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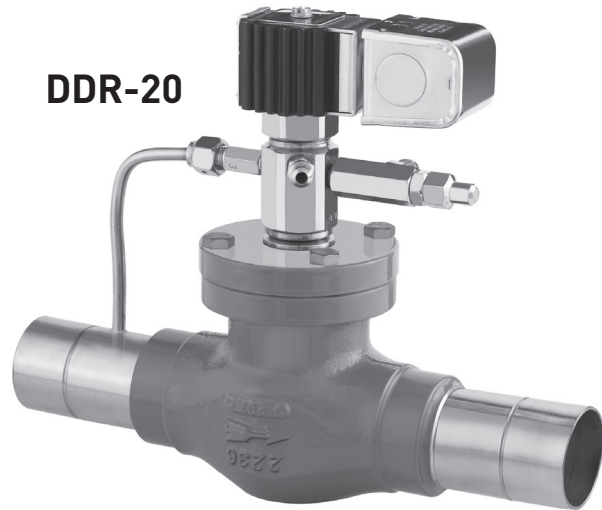
Defrost Differential Pressure Regulating Valves

Installation and Service Instructions

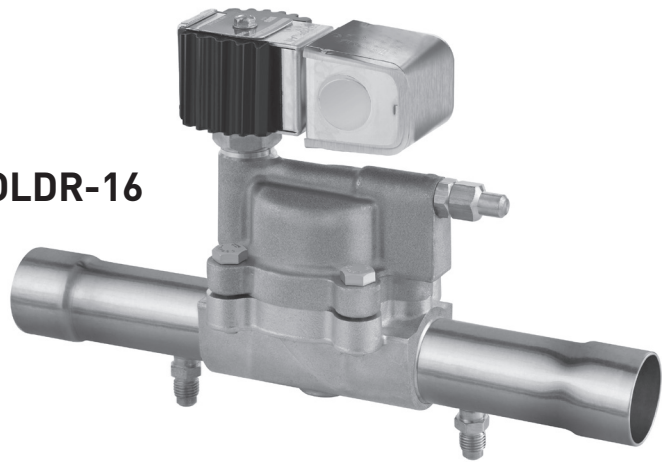
(O)LDR-16, (O)LDR-20, DDR-20

Obsolete: (O)LDR-15, XTM-1, XTM-5, XTO-1, -4 (Included for part's breakdown)

DDR-20



OLDR-16



INSTALLATION INSTRUCTIONS

To ensure optimum performance, defrost differential pressure regulating valves must be selected and applied correctly. These subjects are covered thoroughly in Bulletin 90-50 and should be reviewed prior to installation. Proper installation procedures are equally important and are covered in the following paragraphs.

VALVE LOCATION - The **(O)LDR** valves are installed in the liquid line between the receiver and the liquid header. The **DDR-20** is installed in the discharge line before the condenser. Figure 1 is a piping schematic only to illustrate the general location of the (O)LDR and DDR-20 valves in the system. The two types of defrost differential valves (liquid line and discharge line) are *not* to be applied on the same system. Sporlan recommends that recognized piping references be consulted for assistance in piping procedures. Sporlan is not responsible for system design, any damage arising from faulty system design, or for misapplication of its products. If these valves are applied in any manner other than as described in this bulletin or other Sporlan literature, the Sporlan warranty is void.

The Defrost Differential Pressure Regulating Valves can be installed in either horizontal or vertical lines; choose the line that best suits the application and permits easy accessibility of the valves. Consideration should be given in valve location so that valves do not act as oil traps or allow solder to flow into the internal parts during brazing. Care should also be taken to install the valves with the refrigerant flow in the proper direction.

IMPORTANT: There are two pilot lines from the **DDR-20** that must be installed in the field in order for the valve to operate properly. The 1/4" SAE fitting on the pilot differential valve must be connected to the receiver. The second 1/4" SAE fitting, located below the solenoid coil (Fitting C), must be connected to the suction line. The pilot line to suction is not a constant high to low side bleed. It only bleeds the small amount of refrigerant from the top of the valve's main piston to open the valve when the solenoid coil is energized. Once the valve is open, and at all other times, there is no high to low side bleed. The bleed through the pilot differential valve, that occurs when the valve is modulating, is to the receiver.

BRAZING PROCEDURES – Any commonly used brazing alloy for high side usage is satisfactory. However, when soldering or brazing it is very important to protect the internal parts by wrapping the valve in a WET cloth to keep the body temperature below 250°F. Also, when using high temperature solders, keep the torch tip large enough to avoid prolonged heating of the copper connections. Always direct the flame away from the valve body to avoid damaging the paint.

TEST PRESSURES and DEHYDRATION

TEMPERATURES – Excessive leak testing or operating pressures may damage these valves and reduce the life of the operating members. The maximum allowable test pressure is 400 psig. If greater pressure is to be used, some method must be used to isolate the valve from these high pressures.

For better leak detection, an inert dry gas such as nitrogen or CO₂ may be added to an idle system to supplement the refrigerant pressure.

CAUTION: Inert gases must be added to the system carefully through a pressure regulator. Unregulated gas pressure can seriously damage the system and endanger human life. Never use oxygen or explosive gases.

VALVE SETTING and ADJUSTMENT – (O)LDR AND

DDR-20: All defrost differential valves are set by turning the adjusting stem located under the cap on the pilot differential valve. The adjustment range is 5 to 50 psig. The (O)LDR have a factory setting of 18 psid and the DDR-20 has a factory setting of 30 psid. Turning the stem **clockwise increases** the setting, **counterclockwise decreases** the setting. **Adjustments must be made with the valve in its differential mode and no refrigerated cases in defrost**, so that the head pressure is normal. Artificially low head pressure at the initiation of defrost can prevent a differential from occurring thereby making it impossible to set the valve. Therefore, always set the defrost differential pressure regulating valve when no cases are in defrost.

