

INSTALLATION, OPERATION & MAINTENANCE MANUAL

CYCLONE 40DC DUST COLLECTOR



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CALIFORNIA PROPOSITION 65 WARNING

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

The Cyclone 40DC Dust Collector is a specially designed air-borne dust collection unit specifically intended for use with large containments. It will provide superior dust collection in a highly efficient, mobile, rugged, economical and easy-to-use machine. The Cyclone 40DC Dust Collector will provide you with years of service, if properly utilized and maintained. Please refer to the Maintenance and Service sections of this manual for instructions on the care of this machine.

In order to meet your current needs and those in the future, we at EnTech Industries would appreciate your feedback in the performance of your new machine. An EnTech representative can be reached at:

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The following safety precautions are very important to both the safety of people and the environment.

WARNING

WARNINGS & PRECAUTIONS - DIESEL ENGINE

- Do not put fuel in the tank while the engine is running. Allow engine to cool before refueling
- Do not allow engine to run out of fuel.
- Do not smoke when putting fuel in the tank.

WARNING

WARNINGS & PRECAUTIONS - DUST COLLECTOR

- Move mobile equipment only if brakes, hitch, and safety chains are in good condition.
- Check vehicle and trailer lights regularly and prior to moving.
- Trailer MUST be pulled level - unpredictable damage will occur if not level while being towed.
- Observe safe towing practices when moving the unit. Use caution and safe speeds when entering and negotiating turns.
- Do not operate the dust collector with damaged filters. Stop Immediately!
- Inspect filters for escaping dust. If dust is present on clean side of filters, replace filters before operating dust collector.
- Only make adjustments that are fully understood.
- Discard used lubricating oil properly. Discard at a recycling station or approved disposal facility. • Only trained personnel should operate the dust collector.
- Only one person should control the engine and the dust collector at a time.
- Ensure that the engine is operated only from the control panel or from the operator's position. • Empty waste from the machine prior to moving the machine.
- Do not operate the reverse jet pulse system at more than 90 PSI.
- Disconnect the battery terminals before a repair is made to the electrical system.

SAFETY PRECAUTIONS

If the following warnings are not observed, personal injury may result!

- Ensure that the engine runs only in areas with adequate ventilation of the combustion emissions.
- Avoid moving parts during operation.
- Do not permit loose clothing or long hair near moving parts.
- Do not operate the engine or the dust collector if a safety guard has been removed.
- Do not operate the dust collector under the influence of controlled substances.
- Do not open the filter access door near power lines.
- Keep at a safe distance from the engine and the dust collector while in operation.
- Ensure personal protective gear is worn during operation and maintenance of machines.



CYCLONE 40DC DUST COLLECTOR

BASIC DESCRIPTION

The Cyclone 40DC Dust Collector consists of six basic elements: the engine, the blower unit, the filtration section, the filter cleaning system, the unloading system, and the trailer components. Together, they provide an efficient method of ventilating large containments and removing the air-borne contaminants before releasing the filtered air into the atmosphere. This section briefly describes these elements of the machine.



Figure 1. Engine

ENGINE

Your Cyclone Dust Collector is equipped with a 6-cylinder turbo-charged, after-cooled diesel engine. Specific information regarding your engine can be found in the included engine manual. (Figure 1)

BAGHOUSE FILTER REPLACEMENT

The blower unit is a non-overloading centrifugal blower capable of generating 40,000 cfm of air flow at 12 inches water column static pressure when operated at 2,000 rpm. The fan is capable of overcoming 18.5 inches water column resistance while moving 24,000 cfm. It is a low maintenance unit which will provide years of trouble-free service. (Figure 2)



Figure 2. Blower Unit

PRODUCT DESCRIPTION

FILTRATION SYSTEM

The filtration section or “hopper” serves as an expansion chamber to allow heavy air-borne particles to drop out of the air stream before they reach the filter cartridges. The hopper contains 60 cartridges for a total of 15,600 square feet of filter cloth. This results in a 2.56:1 air/cloth ratio at 40,000cfm. The unit comes standard with moisture resistant filter media capable of removing 99.8% of dust particles larger than .5 microns. After the initial dust build-up the filters are cleaned automatically by the pulse cleaning system, which will be further described below. The hopper is equipped with six 20-inch ports and adapters for connection with 20-inch ventilating duct hose (Figure 3).



Figure 1. Filter section or “hopper”

FILTER CLEANING SYSTEM

The filter cleaning system utilizes a compressed air, reverse pulse blast to clean the dust build-up from the filter cartridges. The pulsing mechanism is contained within the clean air plenum and is attached to the hopper lid. As such, the filters are available for inspection or removal when the hopper lid is opened with no disassembly of the pulsing hardware required. (Figure 4)

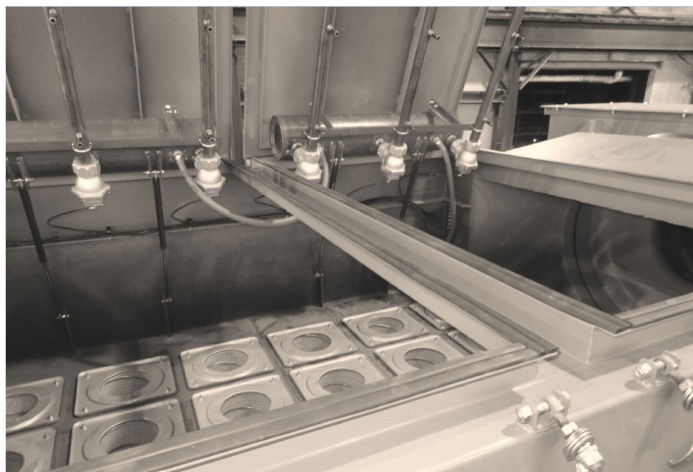


Figure 1. Filter section or “hopper”

PRODUCT DESCRIPTION

The timing of the reverse pulse is controlled by a sequential timer contained within the main control box. It operates under a manually controlled mode. The timing sequence consists of “ON-TIME” pulse duration and an “OFF-TIME” delay between pulses. Operation is controlled with an ON/OFF switch (Figure 5).

During operation two rows of filters are pulsed on timed intervals as long as the system switch is engaged. The system timer is pre-set at the factory and can be adjusted as necessary to meet job site requirements. (Figure 6) The magnehelic gauge shows the restriction across the filters caused by dust build-up.



Figure 5. Filter restriction. Low if no restriction (clean), high if restricted (dirty) and Pulse power



Figure 6. Main engine power switch OFF/ON



Figure 7. Shut off valve and regulator for pulse system

Compressed air for cleaning is supplied by an outside source. The air supply must be filtered and dried for best results and longer filter life. Air entering pulse systems is controlled through a regulator and shut off valve. (Figure 7)



Figure 8. Hydraulic control valve levers

UNLOADING SYSTEM

The unloading system consists of auger powered by hydraulic motors. A barrel fill lid is supplied to provide an air-tight seal to the disposable barrel and is attached to the unloading end of the auger.

The hopper can be unloaded as needed or continuously. Unloading is accomplished by opening the valve at the top of the discharge auger. Then pulling hydraulic control valve lever to operate selected auger. Note: operate only one auger at a time. (Figure 8)

The auger can run to discharge, reverse for blockage, or be stopped. Pulling the valve lever out is discharge, centering lever is stopped, and lever in is reverse. Pressure developed by the hydraulic system is indicated by gauges mounted on the hydraulic pump. The hydraulic system is protected from overload situations by a pressure relief valve built into the hydraulic valves. The relief valve is factory set at 2000 psi. (Figure 9)

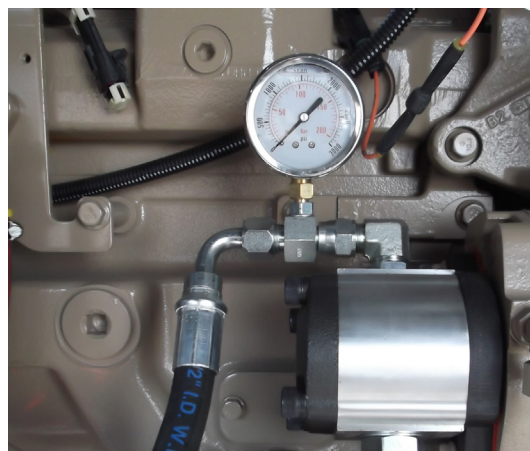


Figure 9. Pressure gauge

TRAILER

The mobilization of the unit should be performed by a qualified driver with a properly sized vehicle. Safe and reasonable driving distances should be observed during towing. Road restrictions should be verified before mobilization of the Cyclone Dust Collector (Figure 10).

