b></p>	<p><b>Temperature Gauge</b></p> 		<p>Temperature gauge Nominal pressure: 60 bar Max. Pressure: 100 bar Flow rate: 0.5–40 l/min Temperature range: 0–120°</p> <p>The temperature gauge is used to measure the temperature of the hydraulic fluid at a specific point in a hydraulic system.</p>
<p><b>25429</b></p>	<p><b>Force Meter</b></p> 		<p>This digital display force meter uses strain gauge technology for measuring the force applied by a hydraulic actuator (the Double-Acting Cylinder, Cat.#25431)</p> <p>This component includes the stand with the strain gauge sensor, a force transducer and a 24 Vdc power supply unit.</p> <p>Range: 0–2000 Newton (0–200kg) Accuracy : 1 Newton (0.1 kg) Power Supply: 24 Vdc</p> <p>Refer to Chapter 1 for details on connecting this component.</p>

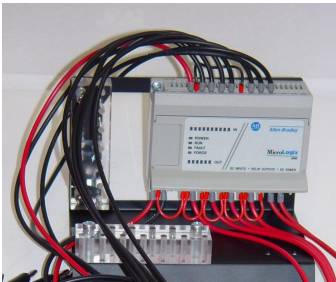
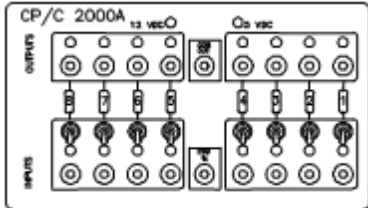
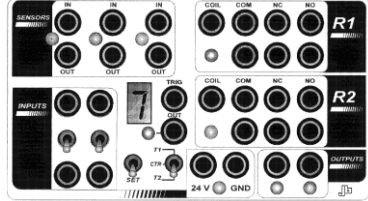
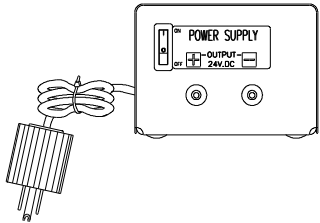
Cat #	Name	Schematic	Description
25443	<b>Hydraulic Pressure Switch</b> 		Hydraulic pressure switch Pressure range: 0-100 bar Operating voltage: 24 Vdc Switching frequency: 200 Hz
25322  ELECTRO	<b>Inductive Proximity Sensor</b> 		Inductive proximity sensor Switching distance: 10mm Operating voltage: 24 Vdc Switching frequency: 200 Hz LED function indicator  Refer to Chapter 1 for details on connecting this component.
25318	<b>Optical Proximity Sensor</b> 		Optical proximity sensor Switching distance: 10mm Operating voltage: 24 Vdc Switching frequency: 100 Hz LED function indicator  Refer to Chapter 1 for details on connecting this component.
25319	<b>Capacitive Proximity Sensor</b> 		Capacitive proximity sensor Switching distance: 10 mm Operating voltage: 24 Vdc Switching frequency: 100 Hz LED function indicator  Refer to Chapter 1 for details on connecting this component.