⚠ WARNING – USER RESPONSIBILITY

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This Bulletin supersedes Bulletin 90-51, April 2004 and all prior publications.

Once the valve is set it will control to maintain this differential setting during defrost. However, there are several system conditions that can cause the differential to change beyond the valve's control:

1. When a defrost is initiated, the head pressure will fall. It can take several minutes for the differential to be created.
2. If there is a very low requirement for refrigeration, and therefore a low demand for liquid refrigerant (i.e. if evaporators condense more liquid than can be used by other systems or branches not in defrost), the differential may never build up enough to reach the valve setting.
3. As a gas defrost cycle progresses, condensing occurs in the evaporators in defrost at a slower rate. Therefore, there is more gas present in the evaporators, which results in a higher natural pressure drop.

IMPORTANT – To verify valve operation, if no differential is occurring between the liquid header and the receiver during defrost, first take all systems or branches out of defrost. Then put the valve in its differential mode and check the valve setting. If the valve maintains set-point with normal head pressures and no cases in defrost, then the valve is operating correctly and some other system condition (such as outlined above) may be causing the problem.

SERVICE INSTRUCTIONS

The (O)LDR and DDR-20 can be easily disassembled for inspection and cleaning or for replacement of parts. Be certain to isolate the valve from all sources of pressure prior to disassembling. Internal parts breakdown are also shown for the XTO and XTM obsolete models for reference. Exploded views of the valves are provided on Pages 6, 7 and 8 for your reference. See table on page 5 for replacement parts and parts kits.

(O)LDR-16

Pilot Differential Valve Replacement Instructions

1. Remove adjustment stem assembly from upper body.
2. Inspect and clean seat if necessary or replace seat. Reinstall adjustment stem assembly.

Internal Parts Replacement

1. Remove enclosing tube lock nut and cap screws.
2. Replace enclosing tube, enclosing tube gasket, plunger assembly and O-Rings (2 small and 1 large).
3. Align upper body and install cap screws. Tighten enclosing tube. (Recommended torque: 25-30 ft. lbs.)

(O)LDR-20

Pilot Differential Valve Replacement Instructions

1. Disconnect the pilot tube from the pilot differential valve. Remove the pilot differential valve from the flange.

2. Inspect and clean the strainer if necessary. Replace strainer and install a new pilot differential valve in the flange. Reconnect the pilot tube from the valve body.

Internal Parts Replacement

1. Disconnect the pilot tube(s) from the pilot valve.
2. Remove the enclosing tube locknut and the cap screws and replace the enclosing tube, enclosing tube gasket, plunger assembly, closing spring, piston assembly, O-Ring (if required), and the tetraseal or gasket. Align the pilot valve flange plate correctly, reassemble the valve and tighten the cap screws.
3. Reconnect the pilot tube connection(s).

DDR-20

Pilot Differential Valve Replacement Instructions

1. Disconnect the pilot line to receiver from the pilot differential valve. Remove the pilot differential valve from the flange.
2. Install a new pilot differential valve in the flange. Reconnect the pilot line to the receiver.