To prepare the unit for mobilization:

1. Check that lights and brakes are functional.
2. Check hitch and safety chains for damage, if damaged replace items.
3. Close the hopper discharge valve by rotating to “Closed” position, as shown on valve handle.
4. Check the tire pressure is at the proper level indicated on the tire sidewall.
5. Remove barrel fill lid and secure.
6. Insure the hopper air inlets are covered. Secure hopper lids.
7. Check and latch engine frame compartment doors.
8. Trailer MUST be pulled level - unpredictable damage will occur if not level while being towed.



Figure 10. Trailer Unit

TRAILER MAINTENANCE

TRAILER LIGHTS

Maintain the integrity of the trailer light harness. Check lights and brakes before towing the unit.

TRAILER UNDER CARRIAGE

Check weekly and maintain the tire air pressure as indicated on the sidewall. Check tread and general tire condition before towing unit.

Tighten tire lug nuts after every 500 miles and every 100 miles after any further tire change.

Check lights prior to every use.

Check brake shoes annually: replace as needed.

Grease wheel bearings annually.

PRODUCT SPECIFICATION

1.	FILTRATION:	60 top loading 30" cartridges
2.	FILTER CLEANING:	Continuous cycle reverse jet pulse
3.	AIR TO CLOTH RATIO:	2.56:1 @ 40,000 cfm
4.	AIR INLETS:	6 inlets 20"; minimum 2 in use
5.	FILTER AREA:	15,600 square feet
6.	EFFICIENCY:	99.8% at .5 microns after initial dust build-up MERV 12 Initial Rating
7.	FLOW RATES:	40,000 cfm @ 12" wc
8.	FAN:	Centrifugal with 33" wheel, non-sparking aluminum inlet cone
9.	DIESEL ENGINE:	John Deere 6068HF 285 140HP
10.	ELECTRICAL SYSTEM:	12V DC
11.	WEIGHT:	20,000 lbs. empty
12.	DIMENSIONS:	Height - 142", Width - 96", Length - 384"
13.	UNLOADER:	Auger driven

NOTES

MOBILIZATION

The mobilization of the unit should be performed by a qualified driver with a properly sized vehicle. Safe and reasonable driving distances should be observed during towing. Road restrictions should be verified before mobilization of the Cyclone Dust Collector.

To prepare the unit for mobilization:

1. Check that lights and brakes are functional.
2. Check hitch and safety chains for damage, if damaged replace items.
3. Close the hopper discharge valve by rotating to “Closed” position, as shown on valve handle.
4. Check the tire pressure is at the proper level indicated on the tire sidewall.
5. Ensure the hopper air inlets are covered.
6. Secure hopper lids.
7. Remove barrel fill lid and secure.
8. Check and latch engine frame compartment doors.

SETUP

The Cyclone Dust Collector should be positioned on level ground with wheels chocked, as close to the containment as possible to minimize the length of duct run needed. Access to the rear auger discharge should also be available.



Figure 11. Air inlet connection

Once the Cyclone Dust Collector is properly positioned, connect a compressed air line to the universal coupling, (Figure 11) the air coupling is located on the front of the machine, under the engine frame. Attention: Air supply from compressor must be dry and clean to prevent damage to filter cartridges. Compressed air must be dried to below dew point. Check the air dryer specifications for capacity and operating characteristics.

Attach at least three 20-inch duct hoses to the hopper inlet. Efficiency of the Cyclone Dust Collector is controlled by hose run length and straightness.

An appropriate grade of diesel fuel for your particular climate condition should be used to fill the fuel tank. Fuel fill spout is located at the rear of the engine frame in front of hopper. Caution: do not fill tank while the engine is running. The Cyclone Dust Collector should now be ready for operation. Please review the reminder section on the operation before starting the machine.

NORMAL AIR FILTER OPERATION

The filtering cartridges are continuously cleaned by the compressed air reverse-pulse system. The condition of the filter cartridges can be determined while the machine is in operation by observing the filter restrictions level as shown on the control panel magnehelic gauge (Figure 12). This device monitors the amount of restriction to air flow through the cartridge created by the dust build-up on the filters. The lower the magnehelic reading, the more efficient the dust collector will operate. Restriction levels above six inches will begin to reduce the amount of air pulled from the contaminants.



Figure 12. Filter restriction (low if no restriction or clean, high if restricted or dirty) and Pulse power

PULSING CONTROL

The filter cleaning system utilizes a compressed air, reverse pulse blast to clean the dust build-up from the filter cartridges. The pulsing mechanism is contained within the clean air plenum and is attached to the hopper lid. As such, the filters are available for inspection or removal when the hopper lid is opened with no disassembly of the pulsing hardware required. (Figure 4)

PRESSURE SETTINGS

The filter cleaning system utilizes a compressed air, reverse pulse blast to clean the dust build-up from the filter cartridges. The pulsing mechanism is contained within the clean air plenum and is attached to the hopper lid. As such, the filters are available for inspection or removal when the hopper lid is opened with no disassembly of the pulsing hardware required. (Figure 4)



Figure 13. Shut off valve and regulator for pulse system

STARTING PROCEDURES

The Cyclone 40DC Dust Collector is powered by a diesel engine. This engine incorporates a glow plug mechanism for cold starts. If engine fails to start using the following procedure, please refer to the “Troubleshooting” section.

1. Check engine oil level on dip stick.
2. Check fuel level in gas tank.
3. Check engine coolant level.
4. Check hydraulic oil level at oil sight glass.
5. Ensure clutch handle is in “Disengaged” position.
6. Turn engine key to “RUN” position. Engine ECU and Controls will cycle.
7. After controls cycle turn key to “start”.
8. Allow diesel engine to warm to operating temperature before running at full throttle. LED indicator will extinguish when engine is warmed.
9. Turn the main pulse power switch on the main control panel to the “ON” position.
10. With the engine at a low RPM (below 1500), slowly engage clutch lever until it locks into engaged position.

WASTE MATERIAL UNLOADING

The Cyclone Dust Collector can be unloaded using the following procedure either while it is being operated or while it's fan is shut down. In either case, make certain there is a tight seal between the barrel fill lid and the barrel itself.

1. Place container (55 gallon drum) under discharge of auger.
2. Attach barrel lid with connections to both the auger discharge and barrel fill lid.
3. Open butterfly valve on auger discharge.
4. Start auger hydraulic motors by pulling the control lever to the unload position.
5. Monitor filling of barrel. When barrel approaches the full level, shut off hydraulic valves.
6. Remove barrel fill lid from waste drum and seal the drum.

SHUTDOWN PROCEDURES

Proper shutdown procedures, as described below, should be followed to ensure the most efficient use of the unit.

1. Gradually throttle engine down to a smooth idling speed.
2. Disengage PTO clutch.
3. Allow pulse cleaning to continue for extra cleaning of the filters. Allow engine idle for five minutes to cool down.
4. Turn key to the "OFF" position.
5. Turn off main power switch on the control panel.

RECOMMENDED PRACTICES

After the engine has been turned off and pulse system has been turned off, remove duct hose and place covers over inlet openings. Resume pulsing of unit for 30 minutes. This will clean the dust build-up off of the filters more completely than when the fan is running. Unload the hopper before the covers are opened.

NOTES

MAINTENANCE

The Cyclone Dust Collector has been designed with minimum maintenance in mind. The required maintenance for the various components is as follows:

ENGINE

Refer to the “Periodic Check and Maintenance” section for specific maintenance procedures and details. For matters other than routine, please contact your nearest EnTech distributor service center.

For maintenance schedule, please refer to the included engine manual.

Fan Drive Belt

Before doing any maintenance work on power drives, be sure the controlling switch is in the OFF position, locked out, tagged, and key removed. Be sure the machine is on a level surface with the wheels chocked.

Relieve Belt Tension: After removing the drive guard (Figure 14), loosen the drive take-up and move the sheaves closer together to allow the removal of all old belts, and to insure installation of the new belts without damage.

For Diesel engine belt removal: loosen the 5/8” bolts on the tensioner pulley, loosen jam nut on adjuster bolt inside the engine frame. Then, loosen adjuster bolt to allow belt to be removed.

Remove old belt and inspect for signs of wear. **Inspect Drive Elements.** This is a good time to service the take-up rails by removing any rust and dirt, so tensioning of the new belts will go smoothly. Also inspect and replace worn or damaged machine elements. This procedure not only reduces the likelihood of future mechanical trouble, but ensures maximum service from the new belts you are about to install. Sheaves should be carefully cleaned of any rust and foreign material. A wire brush followed up with a shop cloth will usually do the job.

Sheave condition and alignment are vital to belt life and performance. New belts should never be installed without a careful and thorough inspection of the sheaves involved.