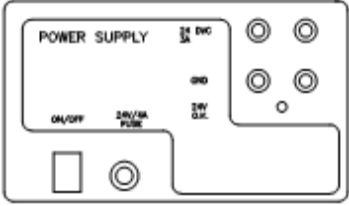
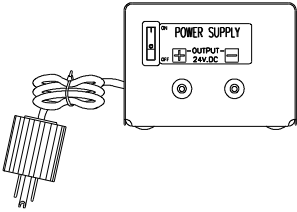
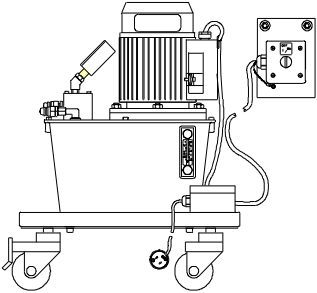
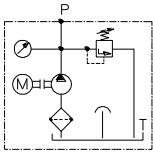
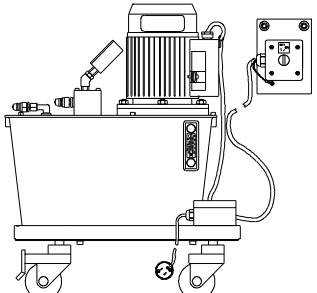
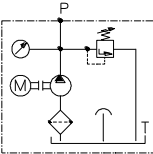
Cat #	Name	Schematic	Description
25323	<b>Magnetic Proximity Sensors</b> 		<p>One pair of magnetic sensors Operating voltage: 12–24 Vdc</p> <p>This pair of sensors can be attached to the barrel of the double acting cylinder (Cat. #25402 or #25431). The piston in the hydraulic cylinder has magnetic properties. Thus, when it comes near a magnetic sensor, it activates it. When positioned at each end of the cylinder, the sensors act as limit switches.</p> <p>Refer to Chapter 1 for details on connecting this component.</p>
<b>Control Units</b>			
5317	<b>Electrical Limit Switch with Roller Lever</b> 		<p>Electrical limit switch Roller actuated Changeover contact</p> <p>Switching distance: 10 mm Operating voltage: 24 Vdc Switching frequency: 200 Hz</p>
25352	<b>Electrical Limit Switch with Adjustable Roller Lever</b> 		<p>Electrical position switch Roller actuated, spring return Banana jacks: 1 NO, 1 NC Operating voltage: 24 Vdc</p>

Cat #	Name	Schematic	Description
25354	<b>Buzzer and Lamp Unit</b> 		1 buzzer and 4 lamps Banana jacks (per input): V+, V- Operating voltage: 24 Vdc, 1A Lamp power: 1.2 W max. each Buzzer power: 0.8 W Frequency: 400 Hz
25355  25376	<b>Electrical Push Button On/Off Switches</b> 		2 electrical push button switches: #25355: Green buttons #25376: Red buttons Banana jacks (per switch): 2 NO, 2 NC Operating voltage: 24 Vdc, 5 A
25356	<b>Electrical Emergency Stop Button</b> 		Electrical push button switch, turn unlock Banana jacks: 1 NO, 1 NC Operating voltage: 24 Vdc, 5 A

Cat #	Name	Schematic	Description
25358	<b>Electrical Selector Switches</b> 		2 electrical selector switches Banana jacks: 2 NO, 2NC Operating voltage: 24 Vdc, 5 A
10024  ELECTRO	<b>Electrical Distributor, 5 jacks</b> 		Electrical distributor Banana jacks: 5 V+, 5 V- Operating voltage: 24 Vdc, 5 A  The electric distributor provides multiple sockets for connection to a power supply.  Refer to Chapter 1 for details on connecting this component.
25357	<b>Electrical Distributor, 8 jacks</b> 		Electrical distributor Operating voltage: 24 Vdc, 5 A Banana jacks: 8 V+, 8 V- 16 connectors LED indicators