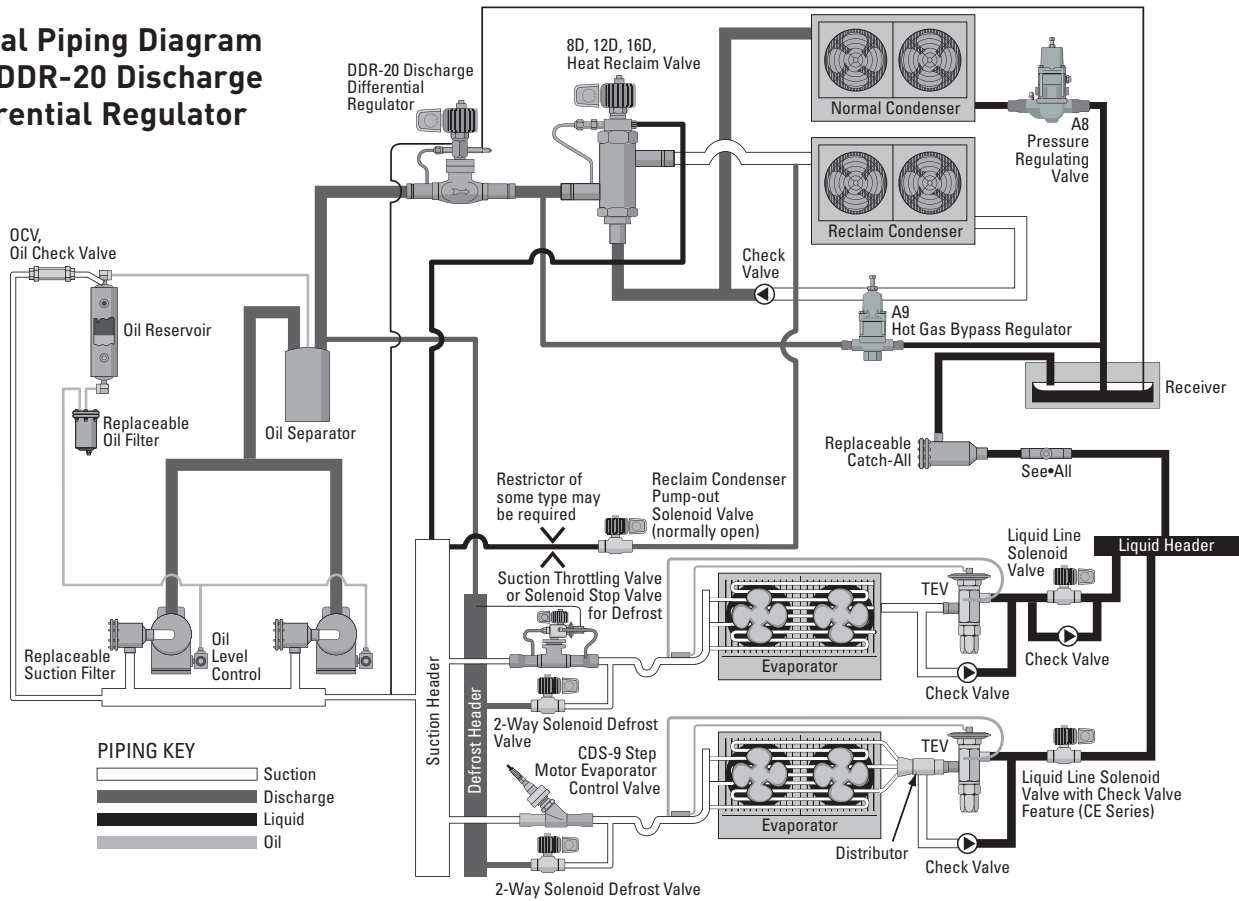
Pilot Valve Replacement Instructions

1. Disconnect the three connections of the pilot valve. They are the pilot tube, pilot line to suction and the pilot line to the receiver. With the body flange still intact, place a wrench at the bottom of the pilot valve. Turn counterclockwise and remove the pilot valve assembly from the adaptor.
2. Install the new pilot valve (at this time the flange is still securely bolted to the valve body). Again, place a wrench at the bottom of the pilot valve. Turn clockwise until the pilot valve is firmly in place.
3. Remove the cap screws and replace the gasket under the adaptor. Reassemble the valve. Before completely tightening the cap screws, rotate the pilot valve to properly align the three connections. Join these connections and tighten the cap screws. A torque value for the cap screws is not recommended but uniformity of compression from the four cap screws is important. Screw the flange down evenly and firmly.

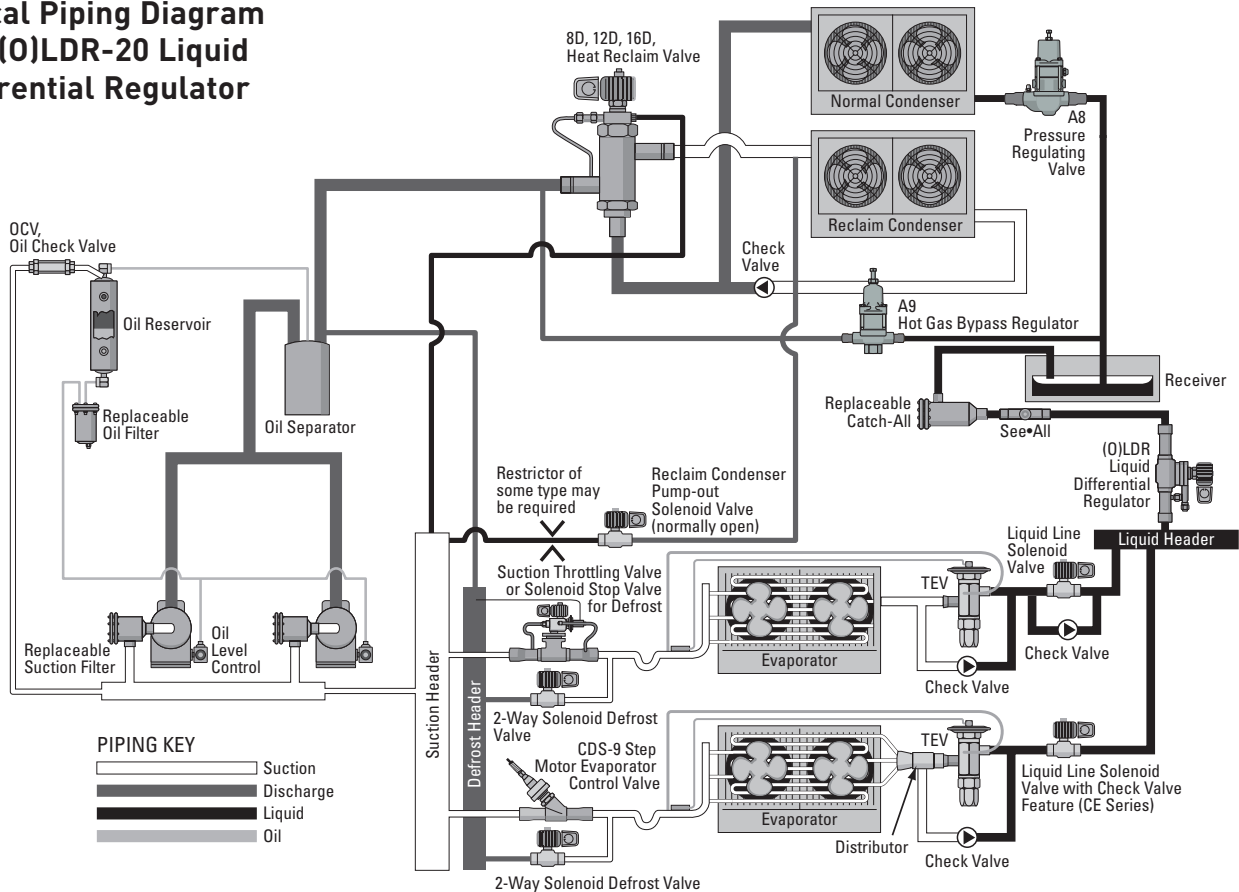
Internal Parts Replacement

1. Disconnect the three connections of the pilot valve and remove the four cap screws. The complete pilot assembly can now be lifted off the main valve body.
2. Replace the piston, body sleeve, O-ring, and closing spring.
3. Install a new gasket and reassemble the valve. Before completely tightening the cap screws, rotate the pilot valve to properly align the three connections. Join these connections and tighten the cap screws. **A torque value for the cap screws is not recommended** but uniformity of compression from the four cap screws is important. Screw the flange down evenly and firmly.