Sheave attention should be given to these conditions:

- a. Worn Groove Sidewalls,
- b. Shiny Sheave Groove Bottom,
- c. Wobbling Sheaves,
- d. Damaged Sheaves.



Figure 14. Fan drive belt behind belt guard on diesel engine

Installing New Belts: Place the new belts on the sheaves, and be sure that the slack of each belt is on the same side. You can do this by pressing the belts with your hand to bring the slack on one side of the drive. Do not force the belts on the sheaves by using a pry bar or by rolling the sheaves. Move sheaves apart until the belts are seated in the grooves, and make preliminary tightening of the drive, just until the slack is taken up.

Apply Tension: All V-belt drives must operate under proper tension to produce the wedging action of the belt against the groove sidewall. A well-established rule is that the best tension for a V-belt drive is the LEAST tension at which the drive will not slip under peak load. Most V-belt problems are due to improper tensioning. Several tools and methods are available to insure proper tensioning. Use tensioner bolt to tension belts, tighten all jam nuts and securing bolts before operation. After the drive has operated under load long enough for the belts to become seated and adjusted, it is a good idea to make a final tension inspection.

Sheave Alignment: Use a laser alignment tool, string, or straight edge to check alignment. The straight edge should make contact at four distinct points along the outside perimeter of both sheaves.

* ALWAYS REPLACE WITH THE RIGHT TYPE OF V-BELT.

FAN

Lubricate per fan specifications located on the machine. These are indicated by “Grease points”.

Note: Use only Mobilith SHC 100 Synthetic grease.

FAN DRIVE BELT

With engine turned off, remove belt guard lid and inspect belt weekly. Adjust belt tension as needed.

Note: As a rule, the belt should maintain its belt tension. Please review the section entitled “Fan Drive Belt” in the “Service” section of this manual.

UNLOADING AUGER

Hydraulic Motor

The hydraulic motor requires no maintenance.

Bearings

Auger shaft bearings are factory sealed and greased. They should only require greasing every 100 hrs.

(Note: When greasing do not rupture bearing seal.)

(Figure 15)



Figure 15. Auger access - Do NOT open while machine is in operation!

MAINTENANCE

Hydraulic Motor

Maintain a supply of hydraulic fluid in the reservoir to the top of the sight tube (Figure 16). Replace the hydraulic fluid filter every 250 hours of operation or once annually, whichever occurs more frequently. Change hydraulic fluid every 2,000 hours. Use ISO 32 Universal hydraulic fluid.

Air System

Drain the water trap on air control system daily after operating machine. Drain during additional intervals while supplying compressed air, depending on the conditions. Note: The machine filters are not a substitute for an external compressed air dryer filter unit. Compressed air supply must be dry and clean before connecting to dust collector. (Figure 17)

Electrical System

Keep battery cable connections free of corrosion and check power supply connections for control panel.

Pulse System

No maintenance of the pulse system is required. If problems occur, please refer to the appropriate items in the "Service" section of this manual.

Filters

The filters (Figure 18) are intended to be maintenance-free, as long as the pulse system is operating and functioning properly. If filter restriction as indicated on the magnehelic gauge consistently exceeds six inches water column, make necessary changes in the timing control as described in the "Operations" section of this manual.



Figure 16: Hydraulic fluid reservoir



Figure 17: Pulse Air control system- water trap and gauge



Figure 18: Filter bay

(Figure 19) After wear in, clutch adjustment should be checked regularly. Strenuous use (including frequent engagements, numerous engagements, or long periods of slip) require more frequent readjustment than light duty applications.

If the clutch overheats, does not pull, or the operating lever jumps from the engaged position this could indicate that clutch adjustment is required.

Adjustment measurements are made by fitting a torque wrench with a 1^{1/2}" socket over the hex end located at the bottom of the hand lever.

Grasp only the torque wrench when making measurements.

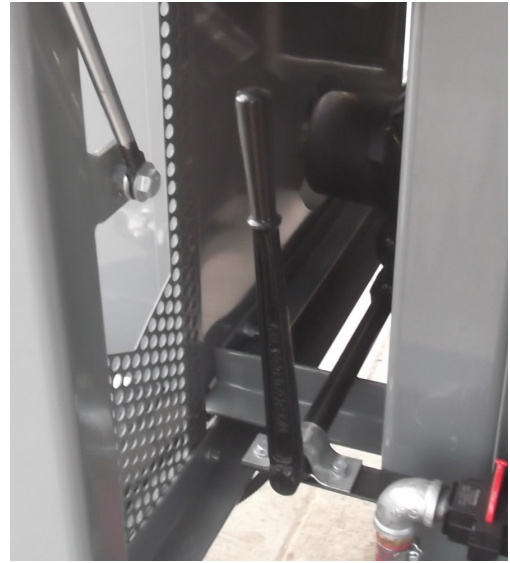


Figure 19: Clutch handle and operating lever

To adjust the clutch:

1. Remove the instruction cover plate from the housing and turn the clutch shaft until the adjusting ring lock pin can be reached.
2. Disengage the adjusting lock pin and insert a cotter pin or small nail into the hole provided to hold it in the disengaged position. Turn the adjusting yoke to the right (or clockwise when looking at the flywheel) until the required peak torque is required at the operating shaft to engage the clutch.
3. Remove the cotter pin or small nail. Re-engage the adjusting ring lock pin.

Repeat steps 2 and 3 as necessary until the proper torque reading is obtained. Replace the instruction cover plate and secure with two hex-head cap screws. Securely tighten.

CLUTCH SPECIFICATIONS

Recommended bearing end play for tapered roller bearings used in in-line applications for SP211HP Series:

0.18-0.23mm or 0.007-0.009inches

Engagement force on operating shaft (torque at shaft to engage clutch) for SP211 Series:

181-240Nm or 133-177lb/ft

MAINTENANCE LOG

[illegible]

Most components of the Cyclone Dust Collector can be serviced, repaired, or replaced by maintenance personnel with average mechanical skills. Guidelines for servicing the various components of the dust collector are as follows:

ENGINE

Refer to the engine manual for basic engine service. All major repairs must be performed by a certified mechanic. Refer to the engine dealer/service network list for the service center nearest you.

FAN

In the event of fan failure, report immediately to EnTech Industries for repair instructions.

Fan Drive Belt

If belt needs replacing, contact EnTech Industries for a replacement belt and utilize the following procedure. For safety, remove the ignition key before starting repair. Refer to <http://www.seiberlich.com/UserFiles/file/Goodyear.pdf> for further information.

1. Remove belt guard lid (Figure 20) by removing the lid retaining bolts.
2. Loosen the 5/8" bolts on the tensioner pulley, loosen jam nut on adjuster bolt inside the engine frame. Then, loosen adjuster bolt to allow belt to be removed.
3. Start engine and observe belt operation. Some belt "SLAP" may be evident at idle, as well as other speeds, but should be minimal at full throttle.
4. Replace belt guard lid and tighten the guard mount bolts on the fan base.



Figure 20: Fan drive belt guard

UNLOADING AUGER

Hydraulic Motor

The hydraulic motor will not require maintenance, as long as the oil supply is properly maintained.

Bearing

Grease auger bearings every 100 hours operation. Do not over grease and rupture seals. If auger drive bearing fails, contact EnTech Industries for a replacement. The bearings can be removed by loosening

SERVICE PROCEDURES

the shaft locking collar, removing the four retaining nuts, and sliding the bearing off the end of the shaft (Figure 21). It is advised to replace the shaft seal located in the block behind the bearing block at this time.

ELECTRICAL SYSTEM

Please refer to the "Troubleshooting" section of this manual for diagnosis and instructions for correcting any problems with the electrical system.

Pulse System

Please refer to the "Troubleshooting" section of this manual for diagnosis and instructions for correcting any problems with the filter pulsing system. (Figure 22)

Filters

To replace filter cartridges, first open the lid at the top of the dust collector. Use caution when opening the lids as gas shocks will automatically open the lids when latches are removed. The filters can be removed by first removing the retaining nuts and washers. Take care to lift the filter straight up from its hole in the tube sheet. Once the bottom of the filter is above the sheet, slide suitable disposal bag beneath the filter and raise toward top of seal. Dispose of contaminated filters properly. Install new filters and secure with retaining nuts and washers.

Filter Installation

Tighten retaining nuts uniformly. Tighten just enough to compress rubber gasket approximately halfway. After all filters have been initially tightened, start over. Now tighten so the filter flange just starts to deflect and stop. After initial use check filters to see if additional tightening is needed.



Figure 21: Auger access



Figure 22: Pulse system inside filter bay

⚠ CAUTION ⚠

Lid is opened by gas springs and will begin to open once the hand nut retainers are released.

