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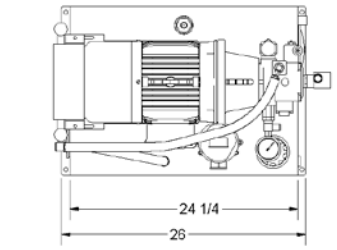
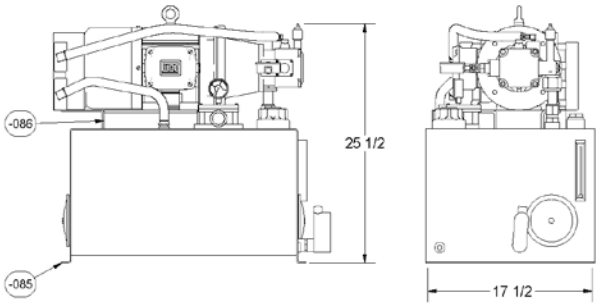
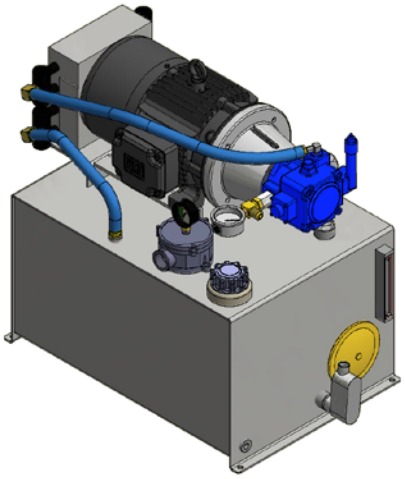
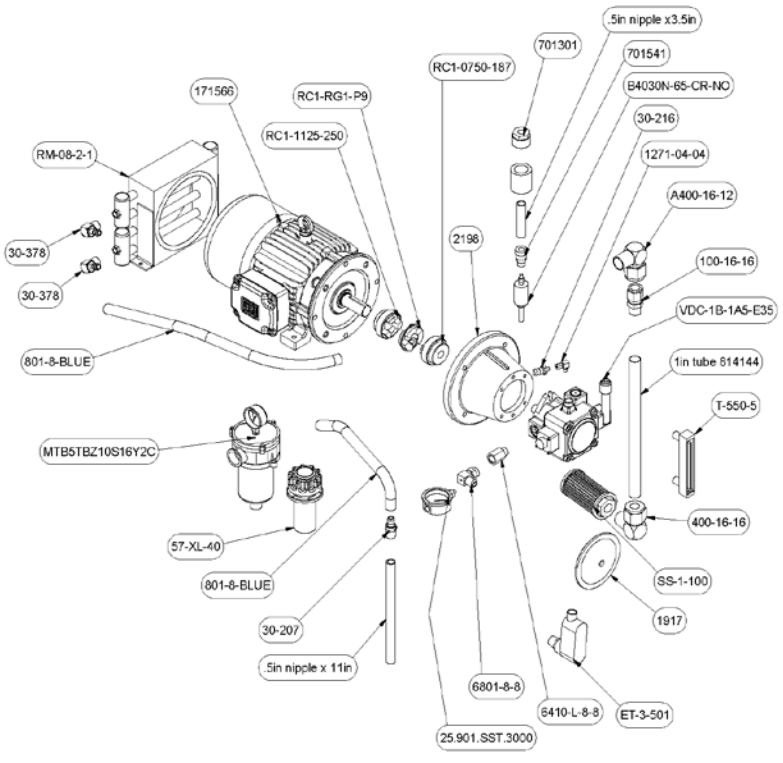




Parts List

PART NUMBER	QTY	DESCRIPTION	VENDOR
-085	1	RESERVOIR 20GAL CAPACITY	CMF
-086	1	MOTOR MOUNT	CMF
171566	1	ELECTRIC MOTOR 5HP TEFC 230/460V 3PH	LEESON
2198	1	ADAPTER MOTOR TO PUMP	VESCOR
VDC-1B-1A5-E35	1	PRESSURE COMPENTATED VANE PUMP 8GPM	NACHI
1917	2	6" INSPECTION DOOR W/ GASKET	VESCOR
T-550-5	1	OIL LEVEL SIGHT GLASS W/ THERMOMETER	LENZ
RM-08-2-1	1	COOLER AIR TO OIL FOR CASE DRAIN FLOW	THERMAL TRANSFER
MTB5TBZ10S16Y2C	1	RETURN LINE FILTER (INTANK STYLE -16 SAE)	SCHROEDER
RC1-RG1-P9	1	RUELAND COUPLING INSERT	VESCOR
RC1-0750-187	1	RUELAND COUPLING PUMP SIDE	VESCOR
RC1-1125-250	1	RUELAND COUPLING MOTOR SIDE	VESCOR
57-XL-40	1	OIL FILLER NECK W/ CAP & STRAINER	LENZ
SS-1-100	1	SUCTION STRAINER 100 MESH	SCHROEDER
30-207	1	FITTING ADAPTER 1/2" HOSE TO 1/2" NPT MALE	MIDLAND
30-378	2	FITTING ADAPTER 1/2" HOSE TO 1/2" NPT MALE 90 DEG	MIDLAND
6801-8-8	1	FITTING ADAPTER -8SAE TO -8 JIC	TOMPKINS
400-16-16	1	FITTING 1" TUBE TO 1" NPT 90 DEG ELBOW	LENZ
A400-16-12	1	FITTING 1" TUBE TO -12 SAE MALE 90DEG	LENZ
1in tube 814144	1	1" HYDRAULIC TUBING	STEEL
1271-04-04	1	FITTING -4 SAE MALE TO 1/4" NPT FEMALE 90 DEG	TRIDENT
30-216	1	FITTING ADAPTER 1/2" HOSE TO 1/4" NPT MALE	MIDLAND
25.901.SST.3000	1	PRESURE GAUGE 0-3000 PSI -4 SAE PORT	NOSHOK
6410-L-8-8	1	O-RING EXTENDER -8 SAE MALE TO -8 SAE FEMALE	TOMPKINS
801-8-BLUE	1	HOSE 1/2" PUSH-LOK CASE DRAIN 6'	PARKER
100-16-16	1	FITTING 1" TUBE TO 1" NPT STRAIGHT	LENZ
ET-3-501	1	TANK HEATER 500 WATT 120V	VESCOR
701301	1	FITTING REDUCER 1 1/4" NPT MALE TO 1/2" NPT FEMALE	STEEL
701541	1	BELL REDUCER 1/2" NPT FEMALE TO 1/4" NPT FEMALE	STEEL
B4030N-65-CR-NO	1	LOW LEVEL / HIGH TEMP SWITCH	ACT
.5in nipple x 11in	1	1/2" NIPPLE FOR CASE DRAIN	
.5in nipple x3.5in	1	1/2" NIPPLE FOR LOW LEVEL / HIGH TEMP	





DRAWN CHRIS	DATE 5/29/2012	CUSTOM METAL FABRICATORS INC. 3194 R AVE HERINGTON KS 67449 PH 785-258-3744 FX 785-258-2584	
THIS DRAWING AND THE IDEAS CONTAINED THEREON ARE THE PROPERTY OF CUSTOM METAL FABRICATORS INC. HERINGTON KS 67449 785-258-3744, AND SHALL NOT BE USED WITHOUT PERMISSION COPYRIGHT 5/29/2012		TITLE HYDRAULIC POWER UNIT 5 8 20	
		SIZE C / DWG NO 5820	REV 2
I:\CMF\HYD Power Unit\5 8 20\User Manual\5820.idw		SHEET 1 OF 1	

GENERAL HYDRAULIC POWER UNIT MAINTENANCE AND START UP GUIDELINES

POWER UNIT START-UP INFORMATION

1. While in transit or during installation, a power unit may be subjected to many unusual conditions. On systems with separately mounted pumps and motors, the alignment between shafts should be checked with an indicator or straight edge and adjustments made if necessary. Pump misalignment drastically reduces pump bearing life. Check setscrews in couplings for loosening. Tighten as required.
2. Fill the reservoir with filtered fluid as recommended by pump manufacturer (see pump date), usually, a premium grade hydraulic fluid with a viscosity index of 90 or higher. For machine tool feed, and similar applications at pressure to 600 PSI and temperatures to 130 degrees F, a fluid viscosity of 150 SSU at 100 degrees F is permissible. For higher pressures and temperatures, a fluid viscosity from 225 to 325 SSU at 100 degrees F will provide maximum pump service life. For cold startup applications at temperatures down to 0 degrees F, Automatic Transmission Fluid, DEXRON TYPE D2, will usually prove satisfactory.
3. Connect the motor to the proper electrical source, checking the motor name plate for proper wiring of dual voltage motors. Jog the motor to check rotation. Poly-phase motors are bi-directional and proper rotation might be established by reversing any two power leads. Consult a qualified electrician.
4. Pump noise and “crackle” is most often caused by air entering the pump section. The tightening of suction fittings will usually eliminate such problems. If pump fails to prime, vent discharge pipe to atmosphere to establish fluid flow.
5. IMPORTANT! After power unit has been started and all the lines filled, replenish the oil in the reservoir to the proper level. The fluid level should be maintained so it always shows in the sight gauge. This is of utmost importance when an immersion type heat exchanger is used to prevent condensation from collecting on uncovered cooling coils.
6. System pressures should be set as low as possible to prevent unnecessary fluid heating; on some applications, this setting may be from 50 to 200 PSI above necessary static pressures to overcome dynamic pressure drop or to achieve proper acceleration.
7. For most industrial applications, an operating temperature of 150 degrees F is considered maximum. At higher temperatures, difficulty is often experienced in maintaining reliable and consistent hydraulic control, component service life is reduced, hydraulic fluid deteriorates, and a potential danger to operating personnel is created.
8. After the first few hours of operation, clean or install new elements in all filters to remove contamination from initial flushing of system plumbing.
9. If filters are equipped with bypass do not allow the filter to go into bypass. Change the element before bypass.

MAINTENANCE INSTRUCTIONS

Hydraulic systems are precision units and their continued smooth operation depends on proper care. Therefore, do not neglect your hydraulic systems. Keep them clean, change the oil and oil filter at established intervals, and follow prescribed maintenance.

Periodic procedures are as follows:

1. Check the reservoir oil level and add filtered oil as required. The level must be maintained between the high and low marked on the sight gauge.
2. Check the operating temperature and oil pressure. For most industrial applications, an operating temperature of 150 degrees F is considered maximum.
3. If an external suction filter is used, check filter indicator for dirty element at least every two hours for first eight hours of operating and clean when necessary. Check at least once every day for the next five days of operation and clean when necessary. Check periodically after that at intervals that will prevent the filter from bypassing or cavitating pump.
4. Check return filters as in step 3. These are usually finer filters, however, and will require more frequent element changes or cleansings than the suction filter. Always change filters when the oil is changed.
5. At least once a year or every 4,000 operating hours, the reservoir, pump suction filter (if one is used) and air vent filter should be cleaned; at this time check the entire system for possible future difficulties. Some applications or environmental conditions may dictate such maintenance be performed at more frequent intervals.
6. Periodically make visual checks of all hose and tube connections. Regular checking and tightening of all hydraulic connections will help to assure trouble-free operation.
7. Periodically check pressure setting. The system was designed to operate at a specific pressure and increasing the pressure above that will result in motor overload. The system should be operated at the minimum pressure to do the intended function, as the lower the system pressure, the longer will be the pump life.
8. Check pump/motor coupling periodically for misalignment. A flexible coupling should always be used and shafts accurately aligned parallel and angularly. Check setscrews in couplings for loosening. Tighten as required.
9. The reservoir cover should remain tightly sealed at all times, except in case of in-tank maintenance and periodic checks for in-tank leaks, in order to prevent atmospheric contamination from entering the system.

