Orttech 4405 Glenbrook Road Willoughby, Ohio 44094 (440) 951 5533
North American Representative for *Ortlinghaus* Products Fax (440) 951 0869

Hydraulic Installation Guidelines
Appendix B

Hydraulic System Requirements

The *Ortlinghaus* Series 0123, 0023, 0224, and 0225 clutch/brakes, clutches, and brakes use hydraulic fluid for two purposes, clutch actuation/brake release and cooling/lubrication. The hydraulic system must supply hydraulic fluid at the proper pressures and flows for each of these purposes. In normal practice the hydraulic system is made up of two subsystems, a hydraulic power unit as shown in Figure B1, and a valve panel as shown in Figure B2. The hydraulic power unit is mounted in a convenient location and the valve panel is to be located a short distance (3 feet or one meter) from the rotary union. The operating pressures and maximum pressures for the actuation oil are listed in Table B1 while general recommendations for actuating oil flow are listed in Table B2. The actual actuating oil flow is dependent on the size of the clutch/brake, clutch, or brake used and the specific operating conditions of the application. The cooling oil flow required is also dependent on the specific application, and there are no general recommendations for it. Please refer to the quotation, kit instructions, or other documentation from Orttech for the proper cooling oil flow. Cooling oil pressure required is a function of flow, line restrictions, and in-line components, as well as the type of cooling used at the clutch/brake, clutch, or brake (inner cooling or splash cooling).

Proper operation of the clutch/brake, clutch, or brake is dependent on the hydraulic system; these are some items that must be incorporated into the system:

- **Hydraulic Power Unit;** Figure B1
  The hydraulic power unit provides the actuating and cooling streams of the fluid. Often two pumps are used, one for the actuating fluid and one for the cooling fluid as well as a fluid conditioning loop. Figure B1 shows a divided reservoir as is used on units provided by Orttech. This is just a sample schematic, as there are other methods of providing the same functions. The hydraulic power unit must include the following items as a minimum requirement.

  - **Reservoir –** This is to be properly sized for the total flow of the pump(s) used, and be divided and/or baffled to allow efficient operation of the pump(s), heat exchanger, filter, and other components. The circuit shown in Figure B1 uses a reservoir divided into two separate chambers, a return chamber and a clean chamber. All used fluid returns to the return chamber, conditioned fluid flows into the clean chamber, and the clean chamber overflows into the return chamber. This is standard practice for hydraulic power units supplied by Orttech. Other arrangements (such as single chamber designs) may be used, but it is the responsibility of the designer that they function properly,
  - **Low Limit Pressure Switch for Actuating Fluid –** To alert the operator or shut down the system if the pressure of the actuating fluid drops below about 90% of the required value.

- **High Limit Pressure Switch for Actuating Fluid –** To alert the operator or shut down the system if the pressure of the actuating fluid rises above about 110% of the required value.
- **Flowmeter for Cooling Fluid –** To set and monitor the cooling fluid flow to the clutch/brake, clutch, or brake. Electrical contacts or a switch are recommended so that the operator is alerted or system shut down when the fluid flow drops below 85% to 90% of the required value.
- **Filter –** A filter in a fluid conditioning loop is recommended, although full flow pressure filters in the actuating and cooling circuits may be used. The filtration used should maintain an ISO Cleanliness Level of 18/16/13 to 19/17/14.
- **Heat Exchanger –** A heat exchanger sized to remove the heat generated in the operation of the clutch/brake, clutch, or brake as well as the heat generated in the hydraulic power unit itself is required. Oil to water and oil to air heat exchangers are both acceptable, with the oil to water giving better control of fluid temperature. In either case some type of control is required to regulate the fluid temperature. If an oil to air heat exchanger is used special care must be taken to make sure it is located to allow free airflow, and the fins and tube surfaces must be cleaned regularly.

- **Valve Panel;** Figure B2

  The valve panel controls the actuating fluid. The operating valve (a press safety valve is shown in Figure B2) allows the actuating fluid to apply the clutch and/or release the brake.
  - **Operating Valve –** The valve used to apply the actuating fluid to the clutch/brake, clutch, or brake. The type of valve used is based on the application, type of machine it is used on, and how the machine is used.
  - **Accumulator –** The accumulator serves two purposes. It provides a local reservoir of pressurized fluid to allow quick engagement of the clutch and/or release of the brake as well as helping to limit surges in pressure. It must be properly sized for the application and have the proper precharge. The precharge pressure for the normal to maximum operating pressures listed in Table B1 is 650 psi (44.8 bar), for other pressures it is to be approximately 70% of the operating pressure.
  - **Accumulator Release Valve –** The accumulator release valve is required so that the pressurized fluid in the accumulator is released when the hydraulic power unit is shut down.
  - **Fixed Orifice – This is a device that is required to be in the pressure line between the accumulator and the operating valve. A properly sized fixed orifice limits pressure surges and spikes to the clutch/brake, clutch, or brake.** Valve panels supplied by Orttech include the fixed orifice; otherwise the proper fixed orifice is shipped with the clutch/brake, clutch, or brake.