INTRODUCTION

The troubleshooting chart is provided to assist the operator in identification of potential malfunctions and to suggest the most effective corrective course of action.

Troubleshooting Tips

- Be familiar with how your 40DC Dust Collector performs under normal and proper conditions.
- Fully read the operator's manual and observe all manufacturers recommended procedures.
- Maintain accurate and up-to-date records for all service and maintenance procedures performed.

How to Use the Troubleshooting Chart

1. Observe and identify the malfunction symptom and match with the area the malfunction is occurring. The more precise you can be in identification, the easier troubleshooting will be.
2. Locate the malfunction definition and determine which area fits in the troubleshooting chart.
3. Review probable causes and identify which one is most likely.
4. Follow prescribed corrective procedure and locate any additional materials in the back of the manual.

When the malfunction does not correspond to the symptom described in the chart, or the prescribed corrective action is ineffective, contact EnTech Industries for technical assistance.

PROBLEM	PROBABLE CAUSE	REMEDY
ENGINE: Does not crank	Battery cables loose	Tighten cables
	Battery cables corroded	Clean and repair cables
	Battery discharged	Charge or replace battery
	Faulty ignition switch	Repair or replace switch
	Faulty starter relay	Replace relay
	Faulty starter	Replace starter
	Faulty Control panel	Replace panel
ENGINE: Crankes but will not start	Out of fuel	Fill with fuel
	Air in fuel lines	Bleed fuel lines
	Fuel filter	Change fuel filter

TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
<i>(continued)</i> ENGINE: Crankes but will not start	Fuel pump	Test pump replace as needed
	Faulty control panel	Replace control panel
	Faulty cold start aid	Trouble shoot glow plugs
	Low compression	Refer to trained technician
ENGINE: Runs poor performance	Fuel Filter	Change fuel filter
	Contaminants in fuel	Drain & refill with fresh fuel
	Faulty fuel line	Inspect fuel lines for holes or damage
	Air Filter	Repalce primary & secondary filters
	Fuel injection system	Refer to trained technician
FAN DRIVE BELTS: Slips or vibrates excessively	Belt is loose	Tighten belt with tensioner move engine down level
	Belt is excessively worn	Replace belt
	Engine mount bolts are loose	Tighten mount bolts and re-tension belt
	Sheaves are out of alignment	Inspect and realign sheaves
	Sheaves are loose on input/ output shaft	Inspect and realign sheaves
	Engine clutch	Inspect clutch for bearing failure
UNLOADING AUGERS: Augers do not turn	Hydraulic oil level is low	Fill with universal hydraulic fluid
	Main hydraulic valve shut	Turn on valve
	Faulty pressure relief valve	Check line pressure at by-pass gauge, by-pass pressure is 2000 psi Reset or replace valve
	Object stuck in auger	Jog auger forward and reverse this should free up stuck object: if this fails dismantle auger to find problem.
	Broken drive chain	Repair/Replace chain
	Shear bolts	Replace damaged bolts
	Faulty hydraulic pump	Test pump for out put pressure and volume. Repair/replace as needed.
	Faulty hydraulic motor	Bench test motor, repair/replace as needed

PROBLEM	PROBABLE CAUSE	REMEDY
FILTER PULSE SYSTEM: Air leaks continuously from pulse pipe	Loose nylon tube at push fitting	Check nylon tubing to see it is completely inserted into the push in fittings at the pulse valves, bulk head fittings and solenoid box. If tube will not secure into fitting, remove from fitting and cut 1/4" from the end of the tube. Note: it is important that the cut is clean and square. Re-insert tube in fitting.
	Damaged or contaminated pulse valve control diaphragms	Carefully remove the four socket head screws that hold the cap on the back of the pulse valves. Gently pull the cap away from the valve body, taking care not to lose the spring located inside the cap. Remove the control diaphragm from its seat on the valve. Note if any foreign material is dislodged from the diaphragm when removed. Inspect the diaphragm for tears or any other signs of damage.
		If none are visible, replace the diaphragm. Note the position of the alignment pin in the valve. Do not use gasket sealant. Replace cap with spring. Pushing against the small guide hole in the cap over the alignment pin in the valve. Reinstall the four socket head screws. Do not over tighten. A persistent leak may indicate a hole in the diaphragm that is not visible during inspection. If this is the case, replace the diaphragm using the same procedure as in the inspect and clean process.
FILTER PULSE SYSTEM: Pulse system is pressurized but does not pulse	No electricity being supplied to the control box.	Inspect battery connection and terminal leads to control panel terminal strip. Check ground.
	Blown main fuse in control box.	Turn the power switch to "ON" position. The green indicator light should come on. If not turn the main power switch "OFF". Open control panel and locate the fuse holder on the right side of the terminal strip. Remove the fuse and replace with the same style 7.5 amp fuse. Turn power back on and check for system function. If fuse blows again, shut "OFF" system and look for short circuits.

TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
<p><i>(continued)</i></p> <p>FILTER PULSE SYSTEM: Pulse system is pressurized but does not pulse</p>	Blown fuse on timer board	Turn main power switch to "OFF". Open the control panel and locate the 2 amp fuse located on the lower left side of the timer board. Replace if burnt with a same type 2 amp fuse. If fuse is good, a small red indicator light located at the top of the timer board should light up when power is turned on.
	Disconnected wires in control box	With the control box panel open, turn the power "ON". If the timer board power light is not on, a wire connection might be bad. Check for 12V DC power at power source. A defective timer board is indicated if 12V DC power is supplied to the timer board and timer board does not power up.
	Control Switches	Check across switches with test light. If there is no continuity across switch, replace it.
	Timer board functions, still no pulse	Inspect wiring from timer board back to terminal strip, inspect connections: Make sure they are tight and free of corrosion. Inspect wires exiting from terminal strip through box to the pulse solenoids. Again check for tightness and corrosion. With test light, check for power at the 12V DC solenoids. If all solenoids have power, proceed to test solenoids.
	Failed pilot solenoid	The solenoids should make a very distinctive sound when they activate. With a jumper wire supplying 12V DC power direct from the battery, contact the positive side of the solenoid. This solenoid should "CLICK" as it engages. If solenoid does not engage it is faulty and should be replaced.

NOTES

WHAT IS COVERED

EnTech Industries offers a limited warranty to the original purchaser on its new production machines against defects in materials and/or workmanship under normal use for the period of one (1) year from the date of delivery or one thousand five hundred (1,500) service meter hours, which ever shall occur first. EnTech Industries agrees, at its option, to repair or replace any defective part without cost to the original purchaser. No repairs shall be made without the prior consent and approval of EnTech Industries personnel.

WHAT IS NOT COVERED

This warranty does not apply to failure of the machine due to product abuse and misuse, normal wear and tear, lack of maintenance or causes other than defective workmanship or material. Any transportation, freight, mileage, assembly, or disassembly (labor) costs associated with the repair or replacement shall be paid by the original purchaser.

DIESEL ENGINE - WARRANTY

The Diesel engine is separately warranted by the engine manufacturer and is serviced through the manufacturer's authorized service center network. EnTech Industries, disclaim any and all express or implied warranties with respect to the Diesel engine.

The express warranties set forth herein are in lieu of all other warranties, express or implied, including without limitation any warranties of merchantability or fitness for a particular purpose and all other such warranties, to the extent permitted by law, are hereby disclaimed and excluded due to operation of law are limited in duration to the duration of the express warranty provided herein for the product warranted.

The remedies set forth above are the sole and exclusive remedies provided hereunder and EnTech Industries shall not be liable for any further loss, damages or expenses, including incidental or consequential damages, directly or indirectly arising from the use of its products. Some states do not allow limitations on duration of an implied warranty. The above limitations on the duration of any implied warranties not excluded hereby due to operation of law, may not apply to you. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion of incidental or consequential damages may not apply to you. This warranty gives you specific legal rights and you may also have other rights which may vary from state to state.

How To make a claim under this limited Warranty, contact a representative of:

**BLASTONE INTERNATIONAL
(AUST) PTY LTD**

Phone: 1-800-999-1881
Email: sales@blastone.com
Address: 4510 Bridgeway Avenue,
Columbus, OH 43219

Provide the following information:

1. Name, address, and telephone number.
2. Description of the product for which the claim is made, including the following:
 - A. Model Number
 - B. Year
 - C. Serial Number
 - D. Hours of Service
3. Date of purchase of the product.
4. Nature or the product problem or failure.

ENGINE AND MACHINE MAINTENANCE REMINDERS

ENGINE MAINTENANCE REMINDERS

ALWAYS REFER TO THE MANUFACTURER'S OPERATION & MAINTENANCE MANUALS FOR ADDITIONAL DETAIL.