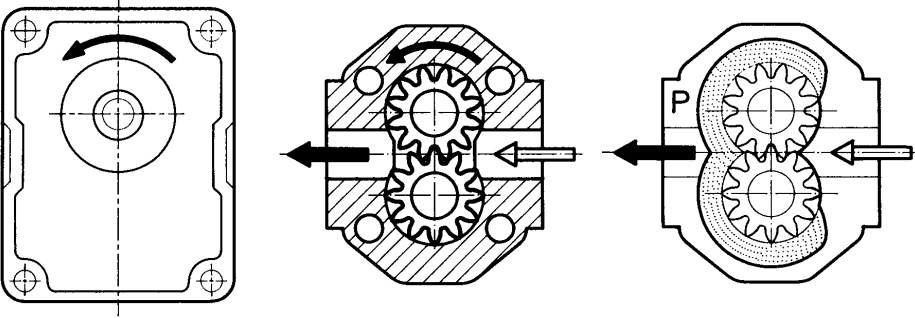
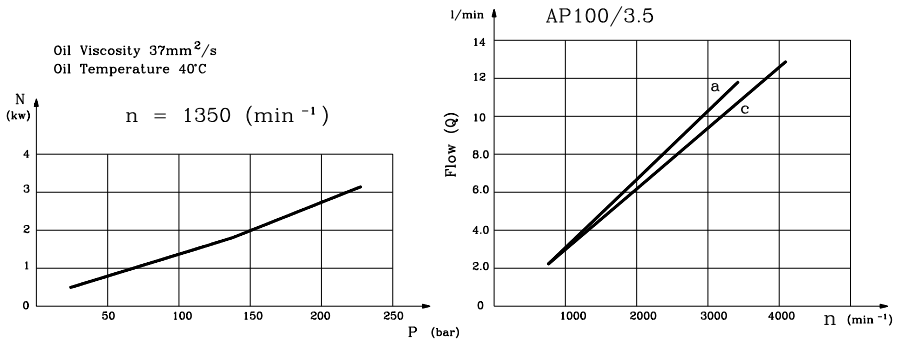
Cat #	Name	Schematic	Description
25360	<p><b>Electrical Timer Relay</b></p> 		<p>Electrical timer relay Eight operating modes: A: On delay B: Flicker Off start B2: Flicker On start C: Signal On/Off delay D: Signal Off delay E: Interval G: Signal On/Off delay J: One-shot Banana jacks: 1 COM, 1 NO, 1 NC, 1 trigger; V+, V- Operating voltage: 24 Vdc, 5 A</p>
25366	<p><b>Electrical Counter</b></p> 		<p>Electrical decremental counter LED indicators: present value, set value, reset, key protection, control output Operation keys: reset, increment, decrement Banana jacks: 1 COM, 1 NO, 1 NC, V+, V-, operation (key, count, gate, reset, V-) Operating voltage: 24 Vdc, 5 A</p>
25359	<p><b>Relay Unit, 2 NO / 2 NC</b></p> 		<p>Relay unit 3 separate relays, each with 4 changeover contacts: 2 NO, 2 NC Banana jacks (per relay): 2 COM, 2 NO, V+, V-, Operating voltage: 24 Vdc, 5 A</p>
25375	<p><b>Relay Unit, 3 NO / 1 NC</b></p> 		<p>Relay unit 3 separate relays, each with 4 changeover contacts: 3 NO, 1 NC Banana jacks (per relay): 2 COM, 2 NO, V+, V-, Operating voltage: 24 Vdc, 5 A</p>

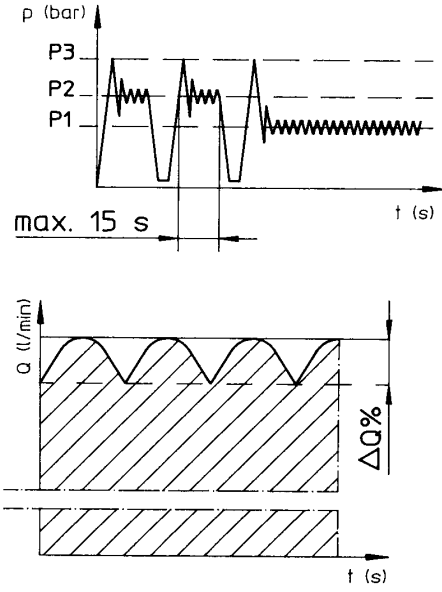
Cat #	Name	Schematic	Description
3031	PLC MicroLogix 		PLC MicroLogix 8 Digital Inputs with Banana Cables 6 Relay Outputs with Banana Cables Indication LEDs Red Power Supply Cable (+) Black Power Supply Cable(-) Red COM Cable Communication Cable Wire Holder
3005	CP/C 2000A Control Unit 		Control unit Banana jacks: 8 digital inputs (10 Vdc) 8 digital outputs, NO 4A max. LED indicators: I/Os, voltage 8 push button/toggle switches Power switch Operating voltage: 100/220Vac RS232 serial com: 8 bit
3007	Electro-Mechanical Switching Unit 		Electro-mechanical switching unit 2 digital relays with changeover contact Timer NO and NC Counter unit Two switches (push button / toggle) Operating voltage: 24 Vdc, 5 A  This unit provides electromechanical control of electro-hydraulic components on the Electro-HydraFlex panel. Enables operation and control of the panel without PC or software.
<b>Power Supplies</b>			
430718 430719	Power Supply, 2A 		Input voltage: #430718: 220 Vac / 24 Vdc #430719: 110 Vac / 24 Vdc Output voltage: 24 Vdc Output current max.: 2 A