SAFETY PRECAUTIONS

REQUIRED FOR HYDRAULIC MACHINERY OPERATION

AND MAINTENANCE

Although the scope of this manual covers only the hydraulic operation of the equipment, these safety precautions also apply to pneumatically powered equipment or portions of the equipment. Some of them will also apply to electrically or mechanically powered equipment and should be observed where appropriate.

This hydraulic equipment has been constructed using the highest standards of workmanship with industry accepted state-of-the-art techniques, components, and designs and has been inspected and tested for defects, and proper operation prior to shipment.

However, this equipment, like any other, may develop problems due to abuse, normal wear or unforeseeable circumstances. It, therefore, requires proper operation and maintenance. In the course of performing these functions, personnel may be required to work on or near the equipment. The following precautions are given to avoid injury to these personnel.

All safety requirements listed below are those generally applicable to hydraulically powered machinery but do not pretend to be all inclusive. They are intended for qualified, experienced personnel who are capable of understanding the hazards of machinery operation and maintenance and, therefore, avoid injury by using the precautions. Particular types of machinery and hydraulic systems may require other precautions. Other precautions should be determined by someone in charge of the machinery who is capable of analyzing any hazards associated with operating and maintaining the equipment. These precautions should be included in the comprehensive safety program for the particular machinery, equipment, plant or process.

1. Return all movable machine members to their normal start-up condition if possible before starting hydraulic power-unit.
    - Note: In many types of equipment parts of the machinery may start rotating, rising, falling, reciprocating, etc., out of their proper sequence as soon as the hydraulic (or pneumatic) circuit is filled and pressurized, which could result in injury to personnel or damage to machinery.
2. Be sure all personnel and product, workpiece, etc., are clear of machinery before starting hydraulic power unit.
3. Be sure all hydraulic connections which may have been removed, replaced, or disconnected during an equipment shut-down have been re-connected securely before starting hydraulic power unit.
4. Return all valves (manual and control system operated), which, may have been changed from their normal start-up condition during shut-down, back to their normal start-up conditions before starting hydraulic power unit.
5. Before shutting down hydraulic power unit, block up or lock in position any machine members which may move and cause damage to personnel, product or equipment upon loss of hydraulic flow and pressure.
6. Clear all personnel and product, workpiece, etc., from machinery before shutting down hydraulic power unit.
7. If hydraulic system has oil accumulators in circuit, drain pressurized oil form all accumulators (if automatic drainage is not built into circuit) as soon as hydraulic unit is shut down. If accumulator has a shut-off valve, shut valve off also.

8. Shut down power unit and relieve pressure from all pressurized accumulators, actuators, and lines before removing , tearing down or performing maintenance on any remotely located actuators, hoses, filters, valves piping, etc.
9. Maintain and keep in place any equipment guards, such as coupling guards, chain guards, protective cowlings. Do not wear loose clothing or jewelry to get caught in moving parts.
10. If any personnel are required to work on equipment in the vicinity of the hydraulic system while the hydraulic power unit is running, they should always wear eye protection to prevent any eye injury in the event of a hydraulic line rupture and high velocity oil leak. (The above is in addition to any other personnel safety equipment needed for the work being performed.)
11. Any personnel working near the equipment should wear ear protection if the noise level may be high enough to require protection as set forth in OSHA regulations.
12. Any personnel observing or working on or adjacent to hydraulically powered equipment must never place themselves in a location or position that could produce an injury in the event of (1) a hydraulic line failure, either with power unit running or shut down, (2) power blackout, (3) pump/motor failure, or (4) movement of machine members during normal operating cycle or as a result of component malfunction or failure.
13. Before removing or performing maintenance on any hydraulic system components that have an electrical interface (solenoid valves, switches, electric motors, etc.) shut off and padlock electrical power to power unit and/or control system. See paragraphs 5 and 12 above before shut off of power. The above applies to pneumatically controlled equipment also.
14. Avoid locating equipment in any environment for which it was not designed and which may create a dangerous operating condition such as explosive atmosphere (e.g., gas dust), high heat (e.g., molten metal, furnace), chemicals, extreme moisture, etc.

PREVENTING TROUBLE IN

YOUR HYDRAULIC SYSTEM

1. Dirt or contamination is the number one villain in a hydraulic system and should be kept out. It causes wear and malfunctions. Meticulous care should be used during installation to prevent dirt getting into pipe, tubing, hose, fittings and ports of components. After completion, before starting the system, all lines should be flushed and filter elements changed. Proper continuous filtration should be used.
2. Proper sized pipe, hoses, and tubing should be used to assure desired flow rate with limited pressure drop. The suction side supply line to pump should be short, straight as possible, and sized to give as little pressure drop as possible within the limits set by pump manufacture for the rpm chosen. Check to be sure any pump suction valve is fully open.
3. Pumps and fluid motors should not be run faster than recommended.
4. The system pressure must be limited by a relief valve or other means to stay within pressure limits of components. The system should be run at lowest pressure possible to accomplish job. Excessive pressure accelerates wear on components.
5. Reservoir must be sized sufficiently and designed properly to allow deaeration of fluid and cooling.
6. Proper fluid must be used for compatibility to seals and of viscosity range recommended by component manufacturers.
7. System should be designed properly to take care of shock generated by “water hammer” effect when stopping, or excessive de-acceleration forces.
8. The coils on a double solenoid valve should not be energized at same time. This will cause coil burnout.
9. The power unit should be located so that it is protected from weather, accumulation of debris, and heating effect of ambient conditions or direct sun.
10. Heating or cooling of the reservoir by heat exchanger or heater must be of proper design so as not to oxidize oil.
11. On start-up, be sure pump rotates in correct direction. Some pumps may work for a short time when rotated in wrong direction.
12. After filling lines in start-up, be sure to add filtered oil to reservoir to bring oil level to proper height.
13. Proper design of circuit must be accomplished to prevent deadheading of pump when not performing work as a pump. Pumping over a relief valve generated considerable heat and may ruin components.
14. The pre-charge on accumulators must be maintained or the accumulator becomes ineffective.
15. Crankcases of pumps and fluid motors must be filled when required before start-up.

The above are not intended to be all inclusive but cover some of the most common reasons for trouble in a hydraulic system.

TROUBLESHOOTING GUIDE & MAINTENANCE HINTS

EXCESSIVE NOISE

Problem	Cause	Remedy
Pump Noisy	Cavitation	Any or all of the following: • Replace dirty filters • Wash strainer in solvent compatible with system fluid • Clean clogged inlet line • Clean reservoir breather vent • Change system fluid • Change to proper pump drive motor speed • Overhaul or replace supercharge pump • Fluid may be too cold
	Air in fluid	Any or all of the following: • Tighten leaky inlet connection • Fill reservoir to proper level(with rare exception all return lines should be below fluid level in reservoir) • Bleed air from system • Replace pump shaft seal(and shaft if worn at seal journal)
	Coupling mis-aligned	Align unit & check condition of seals, bearings and couplings
	Pump worn or damaged	Overhaul or replace
Motor Noisy	Coupling misaligned	Align unit & check condition of seals, bearings & couplings
	Motor or coupling worn or damaged	Overhaul or replace
Relief Valve Noisy	Setting too low or too close to another valve setting	Install pressure gage & adjust to correct pressure
	Worn poppet & seat	Overhaul or replace

EXCESSIVE HEAT

Problem	Cause	Remedy
Pump Heated	Fluid heated	Install pressure gage & adjust correct pressure(keep at least 9 bar(125psi) difference between valve settings). Also refer to Fluid Heated below.
	Cavitation	Any or all of the following: • Replace dirty filters • Clean clogged inlet line • Clean reservoir breather vent • Change system fluid • Change to proper pump drive motor speed • Overhaul or replace supercharge pump
	Air in Fluid	Any or all of the following: • Tighten leaky connections • Fill reservoir to proper level(with rare exception all return lines should be below fluid level in reservoir) • Bleed air from system • Replace pump shaft seal(and shaft if worn at seal journal)
	Relief or unloading valve set too high	Install pressure gage & adjust to correct pressure.(Keep at least 9 bar(125psi) difference between valve setting)
	Excessive load	Align unit & check condition of seals & bearings. Locate & correct mechanical binding. Check for work load in excess of circuit design.

	Pump worn or damaged	Overhaul or replace
Motor Heated	Fluid heated	Install pressure gage & adjust to correct pressure.(Keep at least 9 bar(125psi) difference between valve setting.
	Relief or unloading valve set too high	Install pressure gage & adjust to correct pressure.(Keep at least 9 bar(125psi) difference between valve setting).
	Excessive load	Align unit & check condition of seals & bearings. Locate & correct mechanical binding. Check for work load in excess of circuit design.
	Motor worn or damaged	Overhaul or replace
Relief Valve Heated	Fluid heated	Install pressure gage & adjust to correct pressure.(Keep at least 9 bar(125psi) difference between valve settings).Also refer to Fluid Heated below.

	Valve setting incorrect	Install pressure gage & adjust to correct pressure.(Keep at least 9 bar(125psi) between valve settings).
	Worn or damaged valve	Overhaul or replace
Fluid Heated	System pressure too high	Install pressure gage & adjust to correct pressure.(Keep at least 9 bar(125psi) difference between valve settings).
	Unloading valve set too high	Install pressure gage & adjust to correct pressure.(Keep at least 9 bar(125psi) difference between valve settings).
	Fluid dirty or low supply	Change filters & also system fluid if correct viscosity. Fill reservoir to proper level.
	Incorrect fluid viscosity	Change filters & also system fluid if correct viscosity. Fill reservoir to proper level.
	Faulty fluid cooling system	Clean cooler and/or cooler strainer. Replace cooler control valve. Repair or replace cooler.
	Worn pump, motor, cylinder, or other component	Overhaul or replace

INCORRECT FLOW

Problem	Cause	Remedy
No Flow	Pump not receiving fluid	Any or all of the following: Replace dirty filters • Clean clogged inlet line • Clean reservoir breather vent • Fill reservoir to proper level • Overhaul or replace supercharge pump
	Pump drive motor not operating	Overhaul or replace
	Pump to drive coupling sheared	Check for damaged pump or pump drive. Replace & align coupling.
	Pump drive motor turning in wrong direction	Reverse rotation
	Directional control set in wrong position	Check position of manually operated controls. Check electrical circuit on solenoid operated controls. Repair or replace pilot pressure pump.
	Entire flow passing over relief valve	Adjust

	Damaged pump	Check for damaged pump drive. Replace or align coupling.
	Improperly assembled pump	Overhaul or replace
Low Flow	Flow control set too low	Adjust
	Relief or unloading valve set too low	Adjust
	Flow bypassing thru partially open valve	Overhaul or replace-or-Check position of manually operated controls. Check electrical circuit on solenoid operated controls. Repair or replace pilot pressure pump.
	External leak in system	Tighten leaky connections. Bleed air from system
	Yoke actuating device inoperative (variable displacement pumps)	Overhaul or replace

	RPM of pump drive motor incorrect	Replace with correct unit
	Worn pump, valve, motor, cylinder or other components	Overhaul or replace
Excessive Flow	Flow control set too high	Adjust
	Yoke actuating device inoperative (variable displacement pumps)	Overhaul or replace
	RPM of pump drive motor incorrect	Replace with correct unit
	Improper size pump used for replacement	Replace with correct unit