Typical Piping Diagram with DDR-20 Discharge Differential Regulator



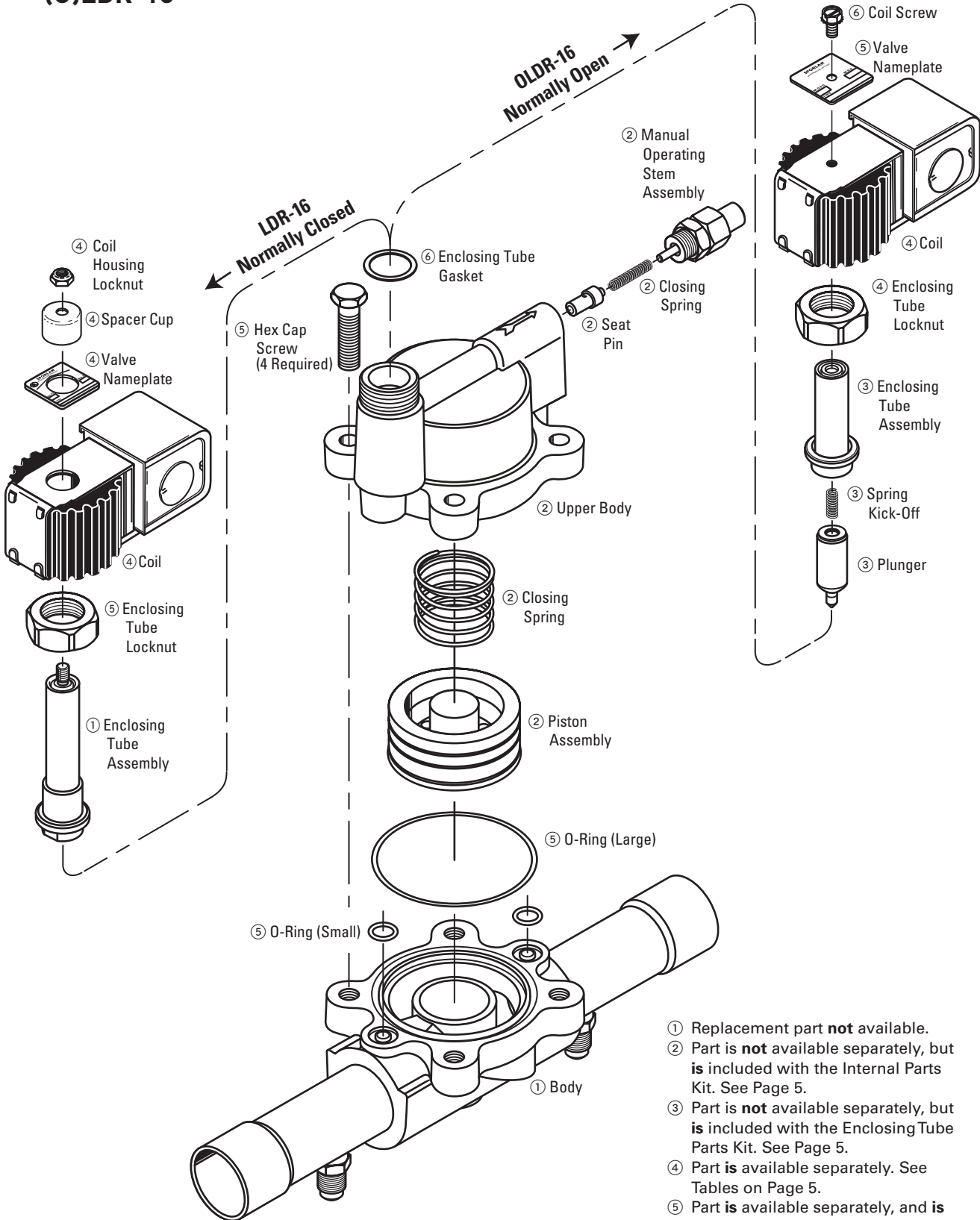
Typical Piping Diagram with (O)LDR-20 Liquid Differential Regulator