Cat #	Name	Schematic	Description
3009 3010	Power Supply, 3A 		<p>Input voltage: #3009: 220 Vac / 24 Vdc #3010: 110 Vac / 24 Vdc</p> <p>Output voltage: 24 Vdc Output current max.: 3 A</p> <p>This power unit provides the 24Vdc/ 3A power supply required by the CP/C2000A controller (Cat.#3004) and the Electro-Mechanical switching unit (Cat.#3007).</p>
430722 430721	Power Supply, 4A 		<p>Input voltage: #430722: 220 Vac / 24 Vdc #430721: 110 Vac / 24 Vdc</p> <p>Output voltage: 24 Vdc Output current max.: 4 A</p>
<b>Hydraulic Power Supply</b>			
25401 25434	Hydraulic Power Pack, 10 L 		<p>Tank: 10 L capacity Gear pump: 3.5 l/min Maximum pressure: 210 bar One phase AC Motor 0.75 kW</p> <p>Operating voltage: #25401: 220Vac/ 50 Hz #25434: 110Vac/ 60 Hz</p> <p>Refer to Chapter 1 for details on connecting this component.</p>
25444 25445	Hydraulic Power Pack, 20 L 		<p>Tank: 20 L capacity Gear pump: 5 l/min Maximum pressure: 210 bar One phase AC motor 1.3 kW</p> <p>Operating voltage : #25444: 110Vac/ 60 Hz #25445: 220Vac/ 50 Hz</p> <p>Refer to Chapter 1 for details on connecting this component.</p>
<p>The power pack is the energy source of the HydraFlex system. It is mounted on a trolley and consists of the following elements (numbers refer to the figure of the Power Pack in Chapter 1):</p>			