INCORRECT PRESSURE

Problem	Cause	Remedy
No Pressure	Pump not receiving fluid	Any or all of the following: Replace dirty filters Clean clogged inlet line Clean reservoir breather vent Fill reservoir to proper level Overhaul or replace supercharge pump
	Pump drive motor not operating	Overhaul or replace
	Pump to drive coupling sheared	Check for damaged or pump drive. Replace and align coupling
	Pump drive motor turning in wrong direction	Reverse rotation
	Directional control set in wrong position	Check position of manually operated controls. Check electrical circuit on solenoid operated controls. Repair or replace pilot pressure pump.
	Entire flow passing over relief valve	Adjust

	Damaged pump	Check for damaged pump or pump drive. Replace and align coupling.
	Improperly assembled pump	Overhaul or replace.
Low Pressure	Pressure relief path exists	Refer to remedies above for No Pressure & the following remedies.
	Flow control set too low	Adjust
	Relief/unloading valve set too low	Adjust
	Flow bypass thru partially open valve	Overhaul or replace-or-check position of manually operated control. Check electrical circuit on solenoid operated controls. Repair or replace pilot pressure pump.
	External leak in system	Tighten leaky connections. Bleed air from system
	Yoke actuating device inoperative (variable displacement pump)	Overhaul or replace

	RPM of pump drive motor incorrect	Replace with correct unit
	Worn pump,valve, motor, cyl, etc.	Overhaul or replace
	Pressure reducing set too low	Check position of manually operated control. Check electrical circuit on solenoid operated controls. Repair or replace pilot pressure pump.
	Damaged pump, motor or cylinder	Overhaul or replace
Erratic Pressure	Air in fluid	Tighten leaky connections.(Fill reservoir to proper level & bleed air from system).
	Worn relief valve	Overhaul or replace
	Contamination in fluid	Replace dirty filters & system fluid

	Accumulator defective or has lost charge.	Check gas valve for leakage. Charge to correct pressure. Overhaul if defective.
	Worn pump, motor or cylinder	Overhaul or replace
Excessive Pressure	Incorrect setting of pressure reducing, relief or unloading valve	Adjust
	Yoke actuating device inoperative (variable displacement pumps)	Overhaul or replace
	Pressure reducing, relief or unloading valve worn or damaged	Overhaul or replace

FAULTY OPERATION

Problem	Cause	Remedy
No Movement	No flow or pressure	Refer to Incorrect Flow Chart
	Limit or sequence device(mechanical, electrical, or hydraulic) inoperative or mis-adjusted	Overhaul or replace
	Mechanical bind	Located bind and repair
	No command signal to servo amplifier	Repair command console or interconnecting wires
	Inoperative or mis-adjusted servo amplifier	Adjust, repair or replace
	Inoperative servovalve	Overhaul or replace
	Worn or damaged cylinder or motor	Overhaul or replace

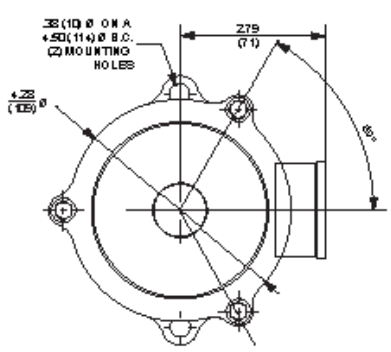
Slow Movement	Low flow	Refer to Incorrect Flow Chart
	Fluid viscosity too high	Fluid may be too cold or should be changed to clean fluid of correct viscosity
	Insufficient control pressure for valves	Refer to Incorrect Pressure Chart
	No lubrication of machine ways or linkage	Lubricate
	Misadjusted or malfunctioning servo amplifier	Adjust, repair or replace
	Sticking servovalve	Clean & adjust or replace. Check condition of system fluid & filters
	Worn or damaged cylinder or motor	Overhaul or replace

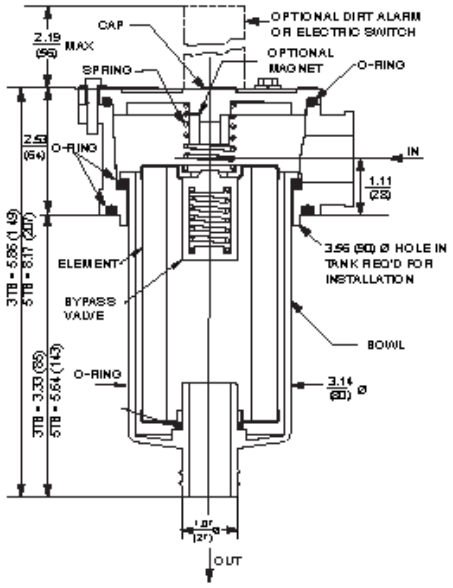
Erratic Movement	Erratic pressure	Refer to Incorrect Pressure Chart
	Air in fluid	Any or all of the following: • Tighten leaky inlet connection • Fill reservoir to proper level(with rare exception all return lines should be below fluid level in reservoir). • Bleed air from system • Replace pump shaft seal (and shaft if worn at seal journal).
	No lubrication of machine ways or linkage	Lubricate
	Erratic command signal	Repair command console or interconnecting wires
	Misadjusted or malfunctioning servo amplifier	Adjust, repair or replace
	Malfunctioning feedback transducer	Overhaul or replace
	Sticking servovalve	Clean & adjust or replace. Check condition of system fluid & filters
	Worn or damaged cylinder or motor	Overhaul or replace

Excessive Speed or Movement	Excessive flow	Refer to Incorrect Flow Chart
	Malfunctioning feedback transducer	Overhaul or replace
	Misadjusted or malfunctioning servo amplifier	Adjust, repair or replace
	Overriding work load	Adjust, repair or replace counterbalance valve.

MTB MiniMiser Tank-Mounted Filter

35 gpm
135 L/min
100 psi
7 bar





Metric dimensions in ( ).
Model No. of filter in photograph is MTB5TBZ5P16.

Filter Housing Specifications

Flow Rating:	Up to 25 gpm (95 L/min) for 150 SUS (32 cSt) fluids – MTB-3 Up to 35 gpm (135 L/min) for 150 SUS (32 cSt) fluids – MTB-5
Max. Operating Pressure:	100 psi (7 bar)
Min. Yield Pressure:	229 psi (15 bar)
Rated Fatigue Pressure:	Contact factory
Temp. Range:	-20°F to 225°F (-29°C to 107°C)
Bypass Setting:	Cracking: 25 psi (2 bar) Full Flow: 51 psi (3.5 bar)
Porting Head & Cap: Element Case:	Die Cast Aluminum Glass Filled Nylon
Weight of MTB-3: Weight of MTB-5:	1.8 lbs. (0.8 kg) 2.1 lbs. (1.0 kg)
Element Change Clearance:	3.0" (76 mm) MTB-3 5.0" (127 mm) MTB-5

Element Performance Information

Element	Absolute Rating Per ISO 4572/NFPA T3.10.8.8 Using automated particle counter (APC) calibrated per ISO 4402 $\beta_x \geq 75$	$\beta_x \geq 100$	$\beta_x \geq 200$	Abs. Rating wrt ISO 16889 Using APC calibrated per ISO 11171 $\beta_{x(c)} \geq 200$	$\beta_{x(c)} \geq 1000$	Dirt Holding Capacity gm
3TB10	15.5	16.2	18.0	N/A	N/A	N/A
3TBZ3	<1.0	<1.0	<2.0	4.7	5.8	11
3TBZ5	2.5	3.0	4.0	6.5	7.5	9
3TBSZ10	7.4	8.2	10.0	10.0	12.7	11
3TBSZ25	18.0	20.0	22.5	19.0	24.0	11
5TB10	15.5	16.2	18.0	N/A	N/A	N/A
5TBZ3	<1.0	<1.0	<2.0	4.7	5.8	18
5TBZ5	2.5	3.0	4.0	6.5	7.5	15
5TBZ10	7.4	8.2	10.0	10.0	12.7	17
5TBZ25	18.0	20.0	22.5	19.0	24.0	18

Element Collapse Rating: 150 psid (10 bar)
Flow Direction: Outside In
Element Nominal Dimensions: 3TB: 3.0" (76 mm) O.D. x 3.0" (76 mm) long
5TB: 3.0" (76 mm) O.D. x 5.0" (127 mm) long

Fluid Compatibility

Type Fluid	Appropriate Schroeder Media
Petroleum Based Fluids	All Paper (E) and Synthetic (Z) media

For more information, refer to Fluid Compatibility: Fire Resistant Fluids, pages 19 and 20.

MiniMiser Tank-Mounted Filter MTB

Features

- Cost effective alternative to spin-on filters.
- Compact size minimizes space requirements.
- Special filter design provides aftermarket benefits.

Element Selection Based on Flow Rate

Element selections are predicated on the use of 150 SUS (32 cSt) petroleum based fluid and a 25 psi (1.7 bar) bypass valve.

Pressure	Element Series	Part No.				
Return Line Tank-Mounted	E	10	See MTA	3TB	5TB	
		25	See MTA	3TB	5TB	
	Z	Z3	See MTA	3TBZ3	5TBZ3	
		Z5	See MTA	3TBZ5	5TBZ5	
		Z10	See MTA	3TBZ10	5TBZ10	
		Z25	See MTA	3TBZ25	5TBZ25	
Flow		gpm	0 5 10 15 20 25 30 35			
		(L/min)	0 (25) (50) (75) (100) (135)			

Shown above are the elements most commonly used in this housing.

Pressure Drop Information Based on Flow Rate and Viscosity

$\Delta P_{filter} = \Delta P_{housing} + \Delta P_{element}$

Exercise:
Determine ΔP at 25 gpm (95 L/min) for MTB5TB25S16CY2 using 200 SUS (44 cSt) fluid.

Solution:

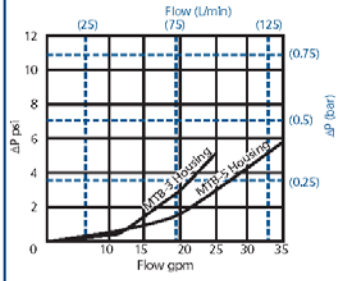
$\Delta P_{housing}$ = 3.0 psi [.21 bar]

$\Delta P_{element}$ = 25 x .08 x (200÷150) = 2.6 psi
or
= [95 x (.08÷54.9) x (44÷32) = .19 bar]

ΔP_{total} = 3.0 + 2.6 = 5.6 psi
or
= [.21 + .19 = .40 bar]

$\Delta P_{housing}$

MTB $\Delta P_{housings}$ for fluids with sp gr = 0.86:



sp gr = specific gravity

$\Delta P_{element}$

$\Delta P_{element}$ = flow x element ΔP factor x viscosity factor

El. ΔP factors @ 150 SUS (32 cSt):

	3"	5"
TB10	.73	.40
TB25	.10	.08
TBZ1	1.17	.70
TBZ3	.66	.36
TBZ5	.45	.25
TBZ10	.49	.25
TBZ25	.33	.16

If working in units of bars & L/min, divide above factor by 54.9.

Viscosity factor:
Divide viscosity by 150 SUS (32 cSt).

Sizing of elements should be based on element flow information provided in the Element Selection chart above.