REPLACEMENT PARTS AND PARTS KITS (O)LDR, XTM, XTO

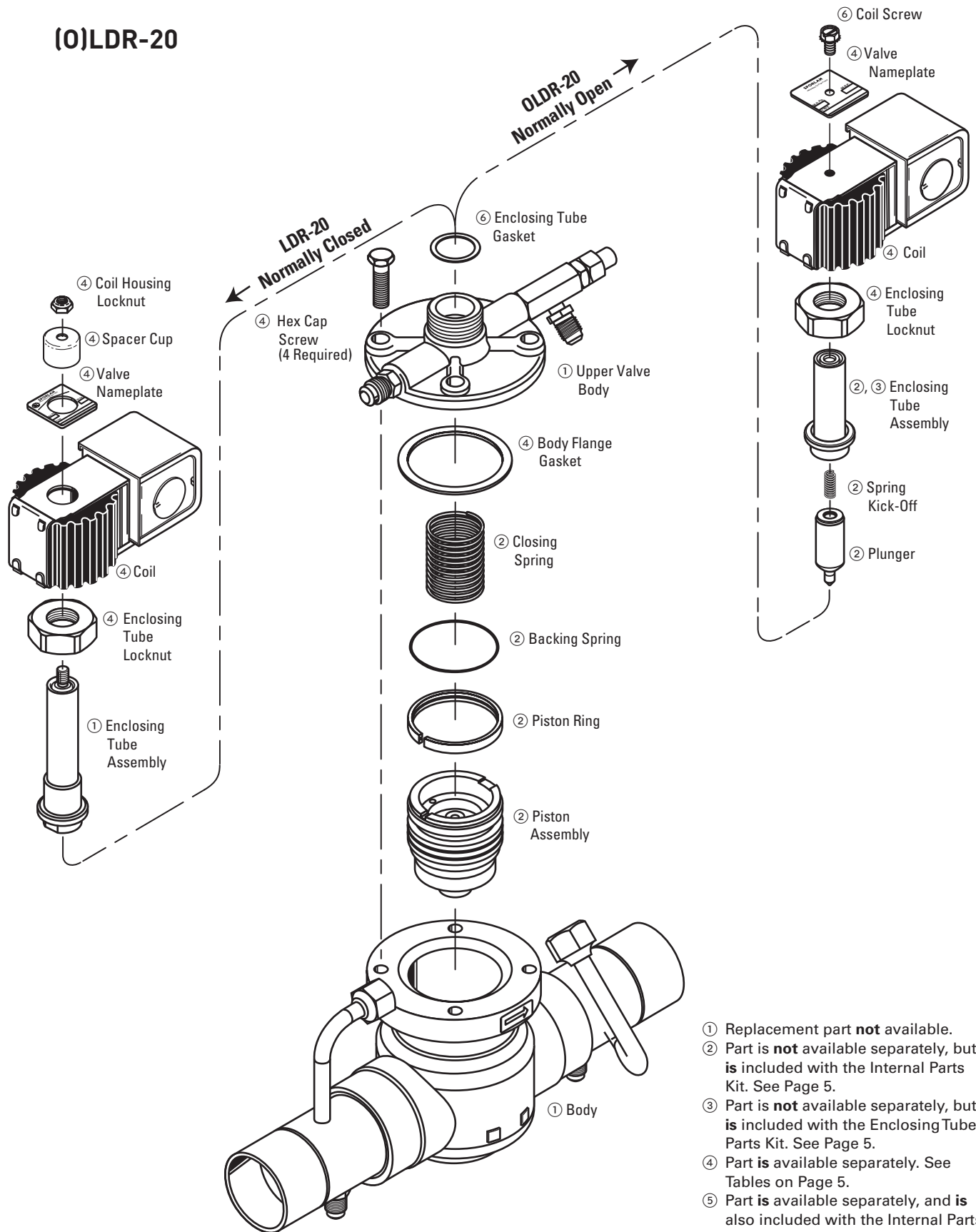
ITEM NUMBER	PART NUMBER and DESCRIPTION DRAWINGS ON PAGES 6, 7 and 8		VALVE TYPE and SIZE							
			LDR-15	XTM	OLDR-15	LDR-16	OLDR-16	LDR-20	XTO	OLDR-20
			QUANTITY REQUIRED							
REPLACEMENT PARTS SOLD SEPARATELY										
—	641-006 (Prior to 2004)	Body Flange Tetraseal	1	1	1					
183675	2645-000 (As of 2004)									
382260	21007-7	Cap Screw						4	4	4
—	21028-7					4	4			
382200	4208-5		4	4	4					
—	MKC-1	Coil (Specify Voltage & Frequency)					1			
—	MKC-2				1					1
—	OMKC-1					1				
—	OMKC-2		1	1				1	1	
382005	1025-1	Coil Housing Locknut	1	1				1	1	
—	1025-7					1				
958101	1390-000	Coil Housing Screw			1		1			1
183660	641-3 (Prior to 3-1999)	Enclosing Tube Gasket (Tetraseal)	1	1	1			1	1	1
380104	14000-2 (As of 3-1999)					1	1			
—	14000-1									
382150	13252-1	Enclosing Tube Locknut	1	1	1			1	1	1
—	13256-2					1	1			
183710	938-1	Gasket						1	1	1
—	621-008 (Prior to 2004)	O-Ring	1	1	1					
958148	4508-008 (As of 2004)									
621-11	183608	O-Ring (small)				2	2			
621-036	968030	O-Ring (large)				1	1			
382580	2003-1	Seal Cap	1	1	1	1	1	1	1	1
382623	638-106	Seal Cap O-Ring	1	1	1	1	1	1	1	1
382003	2527-1	Spacer Ring	1	1				1	1	
382020	2717-6	Spacer Cup	1	1				1	1	
—	155826					1				
958069	173-000	Strainer	1	1	1			1	1	1
382008	14115	Valve Nameplate (Specify Valve Type, Voltage & Frequency)	1	1	1	1	1	1	1	1
REPLACEMENT PARTS KITS										
PILOT DIFFERENTIAL ASSEMBLY KIT										
382640	KS-XTT-1	Pilot Differential Valve	1	1	1			1	1	1
INTERNAL PARTS KIT										
381632	KS-XTM	Enclosing Tube Enclosing Tube Gasket Stem & Plunger Assembly Piston Assembly, Closing Spring O-ring, Body Flange Tetraseal	1	1						
381649	KS-OLDR -15	Enclosing Tube Gasket Plunger Assembly Piston Assembly, Closing Spring O-ring, Body Flange Tetraseal Enclosing Tube			1					
381653	KS-OLDR-16	Upper Valve Assembly Piston Assembly Enclosing Tube Locknut Closing Spring, O-Ring (large) O-Ring (small), Cap Screws					1			
381634	KS-XTO	Enclosing Tube Enclosing Tube Gasket Stem & Plunger Assembly Piston Assembly Closing Spring, Gasket						1	1	
381650	KS-OLDR -20	Enclosing Tube Gasket Plunger Assembly Piston Assembly, Closing Spring Gasket, Enclosing Tube								1
ENCLOSING TUBE KIT										
382355	KE-9	Enclosing Tube Assembly			1					1
382435	KE-6	Enclosing Tube Gasket, Coil Screw					1			