- **Rotary Union / Rotary Inlet**

  The rotary union / rotary inlet is the device that transfers the fluid from the stationary piping to the rotating shaft. When splash cooling is used, a single

passage rotary union is used to transfer the actuating fluid. When inner cooling is used a dual passage rotary union is normally used to transfer both the actuating and cooling fluid. The end of the shaft must be machined to accept the rotary union used, and an adaptor may be requires in some cases. Piping connections to the rotary union must be made with short lengths of hose to prevent binding of the bearings of the rotary union. *Ortlinghaus* rotary oil inlets are recommended for multiple passage applications. For more information on rotary unions / rotary inlets please see Appendix H.

General Information

On the hydraulic power unit, indicators or switches for fluid temperature and level should be used so that the operator can be alerted in the event of high fluid temperature or low fluid level. A flow control or some other means is to be used to set the flow of the cooling fluid going to the clutch/brake, clutch, or brake.

The sensor for the device that controls the flow of water through the oil to water heat exchanger or the fan motor of the oil to air heat exchanger must be located in the clean chamber of a two chamber reservoir as shown in Figure B1, or if an alternate design of reservoir is used (such as a single chamber reservoir), in a location where the average bulk fluid temperature is sensed. The heat exchanger must be properly sized to reject the required amount of heat based on the temperature of the fluid on the inlet side of the heat exchanger and the temperature of the cooling water in the case of an oil to water unit or the ambient air temperature in the case of an oil to air unit.

The piping between the hydraulic power unit and the valve panel is to be properly sized for the pressures and flows expected. Steel hydraulic tubing with 37° flare fittings is strongly recommended. Long lengths of hose are not recommended. The piping between the valve panel and the rotary union/rotary inlet is to be kept as short as possible. The recommendation is a maximum of three feet (one meter). A short length of hose must be used at the connection to rotary union/rotary inlet. Cooling fluid connections to the rotary union/rotary inlet or clutch/brake cover are to be made with a short length of hose to allow flexibility and prevent binding. All hose used must be properly sized for the flows and of a grade sufficient to handle the expected pressures. Some general guidelines for line sizes are:

- Actuating fluid
  - 5/8” OD tubing for sizes 63 through 80
  - 3/4" OD tubing for sizes 86 through 94
  - 1” OD tubing for sizes 96 and 98

- Cooling fluid
  - 5/8” OD tubing for flows of 8 gpm (30 liters/min) or less
  - 3/4" OD tubing for flows from 8 to 12 gpm (30 to 45 liters/min)
  - 1” OD tubing for flows from 12 to 25 gpm (45 to 95 liters/min)
  - 1-1/4” OD tubing for flows from 25 to 40 gpm (90 to 150 liters/min)

It may be necessary to increase line sizes for long runs between the hydraulic power unit and the valve panel.

The drain line from the cover back to the reservoir is to be a vertical drain line or to be sloped downward a minimum of 2 inches per foot (170 mm per meter) its entire length. If the physical arrangement of the installation does not allow this, a separate reservoir equipped with a pump (a scavenging reservoir) is to be used just below the cover so that the return oil may be pumped back to the main reservoir. The drain line must be sized to allow the return flow to flow freely without backing up into the cover. The size of the drain line is a function of the flow in it, total length, number of bends and elbows, and it's overall layout.

If an *Ortlinghaus* cover is used please note that the connections on the cover are BSPT, not NPT. If NPT fittings are to be used adaptors will be required. *Ortlinghaus* covers that incorporate a drip ring around the seal have an M 10 x 1 threaded port on the drip ring. If the cover is ordered from Orttech, the mating fitting with a three foot (one meter) length of 6 mm tubing will be furnished. **The drain connection from the drip ring on the cover must be piped back to the reservoir.**

All piping must be flushed before final connections are made. A suggested flushing procedure is provided in this appendix. Valve panels provided by Orttech that use a press safety valve have a valve protection filter installed. Please refer to the section of this Appendix on valve protection filters for the special instructions on them.

The fluid and filter(s) on the hydraulic power unit should be changed after the first 40 to 60 hours of operation to remove any water, dirt or other contamination that may have been present in the system and piping. Thereafter the fluid filter element(s) should be changed every 1000 operating hours.