Filter Model Number Selection

Filter Series	Element Part No. Length	Element Part No. Media	Optional Magnet	Porting Options	Dirt Alarm (See Appendix A for complete list of options)
MTB	3"	TB10 TB25 TBZ3 TBZ5 TBZ10 TBZ25	(Omit) = None M = Magnet	P12 = ¾" NPTF P16 = 1" NPTF S12 = 1 1/16"-12 SAE Straight (SAE-12) S16 = 1 5/16"-12 SAE Straight (SAE-16) B12 = ISO 228 G-¾ (¾-14 BSPP) B16 = ISO 228 G-1 (1-11 BSPP)	Y2C = Bottom Mounted Gauge in Cap Y5 = Back Mounted Gauge in Cap ESC = Electrical Pressure Switch (2 Terminals)
	5"				

G547 = Two ⅛" gauge ports

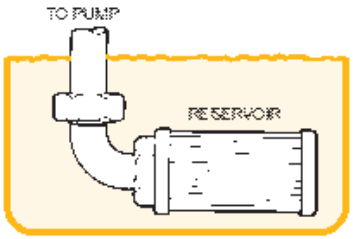
Other Available Options

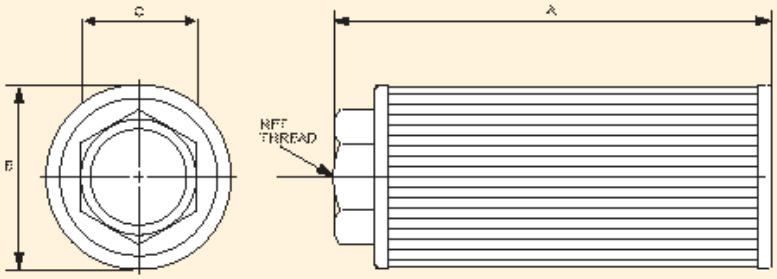
See Appendix B for additional information on these options and instructions on how to order.

Suction Strainers

These all metal suction strainers are furnished with optimized pleat size and screen area for extended life and low pressure drop. 100 mesh stainless steel screen (140 micron) has 33.3% open area. Porting head is carbon steel, center core is plated perforated steel. End cap is heavy gauge zinc plated steel. These strainers can handle temperatures up to 250°F (121°C).

60 mesh (238 micron) and 200 mesh (74 micron) models also available—contact factory.





Model Number				Other Information			
				Dimensions			Screen Area in² (cm²)
Basic Model	Optional 3 psi Bypass	Pipe Size	Flow* gpm (L/min)	A	B	C	
SS-½-100	(Omit) = None	½"	5 (19)	3.10 (79)	2.63 (67)	1.12 (28)	62 (400)
SS-¾-100		¾"	8 (30)	3.55 (90)	2.63 (67)	1.31 (33)	88 (567)
SS-1-100		1"	10 (38)	5.35 (136)	2.63 (67)	1.62 (41)	110 (710)
SS-1¼-100	-3 = Bypass valve	1¼"	20 (76)	6.85 (174)	3.38 (89)	1.88 (48)	162 (1045)
SS-1½-100		1½"	30 (114)	8.01 (204)	3.38 (89)	2.12 (54)	225 (1450)
SS-2-100		2"	50 (189)	9.85 (250)	3.94 (100)	2.75 (70)	340 (2200)
SS-2½-100		2½"	75 (284)	10.10 (257)	5.12 (130)	3.50 (89)	400 (2580)
SS-3-100		3"	100 (379)	11.78 (299)	5.12 (130)	4.00 (102) Round	500 (3225)

*Flow rating based on 5 FPS or less.

Metric dimensions in ( ).

Examples: SS-2-100 SS suction strainer, 2" NPT, without bypass valve.
SS-1-100-3 SS suction strainer, 1" NPT, with 3 psi bypass valve.

900 SERIES

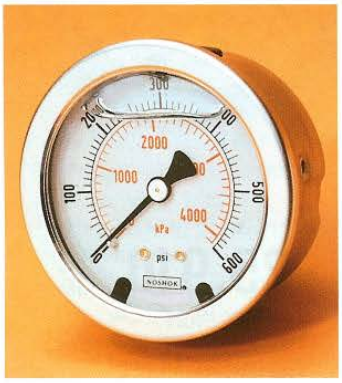
2½ INCH STAINLESS STEEL CASED LIQUID FILLED PRESSURE GAUGES

25.901

2½ INCH
STAINLESS STEEL CASE
GLYCERINE FILLED
¼" NPT
BOTTOM
CONNECTION

40.901

4 INCH
STAINLESS STEEL CASE
GLYCERINE FILLED
¼" NPT
BOTTOM
CONNECTION



25.911

2½ INCH
STAINLESS STEEL CASE
GLYCERINE FILLED
¼" NPT
CENTER BACK
CONNECTION

40.911

4 INCH
STAINLESS STEEL CASE
GLYCERINE FILLED
¼" NPT
LOWER BACK
CONNECTION

SPECIFICATIONS	
Case	304 Stainless Steel
Bezel	304 Stainless Steel
Lens	Plexiglass
Bourdon Tube	Phosphor Bronze. "C" Tube for Pressures up to 600 PSI, Coiled Safety Tube above 600 PSI
Connection	1/4" NPT Brass
Movement	Brass and Nylon with Highly Polished Bearing Surfaces
Safety Protection	Safety Relief Disc on Top of the Case.
Accuracy	25.901/911: ± 1.5% Full Scale. ANSI Grade A. 40.901/911: ± 1.0% Full Scale. ANSI Grade 1A.
Pointer	Balanced Aluminum, Black Finish
Dial	Aluminum, White Background, Dual Scale PSI kPa. Black PSI Scale and Red kPa Scale. UV Resistant.

STANDARD DIAL CONFIGURATIONS

DIAL RANGE PSI/KPA	FIGURE INTERVAL PSI/KPA	GRADUATION INTERVAL PSI/KPA	DIAL RANGE PSI/KPA	FIGURE INTERVAL PSI/KPA	GRADUATION INTERVAL PSI/KPA
30" Hg VACUUM/KPA	5" Hg-20 KPA	.5" Hg-2 KPA	0-200 PSI-KPA	40 PSI-400 KPA	4 PSI-40 KPA
30" Hg/15 PSI-KPA	30" Hg-50 KPA 5 PSI/50 KPA	1" Hg-5 KPA 5 PSI/5 KPA	0-300 PSI-KPA	50 PSI-500 KPA	5 PSI-50 KPA
30" Hg/30 PSI-KPA	30" Hg-100 KPA 10 PSI/100 KPA	2" Hg-10 KPA 1 PSI/10 KPA	0-400 PSI-KPA	100 PSI-500 KPA	5 PSI-50 KPA
30" Hg/60 PSI-KPA	30" Hg-100 KPA 20 PSI/100 KPA	2" Hg-20 KPA 2 PSI/20 KPA	0-600 PSI-KPA	100 PSI-1000 KPA	10 PSI-100 KPA
30" Hg/100 PSI-KPA	30" Hg-100 KPA 20 PSI/200 KPA	5" Hg-20 KPA 2 PSI/20 KPA	0-1000 PSI-KPA	200 PSI-2000 KPA	20 PSI-100 KPA
30" Hg/160 PSI-KPA	30" Hg-100 KPA 20 PSI/200 KPA	5" Hg-50 KPA 5 PSI/50 KPA	0-1500 PSI-KPA	300 PSI-2000 KPA	50 PSI-500 KPA
30" Hg/200 PSI-KPA	30" Hg-100 KPA 50 PSI/200 KPA	5" Hg-50 KPA 5 PSI/50 KPA	0-2000 PSI-KPA	400 PSI-4000 KPA	40 PSI-400 KPA
30" Hg/300 PSI-KPA	30" Hg-100 KPA 50 PSI/500 KPA	10" Hg-50 KPA 5 PSI/50 KPA	0-3000 PSI-KPA	500 PSI-5000 KPA	50 PSI-500 KPA
0-15 PSI-KPA	3 PSI-20 KPA	.5 PSI-5 KPA	0-5000 PSI-KPA	1000 PSI-10,000 KPA	100 PSI-1000 KPA
0-30 PSI-KPA	5 PSI-50 KPA	.5 PSI-5 KPA	0-6000 PSI-KPA	1000 PSI-10,000 KPA	100 PSI-1000 KPA
0-60 PSI-KPA	10 PSI-100 KPA	1 PSI-10 KPA	0-7500 PSI-KPA	1000 PSI-10,000 KPA	100 PSI-1000 KPA
0-100 PSI-KPA	10 PSI-200 KPA	1 PSI-20 KPA	0-10,000 PSI-KPA	2000 PSI-20,000 KPA	200 PSI-5000 KPA
0-160 PSI-KPA	20 PSI-200 KPA	2 PSI-20 KPA			

Consult factory for availabilty of specific models, ranges and options.

	Skarda	No.: Weg
		Date: 12/14/2011

DATA SHEET
Three-phase induction motor - Squirrel cage rotor

Customer	: Skarda
Product line	: W22 NEMA Premium - Ball Bearings

Frame	: 184T
Output	: 5 HP
Frequency	: 60 Hz
Poles	: 4
Full load speed	: 1755
Slip	: 2.50 %
Voltage	: 208-230/460 V
Rated current	: 14.3-12.9/6.45 A
Locked rotor current	: 96.8/48.4 A
Locked rotor current (Il/In)	: 7.5
No-load current	: 6.40/3.20 A
Full load torque	: 14.8 lb.ft
Locked rotor torque	: 230 %
Breakdown torque	: 320 %
Design	: B
Insulation class	: F
Temperature rise	: 80 K
Locked rotor time	: 15 s (hot)
Service factor	: 1.25
Duty cycle	: S1
Ambient temperature	: -20°C - +40°C
Altitude	: 1000 m
Degree of Protection	: IP55
Approximate weight	: 95 lb
Moment of inertia	: 0.40033 sq.ft.lb
Noise level	: 56 dB(A)

	D.E.	N.D.E.
Bearings	6207 ZZ	6206 ZZ
Regreasing interval	---	---
Grease amount	---	---

Load	Power factor	Efficiency (%)
100%	0.80	89.5
75%	0.74	89.5
50%	0.62	88.5

Notes:

Performed by:	Checked:

Pumps

NACHI

VDS,VDR & VDC SERIES
VARIABLE VOLUME, PRESSURE COMPENSATED VANE PUMPS.

Features

- 143 to 2000 PSI PRESSURE RANGES
- QUIET and EFFICIENT OPERATION
- 4.0 to 31.7 GPM at 1800 RPM
- FAST RESPONSE, APPROXIMATELY 60ms on stroke, 90ms off stroke
- SUBPLATE and SAE MOUNTING
- TANDAM PUMP ARRANGEMENTS