(O)LDR-16



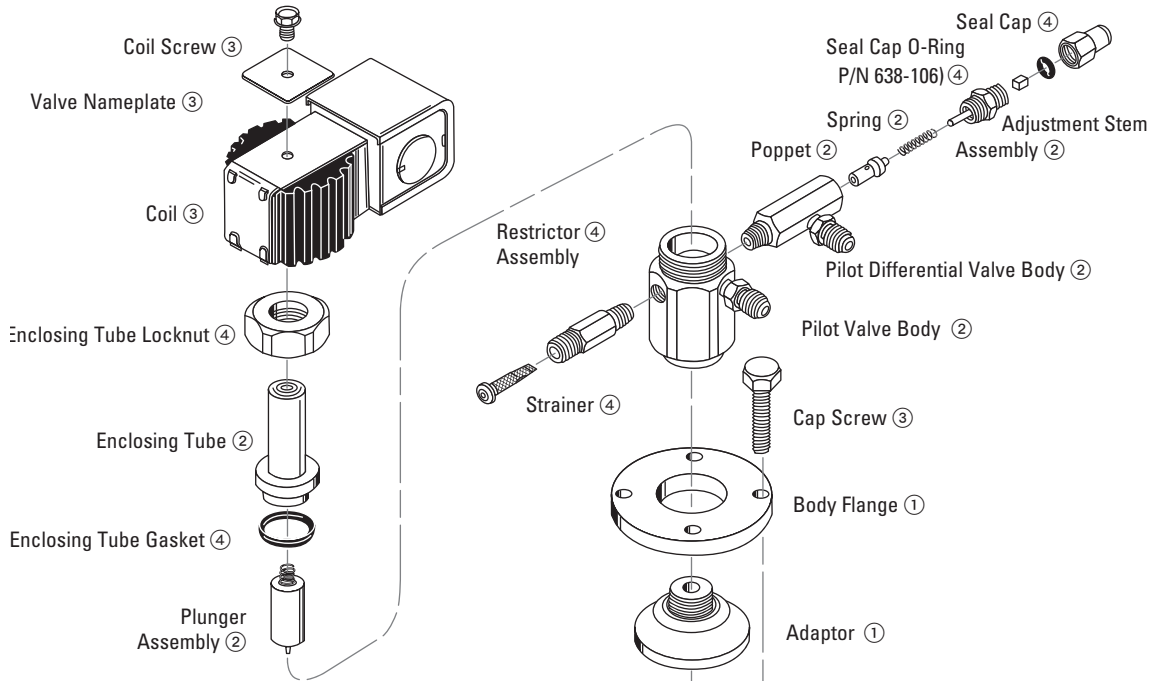
- ① Replacement part **not** available.
- ② Part is **not** available separately, but **is** included with the Internal Parts Kit. See Page 5.
- ③ Part is **not** available separately, but **is** included with the Enclosing Tube Parts Kit. See Page 5.
- ④ Part **is** available separately. See Tables on Page 5.
- ⑤ Part **is** available separately, and **is** also included with the Internal Parts Kit. See Page 5.
- ⑥ Part **is** available separately and **is** also included with the Internal Parts Kit and the Enclosing Tube Parts Kit. See Page 5.

(O)LDR-20



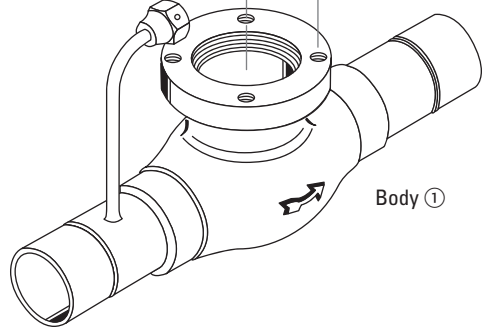
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DDR-20



REPLACEMENT PARTS AND PARTS KITS DDR-20

PART NUMBER	DESCRIPTION	QUANTITY REQUIRED
REPLACEMENT PARTS SOLD SEPARATELY		
2625-000	Cap Screw	4
MKC-2	Coil -Specify voltage and frequency	1
1390-000	Coil Screw	1
641-3	Enclosing Tube Tetraseal	1
14000-2	Enclosing Tube Gasket	1
13252-1	Enclosing Tube Locknut	1
2539-000	Gasket	1
4508-031	O-Ring	1
2449-003	Restrictor Assembly	1
2003	Seal Cap	1
638-106	Seal Cap O-Ring	1
2445-000	Strainer	1
2383-000	Valve Nameplate -Specify valve type, voltage and frequency	1
REPLACEMENT PARTS KITS		
PILOT ASSEMBLY KIT		
K-XUL	Pilot valve, pilot differential valve, enclosing tube locknut, enclosing tube, plunger assembly, enclosing tube gasket, restrictor assembly, strainer, gasket	1
INTERNAL PARTS KIT		
KS-DDR-20	Piston, body sleeve, closing spring, gasket, O-ring	1



- ① Replacement part **not** available.
- ② Part **is not** available separately, but **is** included with the Parts Kits. See table at left.
- ③ Part **is** available separately. See table at left.
- ④ Part **is** available separately, and **is also** included with the Pilot Assembly Kit. See table at left.
- ⑤ Part **is** available separately, and **is also** included with the Internal Parts Kit. See table at left.
- ⑥ Part **is** available separately, and **is also** included with the Pilot Assembly Kit and the Internal Parts Kit. See table at left.