The interval between fluid changes is best determined by a sampling and analysis program to monitor fluid condition. If this is not done, a fluid change interval of 2000 operating hours is the base recommendation.

Table B1
Operating Pressures

Series	Normal		Maximum	
	bar	psi	bar	psi
0-023	60	870	65	940
0-123	63	915	68	985
0-224	63	915	68	985
0-225	63	915	68	985

Please Note:

On the sizes 94 through 98 in both Series 0123 and 0023 higher operating and maximum pressures than those in this table are available. On these sizes please refer to the documentation supplied with the clutch/brake, clutch, or brake for the proper operating pressure.

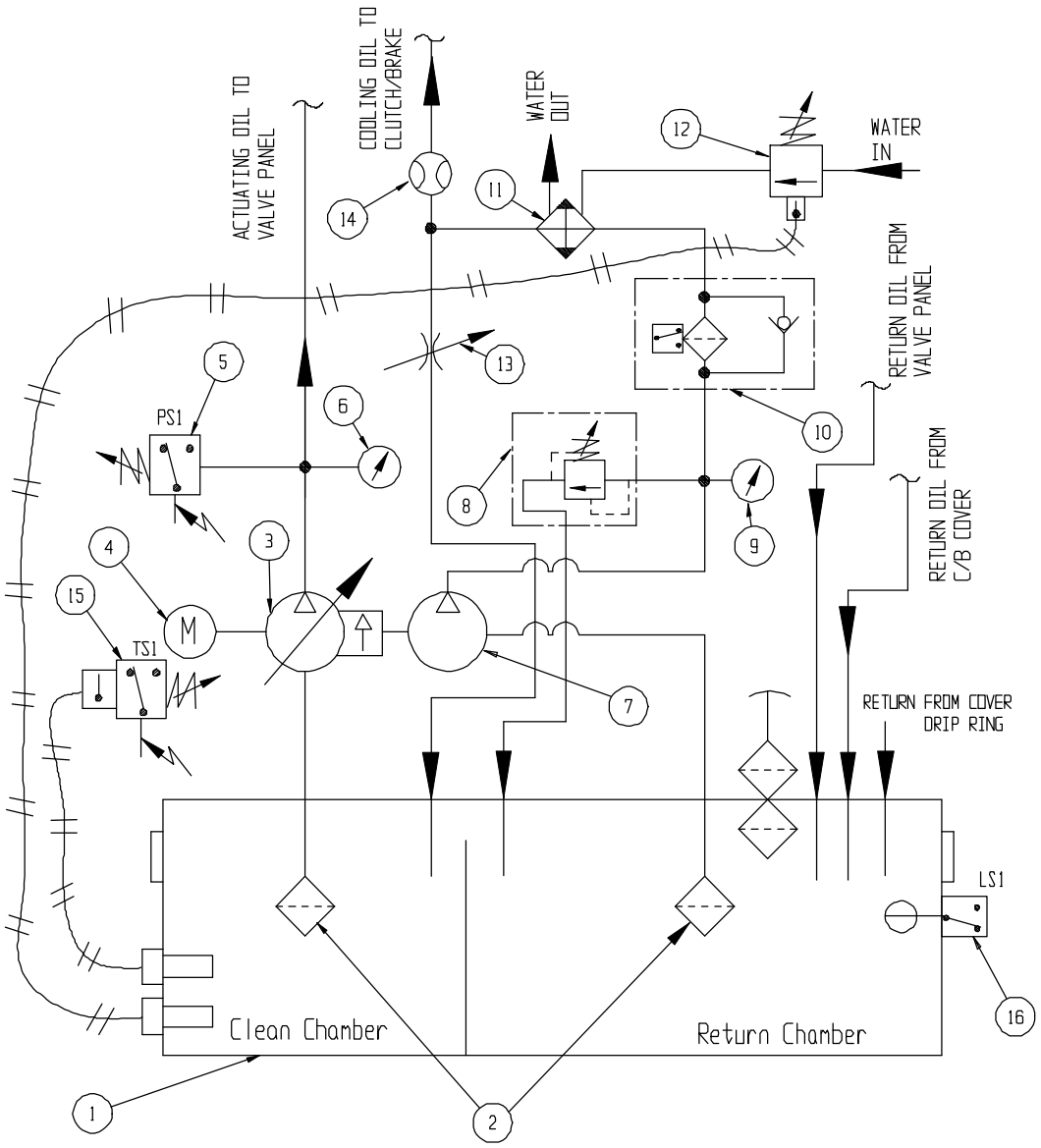

Figure B1
Typical Hydraulic Power Unit

Legend

1	Reservoir		9	Pressure Gauge
2	Inlet Strainer		10	Filter Assembly
3	Variable Volume Pump		11	Oil/Water Heat Exchanger
4	Electric Motor		12	Water Modulating Valve
5	Pressure Switch (low & high limit)		13	Bypass Flow Control
6	Pressure Gauge		14	Flowmeter
7	Fixed Displacement Pump		15	Temperature Switch (high limit)
8	Relief Valve		16	Level Switch