VDS SERIES

VDR SERIES

VDC SERIES

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Pumps

NACHI

VDC Series

HIGH PRESSURE TYPE
VARIABLE VOLUME VANE PUMP
Standard Specifications

VDC Series

Model type		Flow at no load ℓ/min (gpm)		Pressure adjusting range kgf/cm² (psi)	Drive speed rpm		Max setting pressure kgf/cm² (psi)	Weight kgf (lbs)
Foot mounting	Flange mounting	1800 rpm	1500 rpm		Max.	Min.		
VDC-1A-1A2-※20	VDC-1B-1A2-※20/35	30 (7.9)	25 (6.6)	15 ~ 35 (214 ~ 500) 20 ~ 70 (286 ~ 1000) 50 ~ 105 (714 ~ 1500) 70 ~ 140 (1000 ~ 2000)	1800	800	35 (500) 70 (1000) 105 (1500) 140 (2000)	9.5 (20.9)
VDC-1A-1A3-※20	VDC-1B-1A3-※20/35							
VDC-1A-1A4-※20	VDC-1B-1A4-※20/35							
VDC-1A-1A5-※20	VDC-1B-1A5-※20/35							
VDC-1A-2A2-※20	VDC-1B-2A2-※20/35	40 (10.5)	33 (8.7)	15 ~ 35 (214 ~ 500) 20 ~ 70 (286 ~ 1000)	1800	800	35 (500) 70 (1000)	9.5 (20.9)
VDC-1A-2A3-※20	VDC-1B-2A3-※20/35							
VDC-2A-1A2-※20	VDC-2B-1A2-※20/35	54 (14.2)	45 (11.8)	15 ~ 35 (214 ~ 500) 20 ~ 70 (286 ~ 1000) 50 ~ 105 (714 ~ 1500) 70 ~ 140 (1000 ~ 2000)	1800	800	35 (500) 70 (1000) 105 (1500) 140 (2000)	25 (55.1)
VDC-2A-1A3-※20	VDC-2B-1A3-※20/35							
VDC-2A-1A4-※20	VDC-2B-1A4-※20/35							
VDC-2A-1A5-※20	VDC-2B-1A5-※20/35							
VDC-2A-2A2-※20	VDC-2B-2A2-※20/35	70 (18.4)	58 (15.3)	15 ~ 35 (214 ~ 500) 20 ~ 70 (286 ~ 1000)	1800	800	35 (500) 70 (1000)	25 (55.1)
VDC-2A-2A3-※20	VDC-2B-2A3-※20/35							
VDC-3A-1A2-※20	VDC-3B-1A2-※20	120 (31.7)	100 (26.4)	15 ~ 35 (214 ~ 500) 20 ~ 70 (286 ~ 1000) 50 ~ 105 (714 ~ 1500) 70 ~ 140 (1000 ~ 2000)	1800	800	35 (500) 70 (1000) 105 (1500) 140 (2000)	A type 47 (103.6) B type 33 (72.7)
VDC-3A-1A3-※20	VDC-3B-1A3-※20							
VDC-3A-1A4-※20	VDC-3B-1A4-※20							
VDC-3A-1A5-※20	VDC-3B-1A5-※20							

VDC Series (Double pump)

Model type	Head end pump			Shaft end pump			Drive speed rpm		Weight kgf (lbs)
	Flow at no load ℓ/min (gpm)		Pressure adjusting range kgf/cm² (psi)	Flow at no load ℓ/min (gpm)		Pressure adjusting range kgf/cm² (psi)	Max.	Min.	
	1800 rpm	1500 rpm		1800 rpm	1500 rpm				
VDC-11B-2A3-2A3-※20/35	40 (10.5)	33 (8.7)	20 ~ 70 (286 ~ 1000)	40 (10.5)	33 (8.7)	20 ~ 70 (286 ~ 1000)	1800	800	20 (44.1)
VDC-11B-2A3-1A5-※20/35				30 (7.9)	25 (6.6)	70 ~ 140 (1000 ~ 2000)			
VDC-12B-2A3-2A3-※20/35	40 (10.5)	33 (8.7)	20 ~ 70 (286 ~ 1000)	70 (18.4)	58 (15.3)	20 ~ 70 (286 ~ 1000)	1800	800	35 (77.2)
VDC-12B-2A3-1A5-※20/35				54 (14.2)	45 (11.8)	70 ~ 140 (1000 ~ 2000)			
VDC-12B-1A5-2A3-※20/35	30 (7.9)	25 (6.6)	70 ~ 140 (1000 ~ 2000)	70 (18.4)	58 (15.3)	20 ~ 70 (286 ~ 1000)			
VDC-12B-1A5-1A5-※20/35				54 (14.2)	45 (11.8)	70 ~ 140 (1000 ~ 2000)			
VDC-22B-2A3-2A3-※20/35	70 (18.4)	58 (15.3)	20 ~ 70 (286 ~ 1000)	70 (18.4)	58 (15.3)	20 ~ 70 (286 ~ 1000)	1800	800	50 (110.3)
VDC-22B-2A3-1A5-※20/35				54 (14.2)	45 (11.8)	70 ~ 140 (1000 ~ 2000)			
VDC-13B-2A3-1A3-※20	40 (10.5)	33 (8.7)	20 ~ 70 (286 ~ 1000)	120 (31.7)	100 (26.4)	20 ~ 70 (286 ~ 1000)	1800	800	48 (105.3)
VDC-13B-2A3-1A5-※20						70 ~ 140 (1000 ~ 2000)			
VDC-13B-1A5-1A3-※20	30 (7.9)	25 (6.6)	70 ~ 140 (1000 ~ 2000)			20 ~ 70 286 ~ 1000			
VDC-13B-1A5-1A5-※20						70 ~ 140 (1000 ~ 2000)			

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Pumps

NACHI

VDC Series

Model Code

VDC-2A-1A4- ※20/35

- Design code
  E20 = VDC-1A, VDC-2A, VDC-3A/B
  E35 = VDC-1B, VDC-2B
  20 = All metric version
- Pressure adjusting range
  2: 15~35 kgf/cm² 214~500 psi
  3: 20~70 kgf/cm² 286~1000 psi
  4: 50~105 kgf/cm² 714~1500 psi
  5: 70~140 kgf/cm² 1000~2000 psi
- Pressure volume characteristics
  A: Constant volume type
- Ring size: 1,2
- Mounting
  A: Foot mounting
  B: Flange mounting
- Pump size: 1,2,3
- VDC series variable volume vane pump

VDC-12B-1A5-2A3-※20

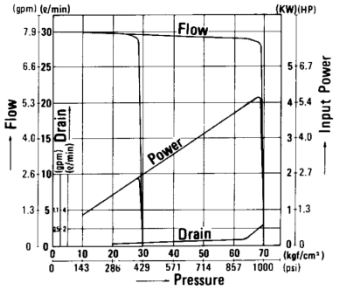
- Design code
  E35 = VDC-11B, VDC-12B
  E20 = VDC-13B
  20 = All metric version
- Pressure adjusting range of shaft end pump
  3: 20~70 kgf/cm² 286~1000 psi
  5: 70~140 kgf/cm² 1000~2000 psi
- Pressure volume characteristics of shaft end pump
  A: Constant volume type
- Ring size of shaft end pump: 1,2
- Pressure adjusting range of head end pump
- Pressure volume characteristics of head end pump
- Ring size of head end pump
- Mounting B: Flange mounting
- Pump size of shaft end pump: 1,2,3
- Pump size of head end pump: 1,2
- VDC series double variable volume vane pump

Note: Remote control pressure compensating type is available. Please check with factory.

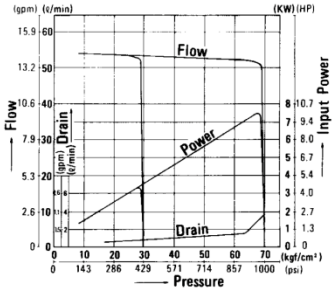
Performance/Characteristics Curves

Performance curves

VDC-1A(B)-1A3-20/35



VDC-2A(B)-1A3-20/35



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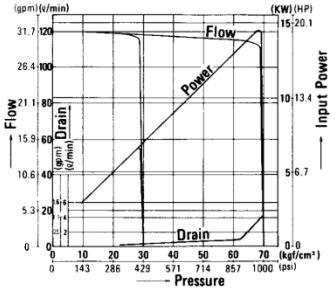

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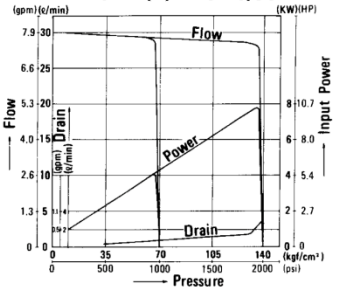

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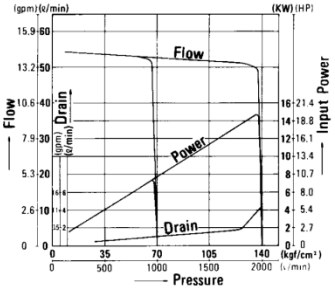
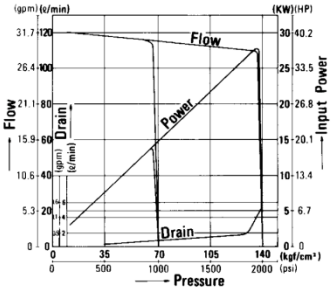
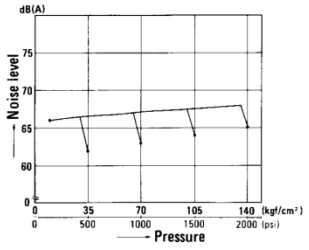


VDC-3A(B)-1A5-20

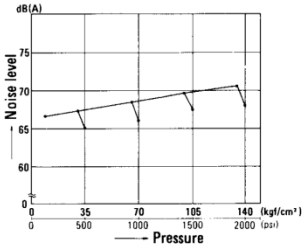


Noise level

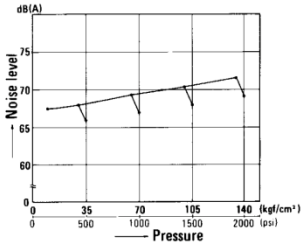
VDC-1※-1A※-20/35



VDC-2※-1A※-20/35



VDC-3※-1A※-20



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Pumps

NACHI

VDC Series

HANDLING INSTRUCTIONS

(1) The rotation is clockwise as viewed from the shaft side.

(2) Hydraulic oil: When the pump is to be used at pressures of less than 70kgf/cm² (1000 psi), use good quality petroleum base hydraulic oil with a rating of 30~50cSt (141~232 SUS) (equivalent to ISO VG32) at 40°C (104°F). Operation at pressure exceeding 70kgf/cm² (1000 psi), use oil with a rating of 50~70cSt (232~324 SUS) (equivalent to ISO VG68) at 40°C (104°F).

(3) Drain: A drain pipe must be fitted leading directly to below the surface of the oil in the tank. Back pressure caused by the piping resistance should be less than 0.3kgf/cm² (4.3 psi). In the case of pumps with drain ports at two positions, use the higher drain port.

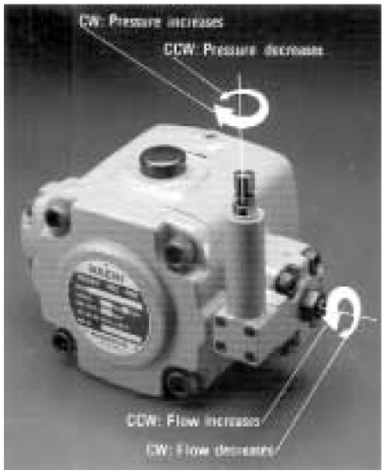
(4) Oil temperature: The pump should be operated with the oil at a temperature of 15 to 60°C (59~104°F) during operation.

(5) Alignment: Alignment between the pump shaft and the motor shaft should be parallel within 0.05mm (0.002 inch), and within 1° for the angle between the two shafts.

(6) Intake conditions: Should be greater than -0.3kgf/cm² (-4.3 psi) at the inlet port of the pump.

(7) Adjustment of discharge volume:
When the Flow adjusting screw is turned clockwise, the volume of discharge will be decreased.
When the volume is to be adjusted, the locknut should first be loosened and after the adjustment has been completed, the locknut should be retightened firmly.

(8) Adjustment of pressure setting:
When the pressure adjusting screw is turned clockwise, the pressure will be increased.
When the pressure is to be adjusted, the locknut should first be loosened, and after the adjustment has been completed, the locknut should be retightened firmly.