* The new design can be easily identified as a thin, synthetic coated metal gasket, known as a Wolverine gasket. The old gasket is a thicker type of O-ring with a square cross section, known as a tetraseal. See the partial cross sections of the valve body at right. The gaskets and the enclosing tubes of the two designs are not interchangeable. The new enclosing tube assembly is included in the replacement parts kits.

*Tetraseal

*Wolverine Gasket

SERVICE TIPS

PROBLEM	POSSIBLE CAUSE	REMEDY
LDR TROUBLE SHOOTING GUIDE		
Valve won't open - High differential	Strainer plugged	Remove pilot differential valve from flange. Remove strainer, visually inspect and clean if necessary.
	Dirt or foreign material in main valve body	Remove flange from body. Inspect piston and inside of valve for rust or other solid contaminants. Clean or replace valve if necessary.
	Pilot differential valve piston jammed	Replace pilot differential valve if necessary.
Valve won't open when coil is energized - Continues to control differential	Solenoid coil defective	Check that there is power to the coil. Check coil for continuity. If open, replace coil.
Valve won't control differential - Stays open	Solenoid coil energized	De-energize coil.
	Solenoid pilot port plugged	Remove enclosing tube. Inspect synthetic pilot port and clean if necessary.
	Dirt or foreign material in main valve body	Remove flange from body. Inspect piston and inside of valve for rust or other solid contaminants. Clean or replace valve if necessary.
	Main piston assembled wrong	Remove flange from body. Inspect main piston. Piston should have piston ring in top groove and spring on top of piston. Reassemble as required.
	Pilot differential valve not closing	Replace pilot differential valve if necessary.
Valve controls differential but setting drifts below original setpoint	Percentage of system in defrost is too great	Decrease the maximum percentage of system in defrost.
	Pilot differential valve not closing	Replace pilot differential valve if necessary.
OLDR TROUBLE SHOOTING GUIDE		
Valve won't control differential - Stays open	Solenoid coil defective	Check that there is power to the coil. Check coil for continuity. If open, replace coil.
	Dirt or foreign material in main valve body	Remove flange from body. Inspect piston and inside of valve for rust or other solid contaminants. Clean or replace valve if necessary.
	Pilot differential valve piston jammed	Replace pilot differential valve if necessary.
Valve won't open - High differential	Solenoid coil energized	De-energize coil.
	Strainer plugged	Remove pilot differential valve from flange. Remove strainer, visually inspect and clean if necessary. (Not applicable for (O)LDR-16)
	Solenoid pilot port plugged	Remove enclosing tube. Inspect synthetic pilot port and clean if necessary.
	Dirt or foreign material in main valve body	Remove flange from body. Inspect piston and inside of valve for rust or other solid contaminants. Clean or replace valve if necessary.
	Main piston assembled wrong	Remove flange from body. Inspect main piston. Piston should have piston ring in top groove and spring on top of piston. Reassemble as required.
	Pilot differential valve not closing	Replace pilot differential valve if necessary.
Valve controls differential but setting drifts below original setpoint	Percentage of system in defrost is too great	Decrease the maximum percentage of system in defrost.
	Pilot differential valve not closing	Replace pilot differential valve if necessary.

SERVICE TIPS

PROBLEM	POSSIBLE CAUSE	REMEDY
DDR-20 TROUBLE SHOOTING GUIDE		
Valve won't open - High differential	Suction tube not connected (Fitting C)	Connect fitting C to suction line.
	Suction pilot line service valve is closed or restricted	Inspect service valve, clean or replace if necessary.
	Dirt or foreign material in the pilot valve poppet	Disassemble and inspect pilot differential valve. Clean or replace pilot valve if necessary.
	Dirt or foreign material in the main valve body	Remove flange from body. Inspect piston and inside of valve for rust or other solid contaminants. Clean or replace valve if necessary.
	Pilot valve adjusted improperly	Re-adjust pilot differential valve counterclockwise to desired set point.
	Pilot differential valve poppet jammed due to adjustment stem being turned too far in	Disassemble and inspect pilot differential valve. Replace pilot valve if necessary.
	Pilot differential valve assembly bent at the junction of the pilot valve flange plate	Replace pilot valve.
Valve won't open when coil is energized - Continues to control differential	Solenoid coil defective	Check that there is power to the coil. Check coil for continuity. If open, replace coil.
Valve won't control differential - Stays open	Solenoid coil energized	De-energize coil.
	Restrictor assembly strainer plugged	Remove pilot tube from restrictor assembly and inspect strainer. Clean or replace if necessary.
	Dirt or foreign material causing poppet to hang open	Disassemble and inspect pilot differential valve. Clean or replace pilot valve if necessary.
	Dirt or foreign material in main valve body	Remove flange from body. Inspect piston and inside of valve for rust or other solid contaminants. Clean or replace valve if necessary.