DAILY MAINTENANCE ITEMS:

1. Check engine oil level
2. Check primary fuel filter
3. Check coolant level
4. Check air cleaner restriction
5. Lubricate PTO clutch adjustment (Refer to PTO inspection plate)

EVERY 100 HOURS:

1. Lubricate PTO main & operating shaft bearings.

EVERY 500 HOURS:

1. Change engine oil & Filter
2. Service battery
3. Replace primary & secondary fuel filters
4. Coolant system analysis (if no coolant filter used)

EVERY 2000 HOURS / 12 MONTHS:

1. Replace coolant filter
2. Coolant system analysis

MACHINE MAINTENANCE REMINDERS

DAILY MAINTENANCE ITEMS:

1. Check hydraulic fluid level
2. Check hydraulic filter
3. Check main filter air restriction
4. Check inlet hoses and intake screen
5. Empty hopper at the end of each shift
6. Check pulse system for proper operation

EVERY 100 HOURS:

1. Grease fan bearings

EVERY 250 HOURS:

1. Inspect drive belt

EVERY 600 HOURS:

1. One pump of grease each auger bearing
2. Inspect augers & drive chains
3. Lubricate drive chains

EVERY 2000 HOURS / 12 MONTHS:

1. Change hydraulic fluid & filter

ENGINE AND MACHINE MAINTENANCE REMINDERS

BEFORE TRANSPORT

1. Inspect safety chains
2. Inspect hitch
3. Check brake, tail, & clearance lights
4. Check brake function
5. Check emergency brake switch

CAUTION

Disconnect ECU Before Welding

THIS UNIT HAS AN ELECTRONIC CONTROL UNIT (ECU).

FAILURE TO CORRECTLY ISOLATE IT DURING WELDING ON THIS EQUIPMENT WILL RESULT IN DAMAGE NOT COVERED UNDER WARRANTY. PLEASE TAKE THE FOLLOWING STEPS TO AVOID ECU DAMAGE:

1. Remove end connection from the engine control system-to-vehicle frame.
2. Disconnect the connectors from the ECU.
3. Connect welder ground close to weld point so ECU and other electronic components are not in ground path.

FLUIDS AND REPLACEMENT FILTERS

DESCRIPTION	PART NUMBER	QUANTITY
Engine Coolant	FLD00110	9.0 quarts
Engine Oil	OIL0021	20.1 quarts
Hydraulic Oil AW-32	OIL0010	20 gallons
Hydraulic Oil Filter	HYD7020	1 piece
Engine Oil Filter	ENG002155	1 piece
Primary Air Filter	ENG002158	1 piece
Secondary Air Filter	ENG002159	1 piece
Primary Fuel Filter	ENG002162	1 piece
Secondary Fuel Filter	ENG002164	1 piece
Dust Collector Cartridge Filters	FLT002070	60 pieces
Magnehelic Gauge Filter	FLT001055	1 piece

MURPHY TACHOMETER INFORMATION

For Murphy Tachometer information go to:

<http://www.fwmurphy.com/products/sensors/ats>

The 40DC Dust Collector is specifically fit with an Alternator driven model.

JOHN DEERE ENGINE LUBE & MAINTENANCE

Lubrication and Maintenance Service Intervals

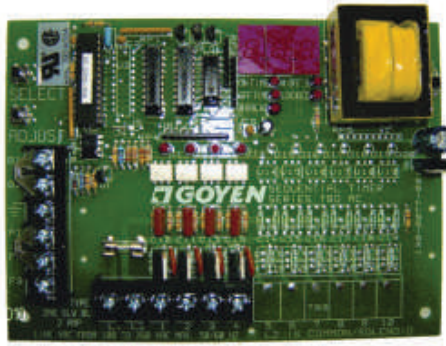
ITEM	DAILY	500 HOUR/ 12 MONTH	2000 HOUR / 24 MONTH	AS REQUIRED
Check engine oil and coolant level	X			
Check fuel filter/water bowl	X			
Check air cleaner dust unloader valve & Restriction indicator guage ^a	X			
Visual walk around inspection	X			
Service fire extinguisher		X		
Check engine mounts		X		
Service battery		X		
Check manual belt tensioner and belt wear		X		
Change engine oil and replace oil filter ^{b,c}		X		
Check crankcase vent system		X		
Check air intake hoses, connections, & system		X		
Replace fuel filter elements		X		
Check automatic belt tensioner and belt wear		X		
Check engine electrical ground connection		X		
Check cooling system		X		
Coolant solution analysis - Add SCA's as required		X		
Pressure test cooling system		X		
Check engine speeds		X		
Flush and refill cooling system ^d			X	
Test thermostats			X	
Chack and adjust engine valve clearance			X	
Add coolant				X
Replace air cleaner elements				X
Replace fan and alternator belts				X
Check fuses				X
Check air compressor (if equipped)				X
Bleed fuel system				X

^a Replace primary air cleaner element when restriction indicator shows a vacuum of 625mm (25in) H₂O.

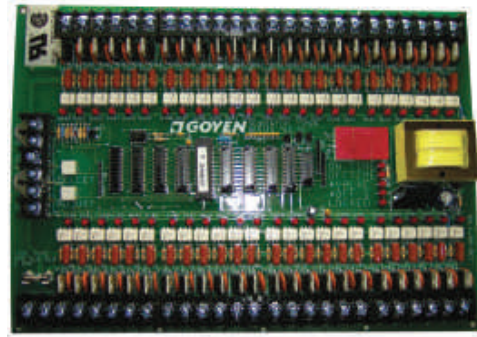
^b During engine break-in, change the oil and filter for the first time before 100 hours of operation.

^c If the recommended engine oils, John Deere PLUS-50TM, ACEA-E7, or ACEA-E6 are not used, the oil and filter change interval is reduced. If diesel fuel with a sulfur content greater than 0.05% is used, the oil and filter change interval is also reduced.

^d If John Deere COOL-GARD is used, the flushing interval may be extended to 3000 hours or 36 months. If John Deere COOL-GARD is used and the coolant is tested annually AND additives are replenished as needed by adding a supplemental coolant additive, the flushing interval may be extended to 5000 hours or 60 months, whichever occurs first.



4, 6, 8 and 10 Station Model



16, 24, 32, 40 and 48 Station Model

INSTALLATION AND OPERATING INSTRUCTIONS

GENERAL DESCRIPTION: The Goyen TBD Digital Timer series is designed to control the pulse valves on reverse jet dust collectors. It provides timed sequential energizing of the pilot solenoid valves. The number of outputs is programmable from 1 and up to 48 stations depending on the model selected. LED indicators are provided for visual indication of which valve is energized. A digital three position LED readout screen is provided to indicate the programmed settings of the various functions. Digital controls allow adjustment of the "on" and "off" times, total number of outputs to be energized and the number of blowdown cycles required. Timer is equipped with integral surge suppression on power input and solenoid load outputs to protect against voltage spikes. The timer will retain all programmed settings if input power is removed.

PRESSURE SWITCH CONTROL: Provision is made to allow the addition of a photohelic pressure switch to operate only when the pressure switch contacts are closed on the high set point. A memory feature enables the timer to energize the next output in sequence when pressure switch calls for timer to restart. When electrical power is disconnected, the timer will restart at output number 1 when power is restored. If this feature is not used, a jumper wire between P1 and P2 is provided to allow continuous operation of timer.

AUTOMATIC BLOWDOWN: This feature allows the timer to continue to operate for off line cleaning for a programmed number of complete cycles when baghouse fan is turned off. The blowdown cycle is initiated by the opening of the auxiliary contacts on fan motor when fan is stopped. When the programmed number of cycles is completed, the timer turns itself off. If feature is not used a jumper is provided on terminals B1 and B2, which is a dry contact (no voltage).