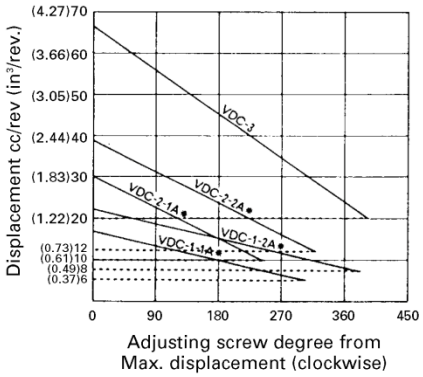
(9) P-Q adjustment at time of shipment from plant
- Flow adjustment: Has already been adjusted to maximum flow indicated for the model type in the catalog.
- Pressure adjustment: Has already been adjusted to preset pressures given in Table below:

Pump pressure adjusting range	Preset pressure when shipped from plant
2: 15~35 kgf/cm² (214~500 psi)	35 kgf/cm² (500 psi)
3: 20~70 kgf/cm² (286~1000 psi)	35 kgf/cm² (500 psi)
4: 50~105 kgf/cm² (714~1500 psi)	50 kgf/cm² (714 psi)
5: 70~140 kgf/cm² (1000~2000 psi)	70 kgf/cm² (1000 psi)

(10) Slide kit and ring stopper: The slide kit and ring stopper have been assembled and fitted in position, and preset accurately at the time of factory adjustment of the pump. Do not reset.
Applies to all vane pumps.

(11) Start-up operation: When the pump is to be operated for the first time, the discharge side of the pump should be in a no-load state. The motor should be started up and stopped a number of times to bleed any air from within the pump or in the inlet line. After verifying that the pump is discharging oil, the pump should be operated for at least ten more minutes without any load in order to eliminate any remaining air in the circuit. (When the pump is to be used in a circuit from which it is not possible to bleed air when the pump is started, then use an air bleed vent.)

Adjustable displacement range



Sub Plate

Pump model	Sub plate model
VDC-1A-1A✱-20	MVD-1-115-E10
	MVD-1-135-E10
VDC-1A-2A✱-20	MVD-1-115X-E10
	MVD-1-135X-E10
VDC-2A-✱A✱-20	MVD-2-135-E10
	MVD-2-160-E10

Foot mounting for VDC-3A = IHM-45-10

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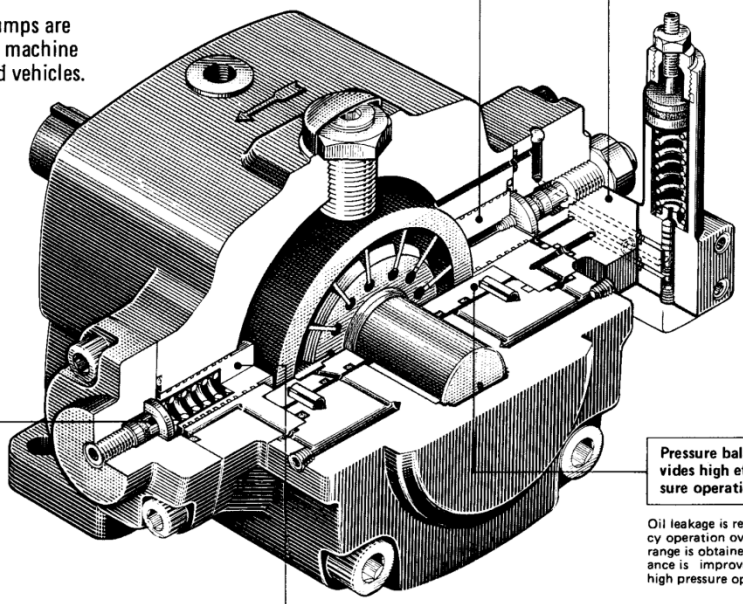
Pumps

NACHI

VDC Series

The VDC series high pressure variable volume vane pumps are a new series of pumps. In addition to Nachi's three exclusive mechanisms (pressure control; pressure balance; ring stopper mechanism), a unique and exclusive three-point ring support system which makes maximum utilization of high pressure oil has been adopted to provide stable high pressure and quiet operation.
The new series of hydraulic pumps are ideal for applications, such as: machine tools, industrial machinery and vehicles.



Regulating piston with positive ring support

Serves to control amount of eccentricity in a smooth manner and increase stability.

New pressure regulating mechanism for stability in high pressure ranges

An exclusive Nachi-developed spool type pressure compensator system has been fitted instead of the conventional needle valve. This serves to assure stable characteristics through out the pressure ranges, regardless of fluctuations in the load. It also provides sharp pressure volume characteristics.

Pressure balance mechanism provides high efficiency, high pressure operation

Oil leakage is reduced, and high efficiency operation over the entire operational range is obtained. Operating performance is improved particularly during high pressure operation.

Ring stopper prevents excessive shifting of ring

The unique stopper prevents excessive shifting of the ring. This provides outstanding instantaneous response, for high precision operation.

Bias piston utilizing high pressure oil for prevention of vibration and quiet operation

The piston operates by high pressure oil in conjunction with the spring to prevent vibration of the ring. It serves to stabilize performance and reduce noise in the high pressure ranges of operation.

Features

(1) High efficiency, high pressure operation

The unique pressure regulator and pressure balance mechanism, plus the exclusive three-point ring support system has improved performance during high pressure operation. The pump operates with high efficiency and stable performance up to a maximum of 140kgf/cm² (2000 psi).

(2) Extremely low vibration and noise levels

The new mechanisms reduces vibration and noise levels. Of particular note is the unique and exclusive three-point support system which uses, a regulating piston and a bias piston to eliminate vibration.
The mechanism, together with improvements to the shape of the inlet and outlet ports and high performance journal bearings, has reduced the noise level during operation.

(3) Fast response

The ring stopper mechanism serves to allow swift response whether in starting, stopping, or with load fluctuations, for high precision operation.

(4) Stable discharge with sharp cut-off characteristics

A revolutionary pressure compensator type pressure regulation mechanism provides, stable sharp cut-off characteristics.
The compensator serves to provide stable and constant volume through out the pressure ranges.

(5) High efficiency operation with reduced power loss

Efficiency has been improved with the new mechanisms and Nachi's high precision machining technology.
Power loss has been reduced, expecially during dead-heading.

(6) Easy adjusting in maintenance and handling

Maintenance is easier due to the positioning of the pressure adjusting mechanism and the volume adjusting mechanism on the same side of the pump.

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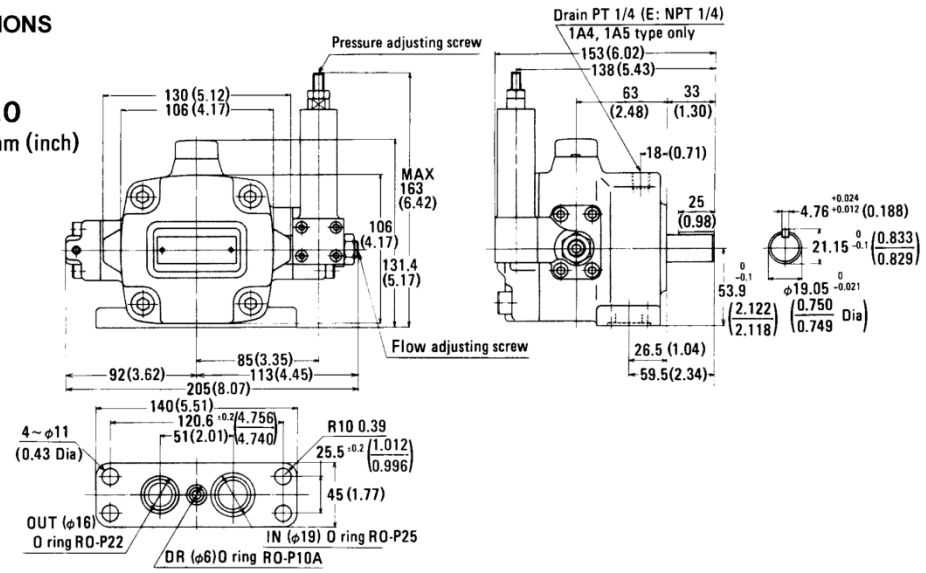
Pumps

NACHI

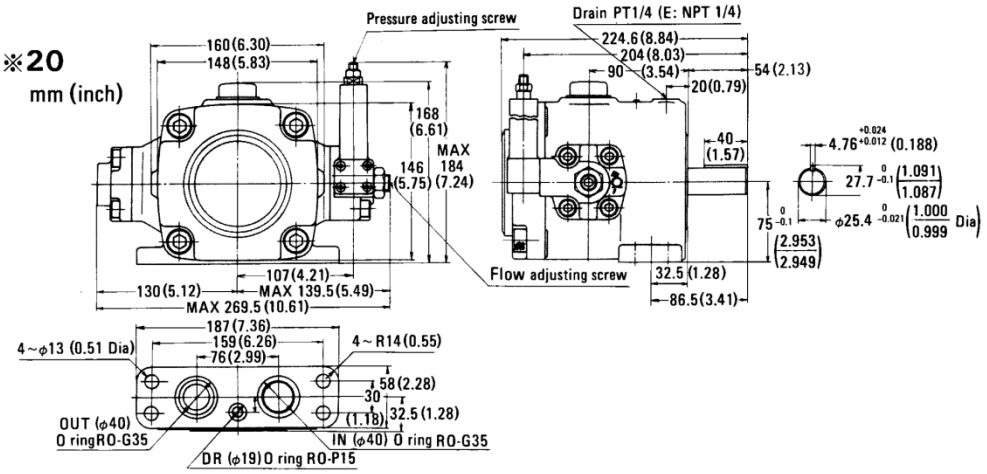
VDC Series

INSTALLATION DIMENSIONS

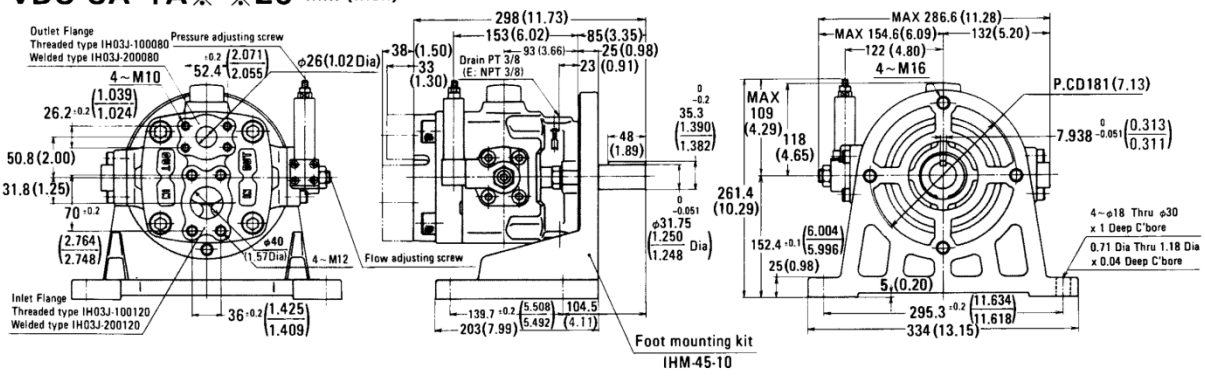
VDC-1A-※A※-※20 mm (inch)



VDC-2A-※A※-※20 mm (inch)



VDC-3A-1A※-※20 mm (inch)