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3. Delivery Dates; Title and Risk; Shipment. All delivery dates are approximate and Seller shall not be responsible for any damages resulting from any delay. Regardless of the manner of shipment, title to any products and risk of loss or damage shall pass to Buyer upon placement of the products with the shipment carrier at Seller's facility. Unless otherwise stated, Seller may exercise its judgment in choosing the carrier and means of delivery. No deferment of shipment at Buyers' request beyond the respective dates indicated will be made except on terms that will indemnify, defend and hold Seller harmless against all loss and additional expense. Buyer shall be responsible for any additional shipping charges incurred by Seller due to Buyer's acts or omissions.

4. Warranty. Seller warrants that the Products sold hereunder shall be free from defects in material or workmanship for a period of twelve months from the date of delivery to Buyer or 2,000 hours of normal use, whichever occurs first. The prices charged for Seller's products are based upon the exclusive limited warranty stated above, and upon the following disclaimer: **DISCLAIMER OF WARRANTY: THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO PRODUCTS PROVIDED HEREUNDER. SELLER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, INCLUDING DESIGN, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

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6. LIMITATION OF LIABILITY. UPON NOTIFICATION, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE A DEFECTIVE PRODUCT, OR REFUND THE PURCHASE PRICE. **IN NO EVENT SHALL SELLER BE LIABLE TO BUYER FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR AS THE RESULT OF, THE SALE, DELIVERY, NON-DELIVERY, SERVICING, USE OR LOSS OF USE OF THE PRODUCTS OR ANY PART THEREOF, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT, EVEN IF SELLER HAS BEEN NEGLIGENT, WHETHER IN CONTRACT, TORT OR OTHER LEGAL THEORY. IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE OF THE PRODUCTS.**

7. User Responsibility. The user, through its own analysis and testing, is solely responsible for making the final selection of the system and Product and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the

application and follow applicable industry standards and Product information. If Seller provides Product or system options, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products or systems.

8. Loss to Buyer's Property. Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, will be considered obsolete and may be destroyed by Seller after two consecutive years have elapsed without Buyer ordering the items manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. Special Tooling. A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture Products. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the Products, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

10. Buyer's Obligation; Rights of Seller. To secure payment of all sums due or otherwise, Seller shall retain a security interest in the goods delivered and this agreement shall be deemed a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect its security interest.

11. Improper use and Indemnity. Buyer shall indemnify, defend, and hold Seller harmless from any claim, liability, damages, lawsuits, and costs (including attorney fees), whether for personal injury, property damage, patent, trademark or copyright infringement or any other claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, improper application or other misuse of Products purchased by Buyer from Seller; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, plans, drawings, or specifications furnished by Buyer to manufacture Product; or (d) Buyer's failure to comply with these terms and conditions. Seller shall not indemnify Buyer under any circumstance except as otherwise provided.

12. Cancellations and Changes. Orders shall not be subject to cancellation or change by Buyer for any reason, except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage. Seller may change product features, specifications, designs and availability with notice to Buyer.

13. Limitation on Assignment. Buyer may not assign its rights or obligations under this agreement without the prior written consent of Seller.

14. Force Majeure. Seller does not assume the risk and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter "Events of Force Majeure"). Events of Force Majeure shall include without limitation: accidents, strikes or labor disputes, acts of any government or government agency, acts of nature, delays or failures in delivery from carriers or suppliers, shortages of materials, or any other cause beyond Seller's reasonable control.

15. Waiver and Severability. Failure to enforce any provision of this agreement will not waive that provision nor will any such failure prejudice Seller's right to enforce that provision in the future. Invalidation of any provision of this agreement by legislation or other rule of law shall not invalidate any other provision herein. The remaining provisions of this agreement will remain in full force and effect.

16. Termination. Seller may terminate this agreement for any reason and at any time by giving Buyer thirty (30) days written notice of termination. Seller may

immediately terminate this agreement, in writing, if Buyer: (a) commits a breach of any provision of this agreement (b) appointments a trustee, receiver or custodian for all or any part of Buyer's property (c) files a petition for relief in bankruptcy on its own behalf, or by a third party (d) makes an assignment for the benefit of creditors, or (e) dissolves or liquidates all or a majority of its assets.

17. Governing Law. This agreement and the sale and delivery of all Products hereunder shall be deemed to have taken place in and shall be governed and construed in accordance with the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to this agreement.

18. Indemnity for Infringement of Intellectual Property Rights. Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Section. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets ("Intellectual Property Rights"). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that a Product sold pursuant to this Agreement infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If a Product is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using the Product, replace or modify the Product so as to make it noninfringing, or offer to accept return of the Product and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to Products delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any Product sold hereunder. The foregoing provisions of this Section shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

19. Entire Agreement. This agreement contains the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of sale. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter are herein merged.

20. Compliance with Law, U. K. Bribery Act and U.S. Foreign Corrupt Practices Act. Buyer agrees to comply with all applicable laws and regulations, including both those of the United Kingdom and the United States of America, and of the country or countries of the Territory in which Buyer may operate, including without limitation the U. K. Bribery Act, the U.S. Foreign Corrupt Practices Act ("FCPA") and the U.S. Anti-Kickback Act (the "Anti-Kickback Act"), and agrees to indemnify and hold harmless Seller from the consequences of any violation of such provisions by Buyer, its employees or agents. Buyer acknowledges that they are familiar with the provisions of the U. K. Bribery Act, the FCPA and the Anti-Kickback Act, and certifies that Buyer will adhere to the requirements thereof. In particular, Buyer represents and agrees that Buyer shall not make any payment or give anything of value, directly or indirectly to any governmental official, any foreign political party or official thereof, any candidate for foreign political office, or any commercial entity or person, for the purpose of influencing such person to purchase products or otherwise benefit the business of Seller.



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