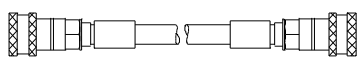



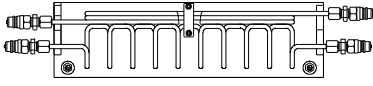
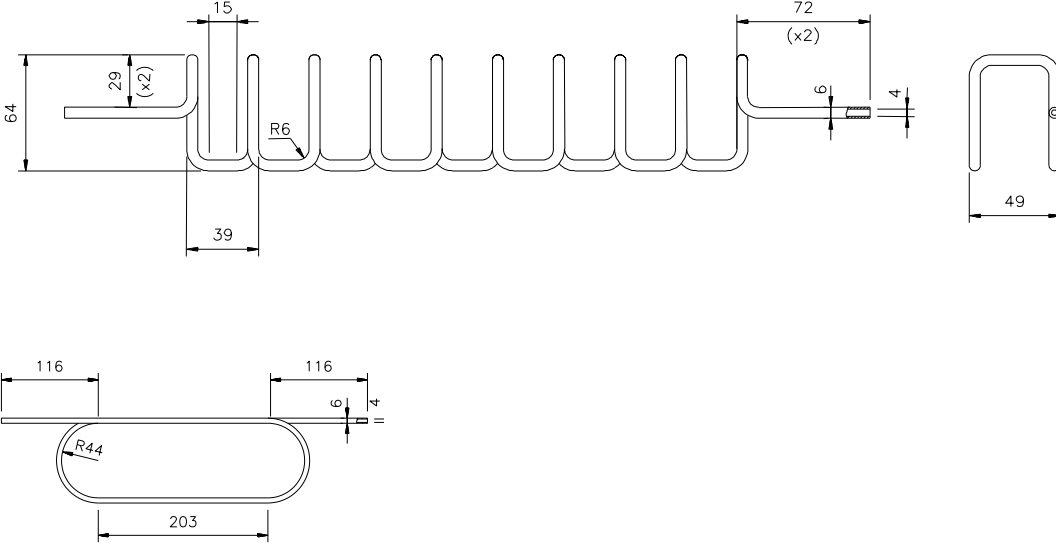
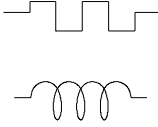
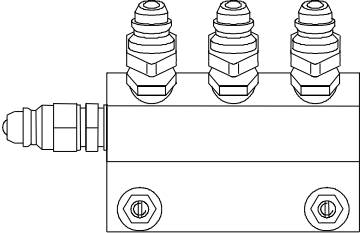
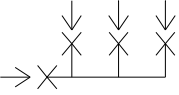
Cat #	Name	Schematic	Description
			<p>Tank: stores the hydraulic fluid. 10 L capacity. Hydraulic fluid specifications:</p> <p>Type: 10W or SADOL S-300            Viscosity: 20 – 50 mm<sup>2</sup>/s            Temperature: 15–60° C</p> <p>Hydraulic fluid should be changed once a year.</p> <p>Gear Pump: a fixed displacement pump which transfers energy from the electric motor to the hydraulic fluid, thereby causing fluid to flow through the piping.</p> <p>Maximum Pressure: 210 bar            Maximum Flow: 5 l/min</p> <p>The HydraFlex gear pump has a drive gear which turns counterclockwise, with the intake port on the right and the delivery port on the left.</p> <p>AC Motor: powers the pump. One-phase, 0.75 kW.</p> <p>Operating Voltage: 220V/50 Hz (110V/60 Hz)</p> <p>Relief Valve: protects the system from high pressure. Factory set to 60 bar. If system pressure exceeds 60 bar, this valve will open and discharge excess fluid to the tank. Do not tamper with this valve.</p> <p>Maximum Pressure: 350 bar            Maximum Flow: 25 l/min</p> <p>Tank Cap: covers the pipeline to the tank (for refilling).</p> <p>Oil Level Gauge: (within temperature gauge) shows the level of hydraulic fluid in the tank. The oil level should be around the mid-point of the gauge.</p> <p>Temperature Gauge: measures the temperature of the hydraulic fluid in the tank. Maximum operating temperature: 55°C.</p> <p>If temperature exceeds 55°C, switch off the system, and allow it to cool down.</p> <p>Pressure Gauge: measures the pressure of the hydraulic fluid when discharged from the power pack.            Maximum Pressure: 100 bar</p> <p>On-Off Switch: starts and stops operation of the hydraulic power pack; mounted on plate for attachment to panel.</p> <p>Quick coupling: pressure discharge port on outgoing line. 1/4"</p> <p>Quick coupling: inlet to tank on return line. 1/4"</p>

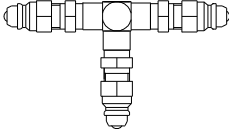
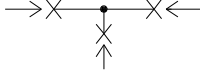
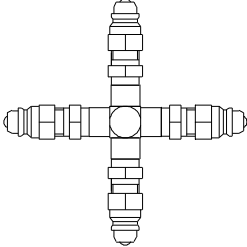
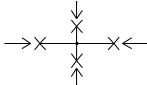
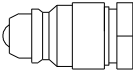
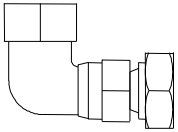
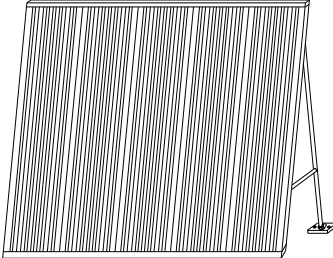
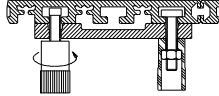
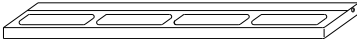
Cat #	Name	Schematic	Description
	<p>Drain plug: allows oil to be drained from tank.</p> <p>Filter: oil filter. Not user serviceable.</p>		<p>Oil Viscosity <math>37\text{mm}^2/\text{s}</math> Oil Temperature <math>40^\circ\text{C}</math></p> <p><math>n = 1350 (\text{min}^{-1})</math></p> 