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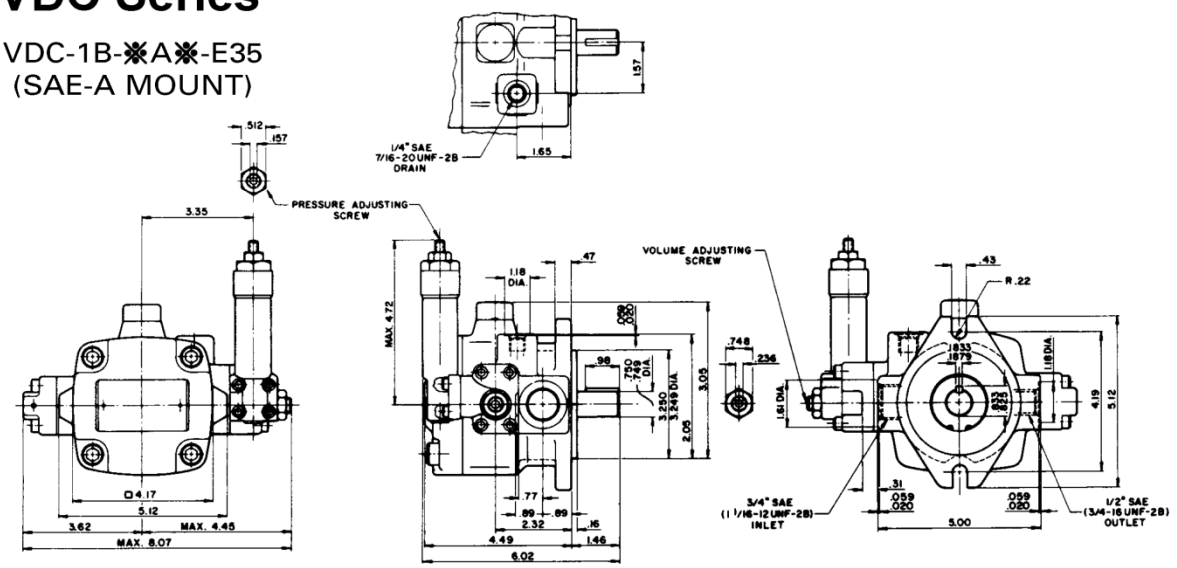
Pumps

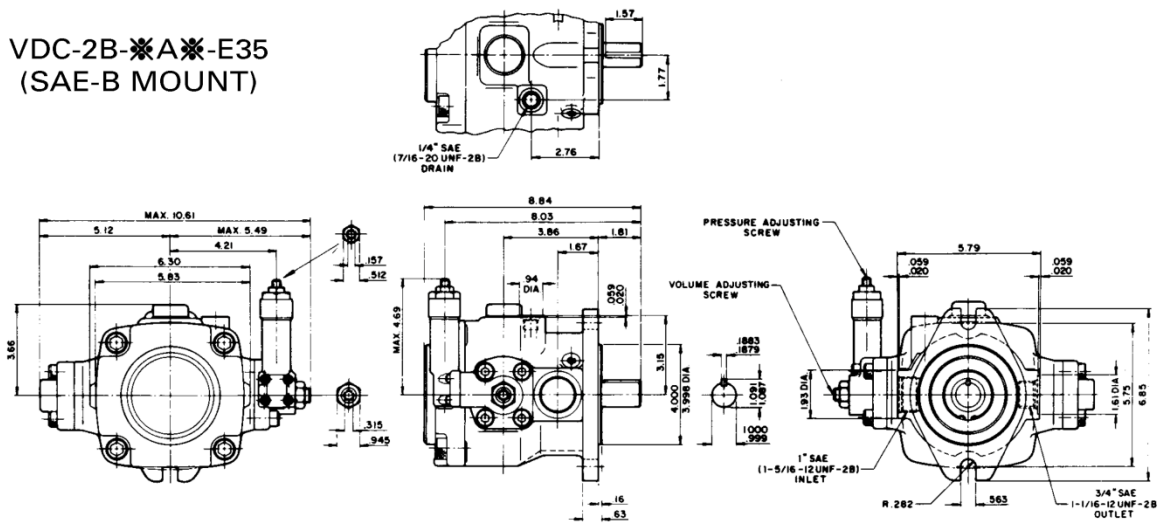
NACHI

VDC Series

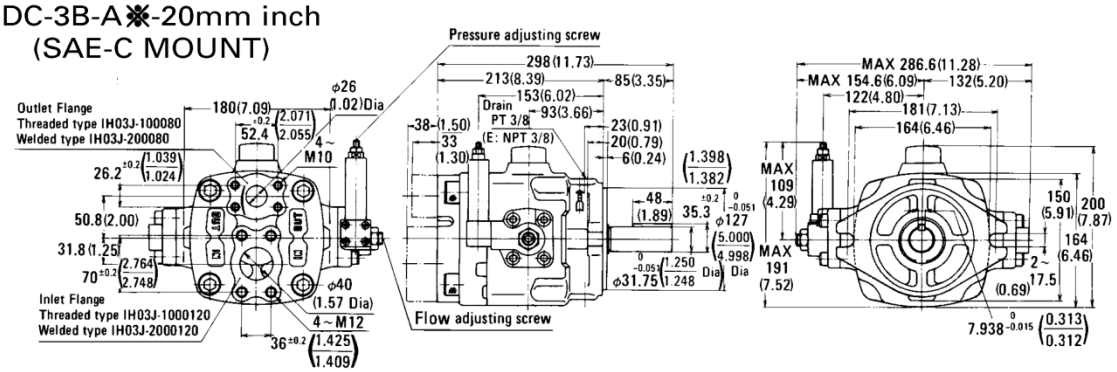
VDC-1B-※A※-E35
(SAE-A MOUNT)



VDC-2B-※A※-E35
(SAE-B MOUNT)



VDC-3B-A※-20mm inch
(SAE-C MOUNT)



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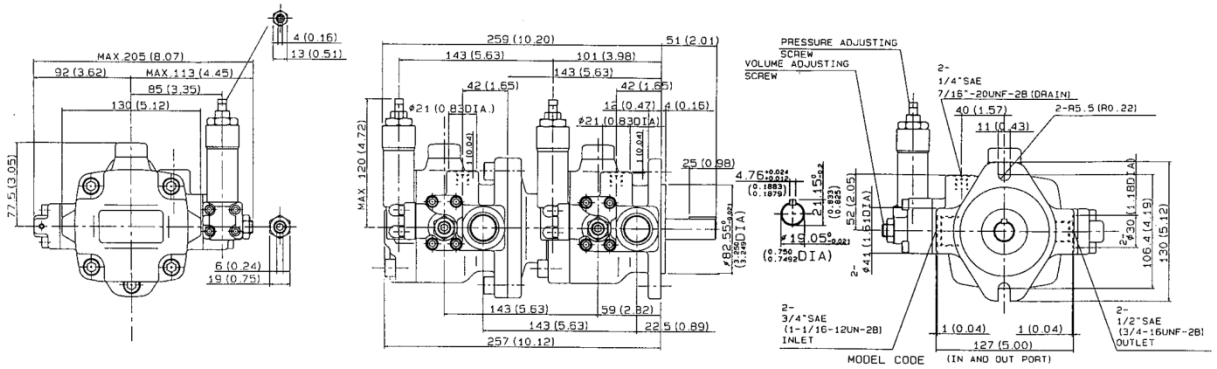
Pumps

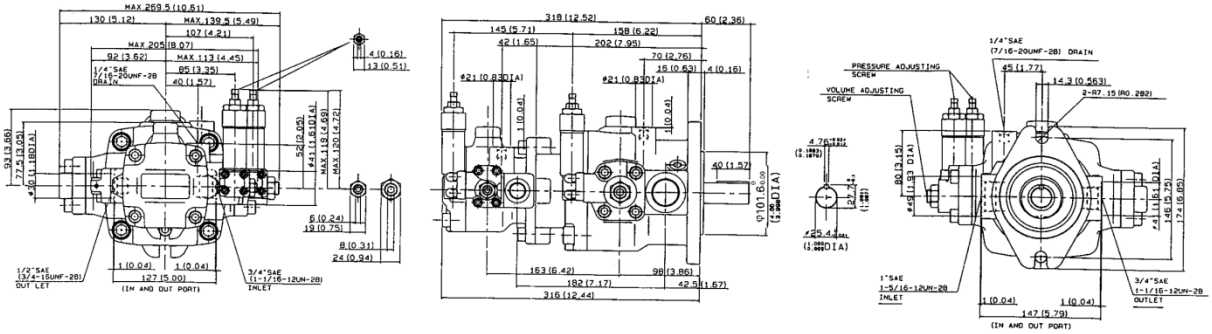
NACHI

VDC Series

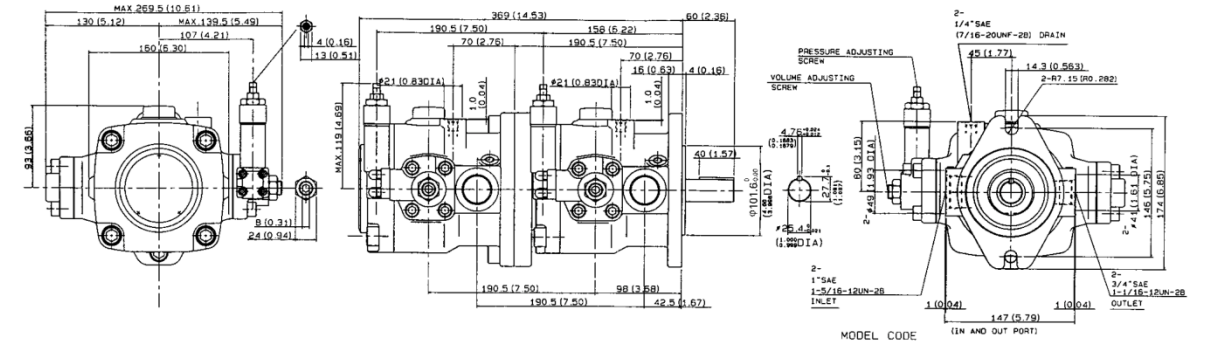
VDC-11B-※A※-※A※-E35 mm inch



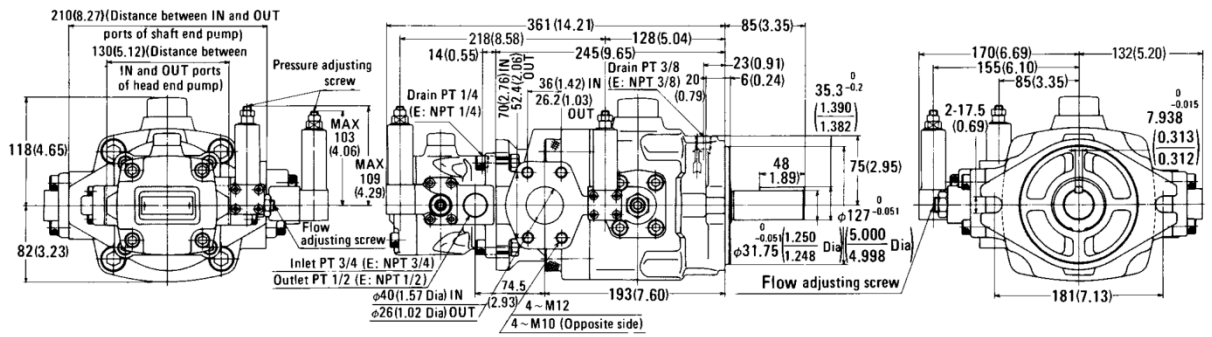
VDC-12B-※A※-※A※-E35 mm inch



VDC-22B-※A※-※A※-E35 mm inch



VDC-13B-※A※-※A※-※20 mm inch



Fluid Cooling Industrial RM Series

0916

Performance Notes

- Mounts behind existing TEFC motor for compact, low cost application
- Utilizes electric motor fan air flow
- Ideal for case drain and low flow applications
- Protected core
- Compact, efficient design
- Low flow & heat removal
- SAE, NPT or metric conversion
- Mounting brackets included

Ratings

Maximum Operating Pressure
300 PSI

Test Pressure
300 PSI

Maximum Operating Temperature
350°F

Materials

Tubes Copper

Fins Aluminum

Turbulators Aluminum

Cabinet Steel with powder coat finish

Filter Stainless frame with washable media

Manifolds Copper (RM-08)
Steel (RM-19 & RM-24)

Connections Brass (RM-08)
Steel (RM-19 & RM-24)

Nameplate Aluminum

How to Order (RM-08 models only)

RM	-	0	8	-			-	
Model Series		Model Size Selected			Number of Passes	Connection Type		Optional Bypass*
					1 - 1 Pass 2 - 2 Pass 4 - 4 Pass	1 - NPT 2 - SAE 3 - BSPP		Blank - No Bypass 30 - 30 PSI 60 - 60 PSI

*Bypass not available in Four Pass.
60 PSI only on Two Pass
30 or 60 PSI on One Pass
This is a partial flow pressure bypass only. It is not designed to be a full flow system bypass.