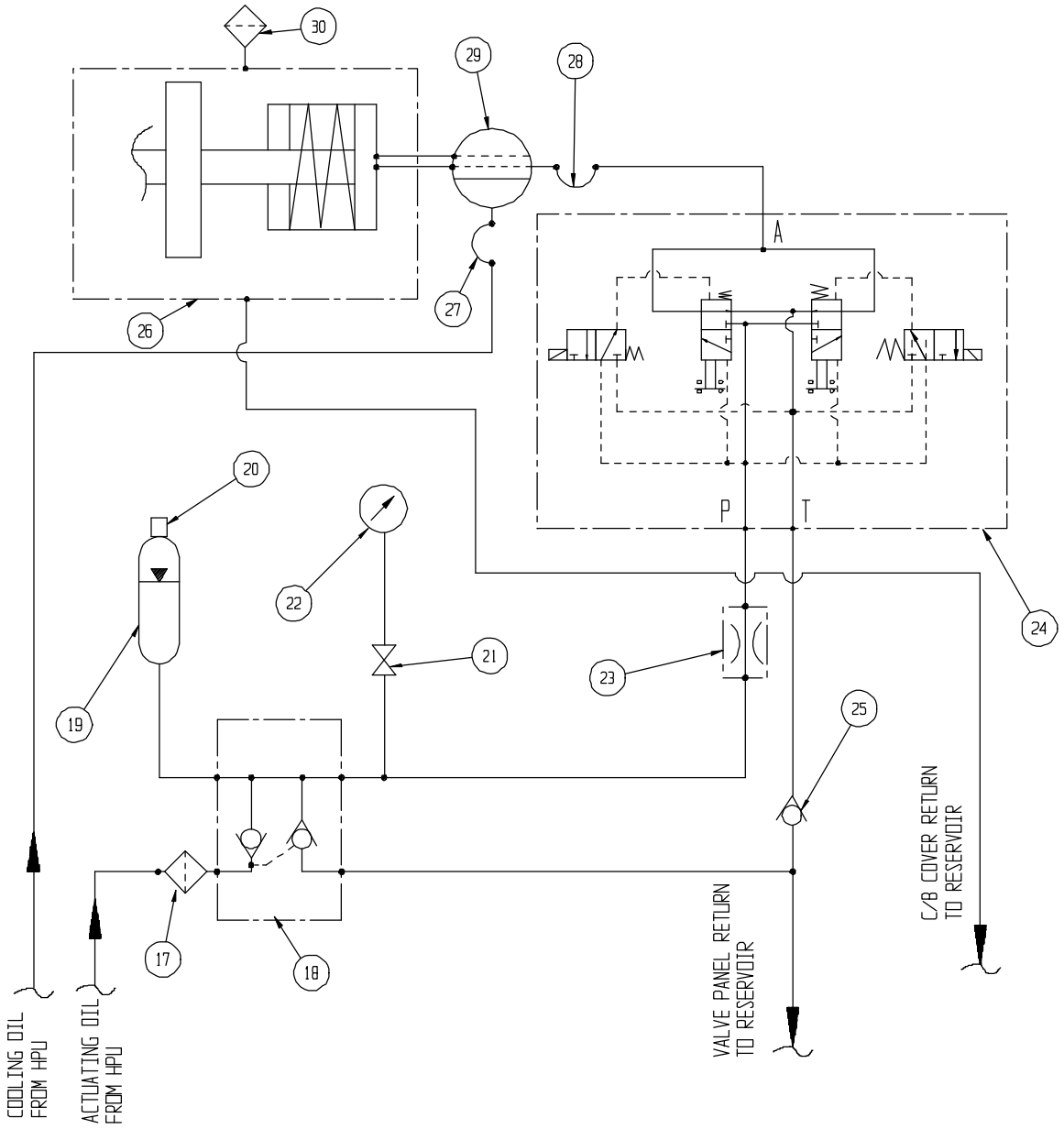

Figure B2

Typical Valve Panel

(Operating valve shown is a press safety valve)