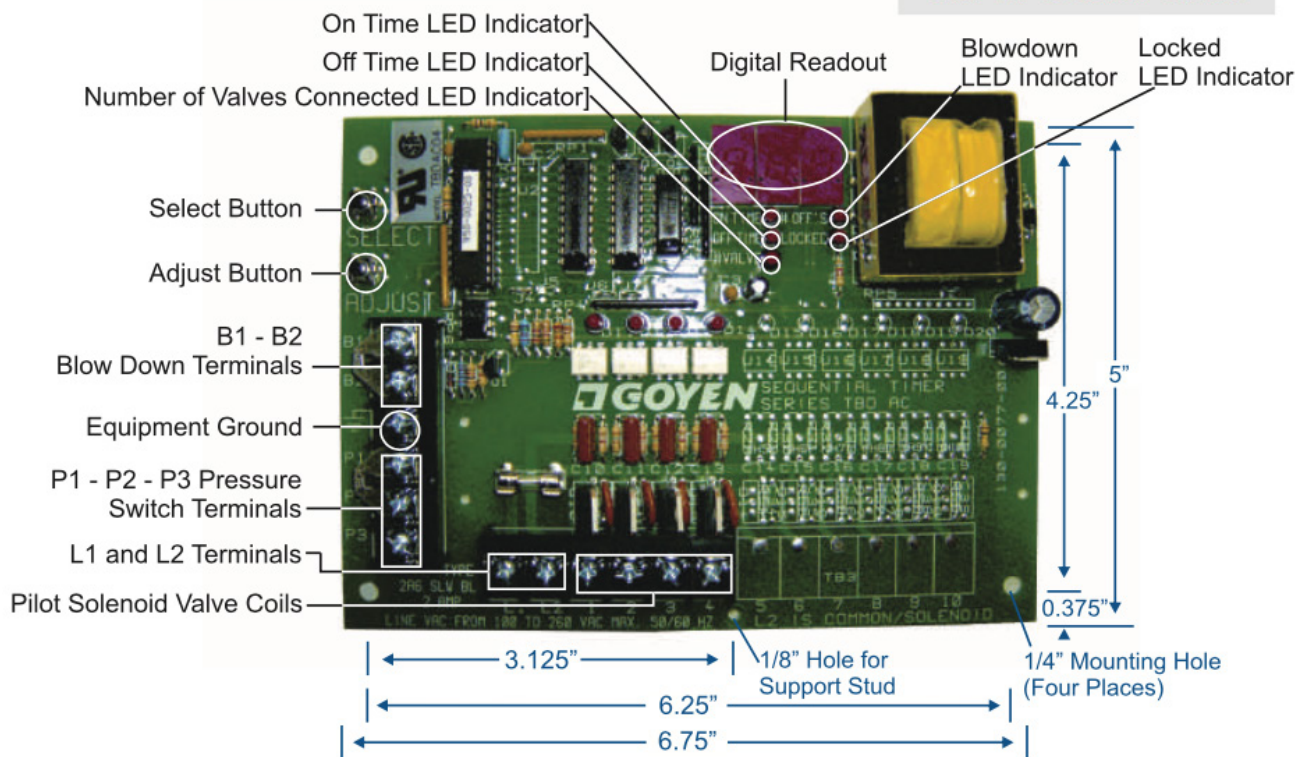
GOYEN WIRING FOR SEQUENTIAL TIMER

SPECIFICATIONS	TBDAC- TBDDC-				TBDAC- TBDDC-				
MODEL NUMBER	4	6	8	10	16	24	32	40	48
# of outputs	1 to 4	1 to 6	1 to 8	1 to 10	1 to 16	1 to 24	1 to 32	1 to 40	1 to 40
Line Voltage AC	AC Models: 120 to 260 VAC 50/60 Hz								
Line Voltage DC	DC Models: 12 or 24 VDC								
Load Output Rating	2 AMPS								
Circuit Protection	2 AMP Fuse 2 AG Slow Blow								
Operating Temperature	from minus 40 deg F to plus 140 deg F								
Timing Range	On Time: 30 to 350 ms in 5 ms steps • Off Time: 1 to 180 seconds in 1 second steps								
Timing Accuracy	(±) 0.5% of set point								
On Demand Control	External Pressure Switch with Memory								
Load Output Indicators	Red Light Emitting Diodes								
Programmed Setting Indicator	Three Position LED Digital Display								
Number of blowdown cycles	0 to 25								
Timer Board Construction	Glass Epoxy with RTV Conformal Insulation								
Board Mounting	Stand Off Studs								
Enclosure 4 to 10 Station	8" x 6" x 3" or 10" x 8" x 4"								
Enclosure 16 to 48 Station	12" x 12" x 6"								

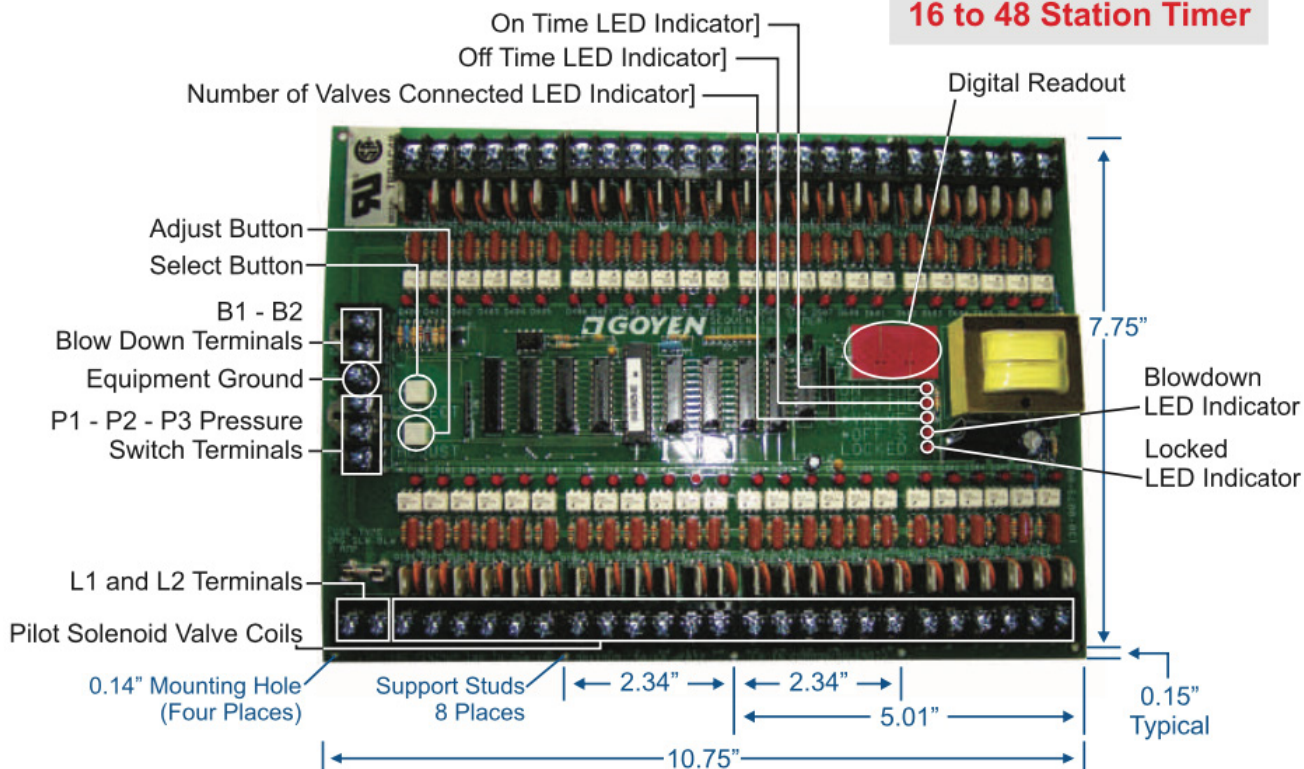
Approvals: UL File # NKCR2.E219494 and CSA Certificate # 1274867

GOYEN DIGITAL TIMER BOARD

4 to 10 Station Timer



16 to 48 Station Timer



INSTALLATION

- **4 to 10 Station Timer**, without photohelic pressure switch gage, can be mounted into a Nema 4 enclosure. Options are 8 X 6 X 3 enclosure requires a backing plate installed first. Timer then gets mounted to backing plate with standoffs supplied.
- **16 to 48 Station Timer**, without photohelic pressure switch gage, can be mounted into a Nema 4 enclosure 12 X 12 X 6. This enclosure requires a backing plate installed first. Timer then gets mounted to backing plate with standoffs supplied.
- **AC Power Line Input** - AC power lines get connected to terminals 1 for ctive Line and L2 for Neutral Line. Solenoid coil gets one line to each terminal station L3 and above and one line tied to common ground back to the L2 terminal Neutral Line. Maximum of 6 solenoids can be fired off each terminal.
- **DC Power Line Input** - DC power lines connect to terminal L1 for Neutral Line and L2 for Active Line. Solenoid coils gets one line to each terminal station L3 and above and one line tied to common ground back to the L2 Active Line. On 12VDC you can only fire one solenoid per terminal. On 24VDC you can fire 2 solenoids.
- **Pressure Switch** - If pressure switch is used, remove jumper between terminal P1 and P2. Connect pressure switch to close contacts on high pressure setting.
- **Blow Down** - This feature is used to pulse valves off line. Remove jumper between terminals B1 & B2. Connect the auxiliary contacts to the fan motor starter. Contacts are open when fan is stopped to operate pulsing off line.