How to Order (All models except RM-08 size)

RM	-			-			-	
Model Series		Model Size Selected			Number of Passes	Connection Type		Optional Bypass*
					1 - 1 Pass 2 - 2 Pass	1 - NPT 2 - SAE 3 - BSPP		Blank - No Bypass 30 - 30 PSI 60 - 60 PSI

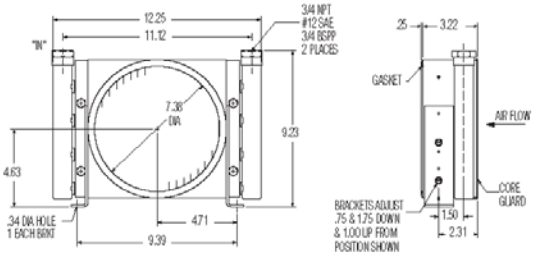
*Available on One Pass only
This is a partial flow pressure bypass only. It is not designed to be a full flow system bypass.

thermaltransfer.com

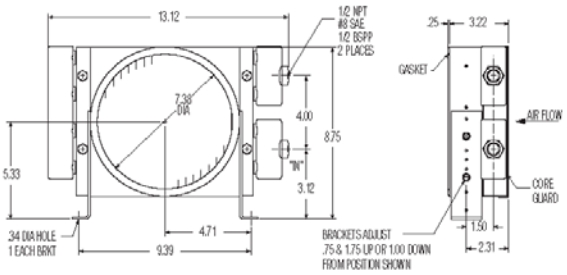
ttp-sales@apiheattransfer.com +1.262.554.8330

Dimensions

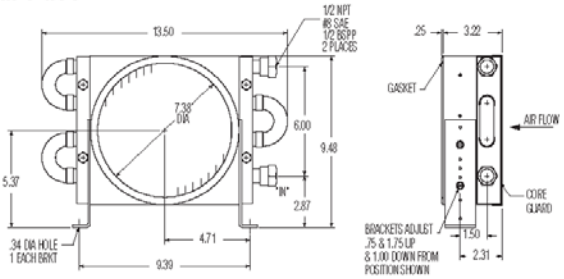
RM-08-1
One Pass



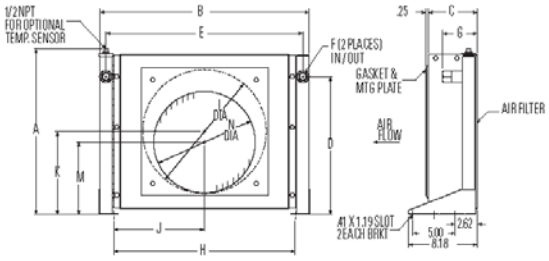
RM-08-2
Two Pass



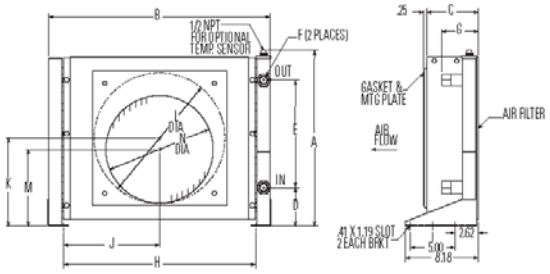
RM-08-4
Four Pass



RM-19-1, RM-24-1
One Pass



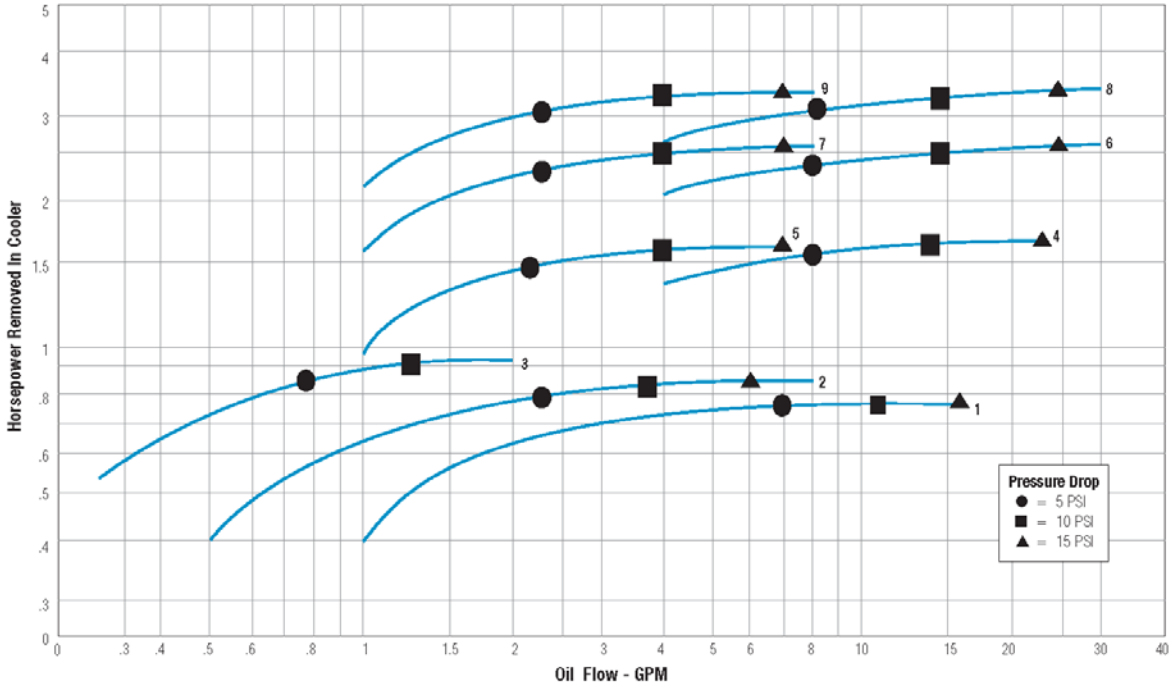
RM-19-2, RM-24-2
Two Pass



Model	A	B	C	D	E	F SAE	F NPT & BSPP	G SAE	G NPT & BSPP	H	J	K	L	M	N	Weight LBS
RM-19-1	13.62	16.00	5.11	10.31	15.00	#12	.75	3.05	4.12	13.96	7.38	6.81	10.38	5.81	7.50	16
RM-19-2	13.62	16.50	5.11	4.31	6.00	#12	.75	3.05	4.12	13.96	7.38	6.81	10.31	5.81	7.50	16
RM-24-1	19.62	24.75	5.85	16.31	23.25	#12	.75	3.05	4.12	21.44	10.72	9.81	14.62	8.56	12.00	31
RM-24-2	19.62	24.75	5.85	4.31	12.00	#12	.75	3.05	4.12	21.44	10.72	9.81	14.62	8.56	12.00	31

NOTE: All dimensions in inches. We reserve the right to make reasonable design changes without notice.

Performance Curves



Selection Procedure

Performance Curves are based on 50SSU oil leaving the cooler 40°F higher than the ambient air temperature used for cooling and 1800 RPM motor speed. This is also referred to as a 40°approach temperature.

STEP 1 **Determine the Heat Load.** This will vary with different systems, but typically coolers are sized to remove 25 to 50% of the input nameplate horsepower.
(Example: 100 HP Power Unit x .33 = 33 HP Heat load. For 1200 RPM motors, multiply Heat Load by 1.5.)
If BTU/HR is known: $HP = \frac{BTU/HR}{2545}$

STEP 2 **Determine Approach Temperature.**
Desired oil leaving cooler °F – Ambient air temp.
°F = Actual Approach

STEP 3 **Determine Curve Horsepower Heat Load.** Enter the information from above:
Horsepower heat load x $\frac{40 \times Cv}{\text{Actual Approach}}$ = Curve Horsepower

STEP 4 **Enter curves** at oil flow through cooler and curve horsepower. Any curve above the intersecting point will work.

STEP 5 **Determine Oil Pressure Drop from Curves:**
● = 5 PSI ■ = 10 PSI ▲ = 20 PSI Multiply pressure drop from curve by correction factor found in oil △P correction curve.

Desired Reservoir Temperature

Return Line Cooling: Desired temperature is the oil temperature leaving the cooler. This will be the same temperature that will be found in the reservoir.

Off-Line Recirculation Cooling Loop: Desired temperature is the oil temperature entering the cooler. In this case, the oil temperature change must be determined so that the actual oil leaving temperature can be found. Calculate the oil temperature change (oil △T) with this formula:
Oil △T = (BTU's/HR) / (GPM Oil Flow x 210).

To calculate the oil leaving temperature from the cooler, use this formula:
Oil Leaving Temp. = Oil Entering Temp – Oil △T.

This formula may also be used in any application where the only temperature available is the entering oil temperature.

Oil Pressure Drop: Most systems can tolerate a pressure drop through the heat exchanger of 20 to 30 PSI. Excessive pressure drop should be avoided. Care should be taken to limit pressure drop to 5 PSI or less for case drain applications where high back pressure may damage the pump shaft seals.

Oil Temperature

Typical operating temperature ranges are:

Hydraulic Motor Oil	110°- 130°F
Hydrostatic Drive Oil	130°- 180°F
Bearing Lube Oil	120°- 160°F
Lube Oil Circuits	110°- 130°F

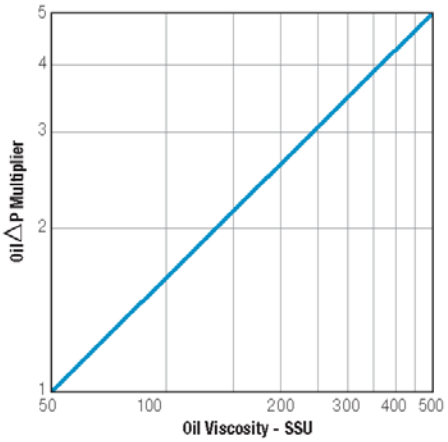
Selection Procedure

C_V Viscosity Correction

Average Oil Temp °F	OIL				
	SAE 5 110 SSU at 100°F 40 SSU at 210°F	SAE 10 150 SSU at 100°F 43 SSU at 210°F	SAE 20 275 SSU at 100°F 50 SSU at 210°F	SAE 30 500 SSU at 100°F 65 SSU at 210°F	SAE 40 750 SSU at 100°F 75 SSU at 210°F
100	1.14	1.22	1.35	1.58	1.77
150	1.01	1.05	1.11	1.21	1.31
200	.99	1.00	1.01	1.08	1.10
250	.95	.98	.99	1.00	1.00

Curve	Model	TEFC Motor Frame Size
1	RM-08-1	48-184
2	RM-08-2	48-184
3	RM-08-4	48-184
4	RM-19-1	213-256
5	RM-19-2	213-256
6	RM-24-1	254-286
7	RM-24-2	254-286
8	RM-24-1	324-365
9	RM-24-2	324-365

Oil Pressure Correction



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