Legend

17	Valve Protection Filter		24	Operating Valve (PSV shown)
18	Accumulator Release Valve		25	Check Valve
19	Accumulator		26	Clutch/Brake Cover
20	Vista Monitor		27	Flexible Hose, Cooling Fluid
21	Gauge Isolator		28	Flexible Hose, Actuating Fluid
22	Pressure Gauge		29	Rotary Union (dual passage shown)
23	Fixed Orifice		30	Vent

Table B2
Actuating Fluid Flow Guidelines
(In Gallons per Minute)

Size	Continuous Operation	Single Stroking			
		10 SSPM	30 SSPM	60 SSPM	100 SSPM
63	2	2	2	2.5	2.5
75	2.5	2.5	2.5	3	3
80	3	3	3.25	3.5	4
86	3.5	3.5	3.75	4	4.5
90	3.5	3.75	4.5	5	- - -
94	4	4.5	5.5	7	- - -
96	4	5	6.5	9	- - -
98	5	6.5	9.5	- - -	- - -

Values listed are minimums for normal applications. Special situations or severe applications may require different flows. Please contact Orttech for additional information.

Table B3
Accumulator Size Guidelines

C/B Size	Accumulator Size	
	Gallons	Liters
63	1	4
75	1	4
80	1	4
86	2.5	10
90	2.5	10
94	5	20
96	5	20
98	5	20

Recommended Hydraulic System Piping Flushing Procedure

Please Note:

As with any procedure, appropriate safety practices must be incorporated and followed to prevent injury to personnel and damage to equipment. If any part of this procedure conflicts with established safety policies or procedures, this procedure must be modified accordingly to conform to them.

In order to prevent chips, dirt, or debris from entering the operating valve, rotary union, and clutch/brake, clutch, or brake; care must be taken to remove all chips, dirt, and debris from all of the piping between the hydraulic power unit, valve panel, and rotary union. The first step is during the fabrication of the piping system. All tubing, pipe, and hose are to be cleaned to remove any chips present as a result of cutting, threading, or flaring. The second step is that all lines and fittings are to be checked for contaminants during field assembly, with the contaminants being removed before connections are made. Lines can be cleared using clean, dry air or a flushing fluid. Follow all appropriate safety procedures while performing this cleaning.

The final step is a “system flush”. To prepare for this, all piping must be in place. Do not yet make the final connections to the valve panel, but instead make a temporary connection between the actuating fluid at the inlet and the return line to the reservoir. Also, connect the cooling fluid line directly to the drain line. These temporary interconnections may be made with hose. When all connections are secure and the hydraulic power unit has been filled with the fluid, start the hydraulic power unit and let it run to circulate the fluid for 20 to 30 minutes to flush the lines.

After the flushing has been completed, shut down the hydraulic power unit and then remove the temporary interconnections. Make up the final connections of the actuating fluid, cooling fluid, and return and drain lines. Connect the operating valve “A” port to the rotary union. Take care to prevent contaminates from entering the piping while making up connections.

If a flushing fluid that is different from the operating fluid is used, remove all of the flushing fluid from the lines and reservoir, and change the filter(s) before the operating fluid is added to the hydraulic power unit.

If the valve panel has a valve protection filter, please refer to the special instructions for the valve protection filter.

Valve Protection Filter

The valve protection filter is a porous element filter installed at the actuating fluid inlet connection on valve panels supplied by Orttech that use a press safety valve. A separate valve protection filter, Orttech Part No. 64A 512448, is available if it is desired to add one to other valve panels.

This filter is installed to protect the press safety valve from any chips and debris not flushed from the piping during assembly or when the piping is altered or modified. It is mandatory that the filter element be removed and inspected after the first 5 to 10 hours of operation at start-up. If no chips or debris are found in the element at this time, the valve protection filter is to be reassembled without the element. If chips or debris are found in the element, clean it and reinstall it in the filter. It is then to be checked again in another 5 to 10 hours, and the above procedure repeated until no chips or debris are found in the element.

The only purpose of the valve protection filter is to protect the operating valve (press safety valve) from chips and debris that may be present in the piping. If the element is left in place during normal operation it may be partially blocked by breakdown products (gum and varnish) of old fluid. This will cause a restriction and a pressure drop in the actuating fluid that will result in a reduction in pressure to the clutch/brake, clutch, or brake. As the valve panel is not usually very accessible, this pressure drop may not be noticed until it has caused sluggish clutch engagement and/or brake release as well as reduced clutch torque, possibly damaging the clutch/brake, clutch, or brake.

During normal operation the filter element is not installed in the valve protection filter.

Whenever the equipment is first started up or whenever the piping is modified or disturbed the element is to be installed and periodically inspected to check for chips and debris. After none has been found the element is to be removed.