CAUTION

Disconnect ECU Before Welding

- **Ground Terminal** - The equipment ground terminal is located between the B2 and P1 terminal on side of board.

PROGRAMMING INSTRUCTIONS

Press the "Select" button to illuminate the LED Digital Readout Screen. The LED indicator will light up adjacent to the function being used. Hitting the "Select" button will move the indicator light to required function. Then press the "Adjust" button to required setting which will be displayed on the Digital Readout. After all functions have been set push "Select" button to the Locked LED indicator. This position will protect all settings in case "Adjust" button was pushed to avoid changes to any settings. Hitting the "Adjust" button will only move settings forward. If setting goes past required range keep hitting button until it returns to target setting.

Step #1 - ON TIME - Amount of time electrical signal is given to solenoid valves. Press "Select" button

to the On Time LED indicator. Press "Adjust" button until required On Time is shown on Digital Readout. This setting is adjustable from 30 to 350 milliseconds in 5 millisecond increments. Normal setting will be 100 m/s. Recommended setting should fall between 75 to 150 m/s,

Step #2 - OFF TIME - Amount of time between each station before it fires. Press "Select" button to the Off Time Led indicator. Press the "Adjust" button to required Off Time. This is adjustable from 1 to 180 seconds in 1 second increments. Recommended minimum Off Time should be 15 seconds in order for header to be recharged.

Step #3 - NUMBER OF TERMINALS USED - LED indicator reads # of Valves used. In some cases more than one valve is wired to each terminal. We may have 30 valves on a 10 station board but only be using 10 terminals. Press "Select" button to # of Valves then press "Adjust" button to set the number of terminals being used.

Step #4 - BLOWDOWN CYCLES - Amount of cycles fired in the off line condition. Press "Select" button to # OFF'S indicator. Hit "Adjust" button to required setting. This setting can be set at "0" if not required. Cycle will start at last station that was fired whole on line & complete one full cycle for each number of cycles listed.

CAUTION

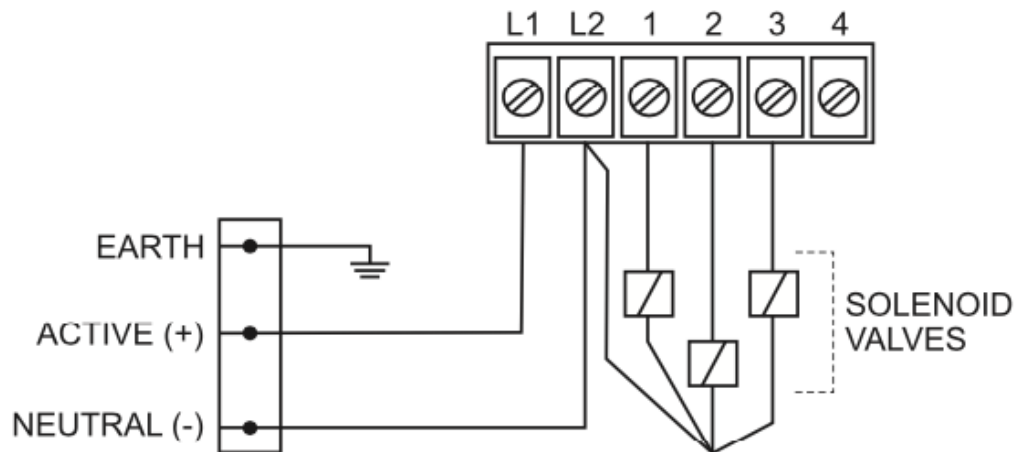
Do not overclean the filters. Setting is adjustable from 0 to 25 cycles. Recommend not to go over 3 cycles.

Step #5 - SETTING LOCKED - Once all previous setting have been entered hit "Select" button to move indicator to Locked position. While in Locked position the Digital Readout screen will only display the last setting of number of blowdown cycles entered. No changes will take place if "Adjust" button is pushed.

WIRING DETAILS FOR SEQUENTIAL TIMER

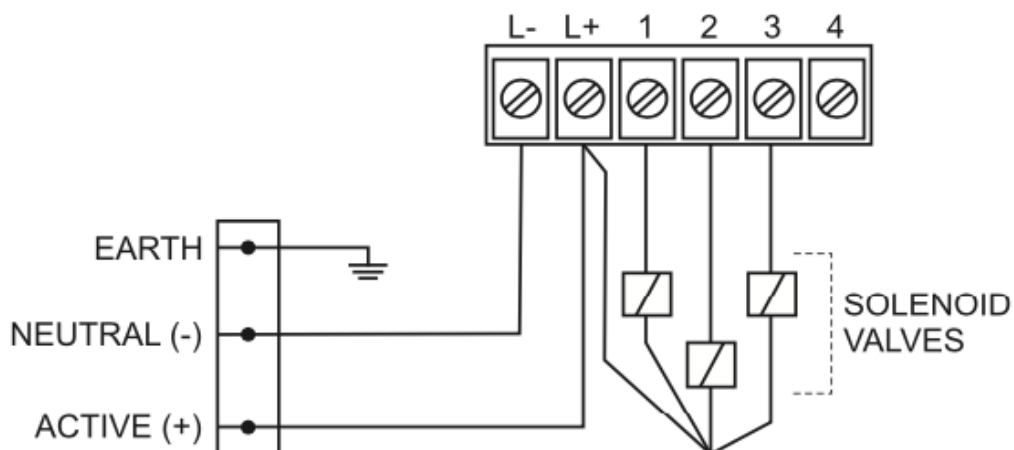
WIRING DETAILS FOR AC MODELS

With AC models, connect active line input power to terminal marked L1 and the neutral line to terminal marked L2. Green wire is earth ground and gets connected to equipment ground terminal located on the side of the timer between the B2 and P1 terminals. Join common side of coils together to run a single wire to terminal L2 (neutral) for common ground. Other wire from coils gets connected to each station as needed.