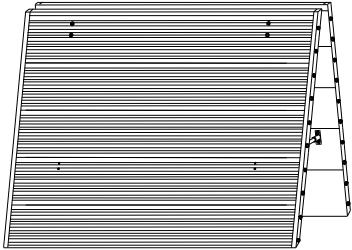
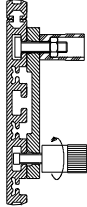
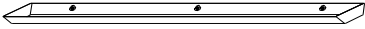
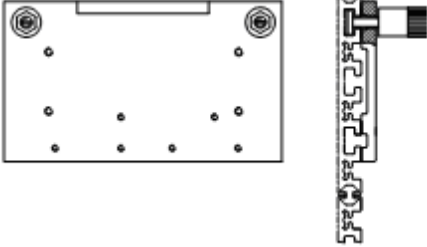
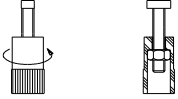
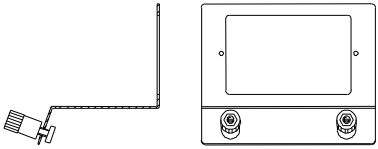
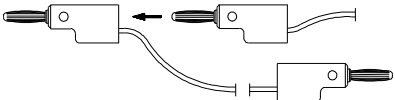
Cat #	Name	Schematic	Description																									
	<p><b>OUTLET</b> There are three different pressure levels:  <b>P1</b> = continuous operating pressure  <b>P2</b> = intermittent operating pressure  <b>P3</b> = peak pressure</p> <p>The recommended delivery pipe oil speed is: <math>v = 2 - 5 \text{ m/s}</math></p> $\Delta Q\% = \frac{Q_{\text{max.}} - Q_{\text{min.}}}{Q_{\text{max.}}} \cdot 100$																											
			<table border="1"> <thead> <tr> <th rowspan="2">Type</th> <th rowspan="2">Displacement cm<sup>3</sup>/r</th> <th colspan="3">Max. pressure</th> <th colspan="2">η min.</th> <th colspan="2">η max.</th> </tr> <tr> <th>P1 bar</th> <th>P2 bar</th> <th>P3 bar</th> <th>P≤P1</th> <th>P&gt;P1</th> <th>P≤P1</th> <th>P&gt;P1</th> </tr> </thead> <tbody> <tr> <td>AP100/3,5</td> <td>3.5</td> <td>210</td> <td>230</td> <td>250</td> <td>650</td> <td>800</td> <td>3500</td> <td>4000</td> </tr> </tbody> </table>	Type	Displacement cm <sup>3</sup> /r	Max. pressure			η min.		η max.		P1 bar	P2 bar	P3 bar	P≤P1	P>P1	P≤P1	P>P1	AP100/3,5	3.5	210	230	250	650	800	3500	4000
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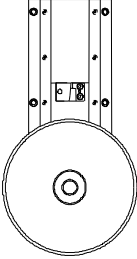
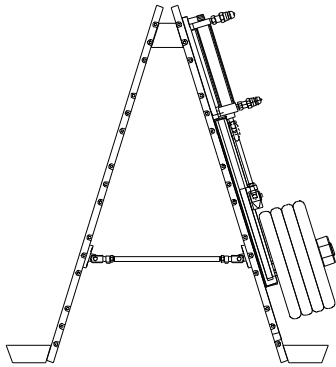

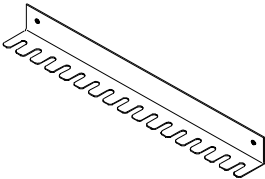
**Hoses and Connectors**

<p>25411 25412 25413</p> <p><b>BASIC</b></p>	<p><b>Hoses</b></p> 		<p>Hose lines with quick release couplings Diameter: 1/4" Length:                  #25411: 2.0 m                  #25412: 0.8 m                  #25413: 0.5 m</p>
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Cat #	Name	Schematic	Description
<p><b>25428</b></p> <p><b>ADVANCED</b></p>	<p><b>Coiled Hoses</b></p>  		<p>Circular and square coiled hoses for resistance measurements</p> <p>The two hoses are made of the same material. The hoses have the same diameter and the same length. The component can therefore be used to test and demonstrate how the configuration of hoses affects the flow of hydraulic fluids.</p> <p>Max. Pressure: 100 bar Material: Stainless Steel 304 Diameter:     Inside <math>\varnothing</math> 4 mm     Outside <math>\varnothing</math> 6 mm Length of each hose: ~ 1840 mm</p>
<p><b>25410</b></p> <p><b>ADVANCED</b></p>	<p><b>Manifold</b></p> 		<p>Manifold, 4 ports Nominal pressure: 60 bar Max. pressure: 210 bar</p> <p>This manifold can be used to distribute hydraulic fluid to as many as three hydraulic consumers. It can also be used to collect fluid returning from three lines into a single line.</p> <p>One manifold should be used to distribute fluid from the pump. Another manifold should be used to connect return lines to the tank.</p>

Cat #	Name	Schematic	Description
25424 BASIC	<b>T-Connector</b> 		T-connector Nominal pressure: 60 bar Flow rate: 0.5–40 l/min Pressure range: 0–250 bar
25439	<b>Cross-Connector</b> 		Cross-connector Pressure range: 0-250 bar Nominal pressure: 60 bar Flow rate: 0.5-40 l/min
24046	<b>Quick Release Coupling</b> 		# 324046 ¼" BSP # 324073 ¼" NPT
324075	<b>Quick Release Coupling - Swivel</b> 		Female connector ¼" BSP
<b>Didactic</b>			
25320	<b>Slotted Panel</b> 		Aluminum panel, with vertical slots for mounting and repositioning components Width: 800 mm Depth: 510 mm Height: 750 mm Position grid: 40x40 mm
25427	<b>Oil Collection Tray</b> 		Oil collection tray for vertical slotted panel.(#25320) Length: #25427: 820 mm #25450: 980 mm

Cat #	Name	Schematic	Description
25351	<b>Double-Sided Slotted Panel</b> 		Two-sided aluminum panel, with horizontal slots for mounting and repositioning components Width: 1000 mm Depth: 520 mm Height: 800 mm Position grid: 40x40 mm
25450	<b>Oil Collection Tray</b> 		Oil collection tray for horizontal slotted panel.(#25351)
11021	<b>Mounting Plate</b> 		Mounting plate for attaching components to panel 190 mm x 108 mm  The mounting plate has two bolts for attaching the plate to the T-slots on the HydraFlex panel. Non-standard components can be used on the panel by attaching them to this plate by means of the pre-drilled holes.
25451	<b>Bolt-Nut Pair</b> 		For attaching mounting plates to slotted panel.
10020	<b>Bracket for CP/C2000A</b> 		Bracket for attaching CP/C2000A unit to panel
411649 411650 411651 411652 411653 411654  ELECTRO	<b>Cables with 4 mm Stacking Banana Plugs</b> 		Universal flexible lines with 4 mm stackable banana plugs  #411649 Red 24" (610mm) #411650 Black 24" (610mm) #411651 Gray 24" (610mm) #411652 Red 48" (1220mm) #411653 Black 48" (1220mm) #411654 Gray 48" (1220mm)

Cat #	Name	Schematic	Description
25448	<b>Loading Weight</b> 		20 kg weight with block for attachment to cylinder
25457	<b>Cylinder and Loading Weight</b> 		
330212	<b>Hex Wrench</b> 		Tool for attaching components to slotted panel.
25449	<b>Hose Support</b> 		Bracket for separating and holding hydraulic hoses.