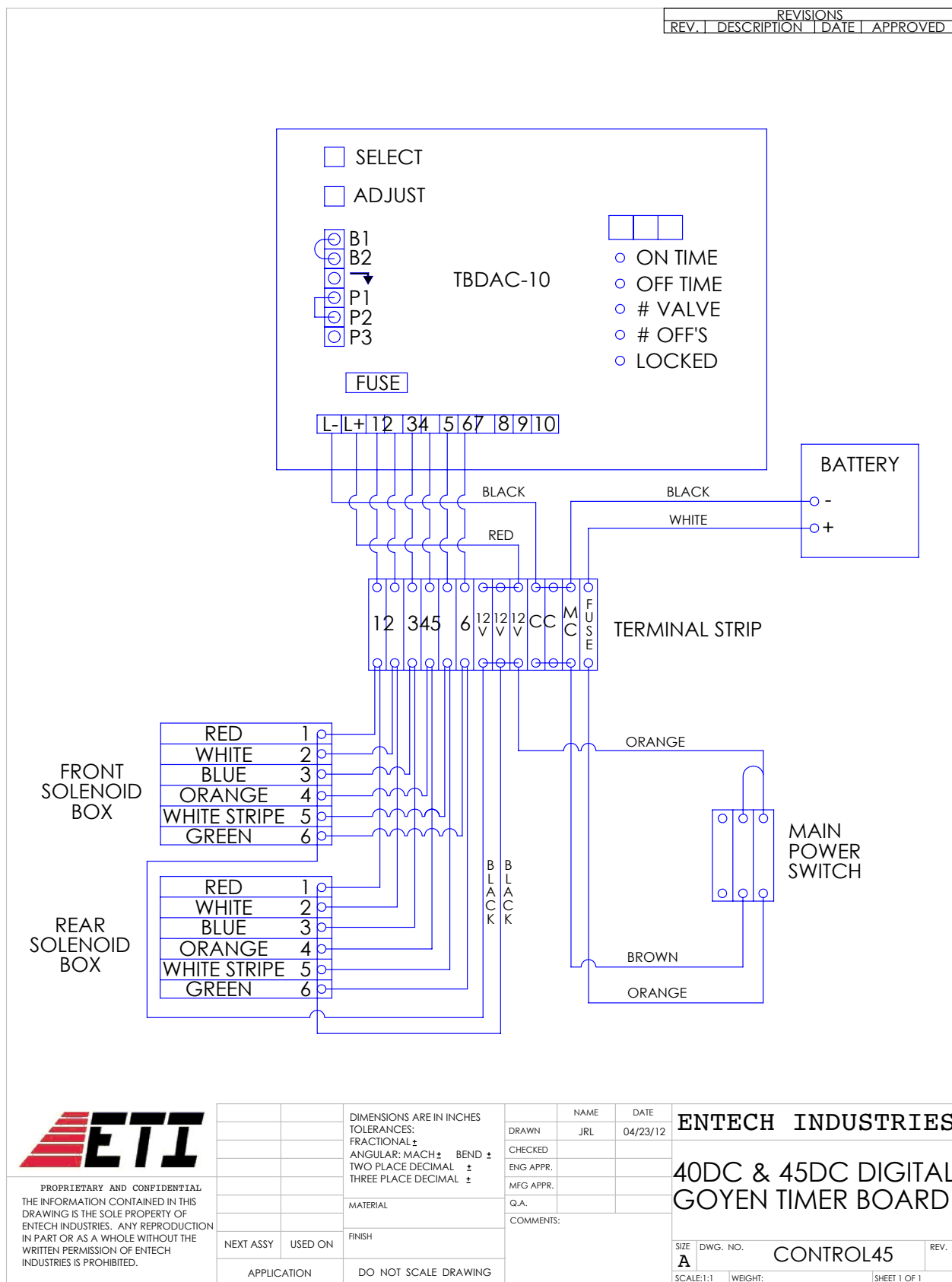


WIRING DETAILS FOR DC MODELS

With DC models, connect active line input power to terminal marked L+ and the neutral line to terminal marked L-. Green wire is earth ground and gets connected to equipment ground terminal located on the side of the timer between the B2 and P1 terminals. Join common side of coils together to run a single wire to terminal L+ (active) for common ground. Other wire from coils gets connected to each station as needed.



GOYEN DIGITAL TIMER BOARD SCHEMATIC



PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS
DRAWING IS THE SOLE PROPERTY OF
ENTECH INDUSTRIES. ANY REPRODUCTION
IN PART OR AS A WHOLE WITHOUT THE
WRITTEN PERMISSION OF ENTECH
INDUSTRIES IS PROHIBITED.

DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±	
MATERIAL	FINISH
NEXT ASSY	USED ON
APPLICATION	DO NOT SCALE DRAWING

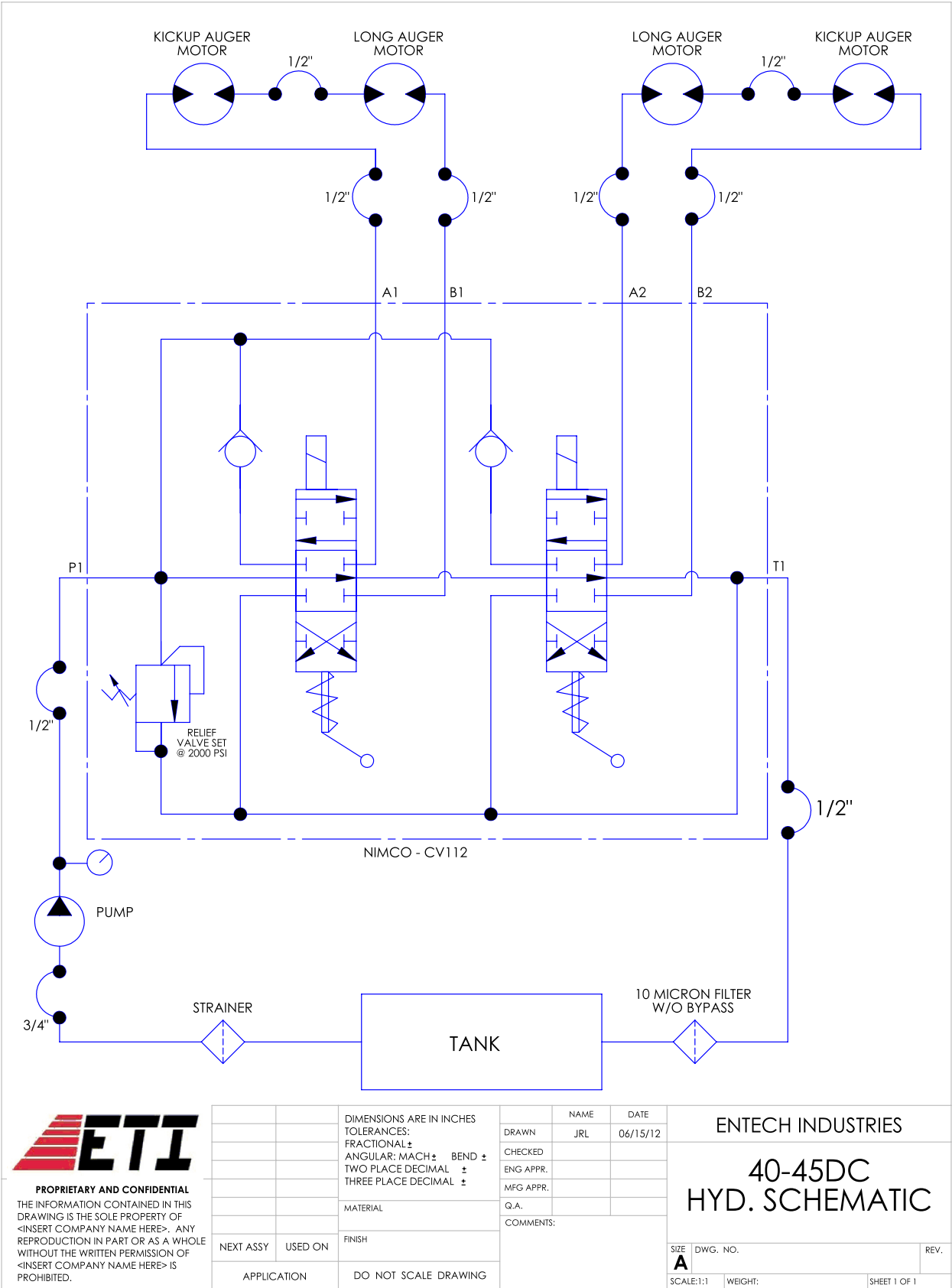
NAME	DATE
JRL	04/23/12
CHECKED	
ENG APPR.	
MFG APPR.	
Q.A.	
COMMENTS:	

ENTECH INDUSTRIES

**40DC & 45DC DIGITAL
GOYEN TIMER BOARD**

SIZE	DWG. NO.	REV.
A	CONTROL45	
SCALE: 1:1	WEIGHT:	SHEET 1 OF 1

HYDRAULIC SCHEMATIC



PILOT VALVE BOXES

D1

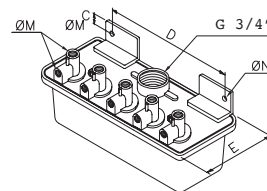
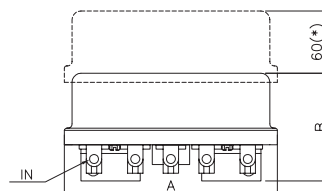
RCP Series



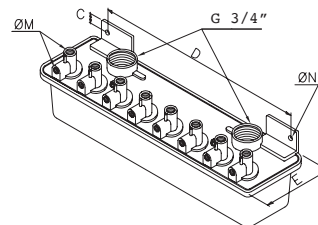
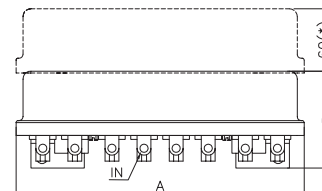
CHARACTERISTICS

Fluid	Filtered and oilfree compressed air
Operating pressure	min 0,5; max 7,5 bar
Temperature range	-20°C +80°C
W/ Heating	-40°C +80°C
Base and cover	Die cast aluminium
Core tube	Stainless Steel
Plunger	Stainless Steel
Screws	Stainless Steel
Coil insulation	Class H
Protection	IP66
Standard voltages	230 -110 - 24V 50-60VHz 19 VA 24VDC 15W

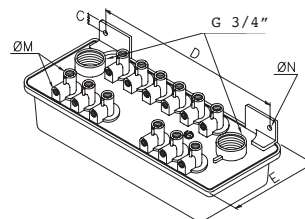
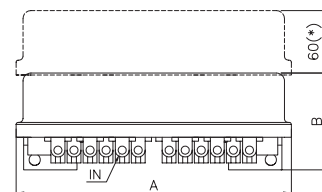
RCP5



RCP8



RCP12



Model	A	B	C	D	E	Ø M	Ø N	Weight (Kg)
RCP5	210	98	10	156	100	1/8"	11	1,7
RCP8	333	98	10	267	100	1/8"	11	3,2
RCP12	306	97	10	237	152	1/8"	11	4,4

27



COMPRESSION FITTING PULSE VALVE

B2 COMPRESSION FITTING PULSE VALVE

D Series



CARACTERISTICS

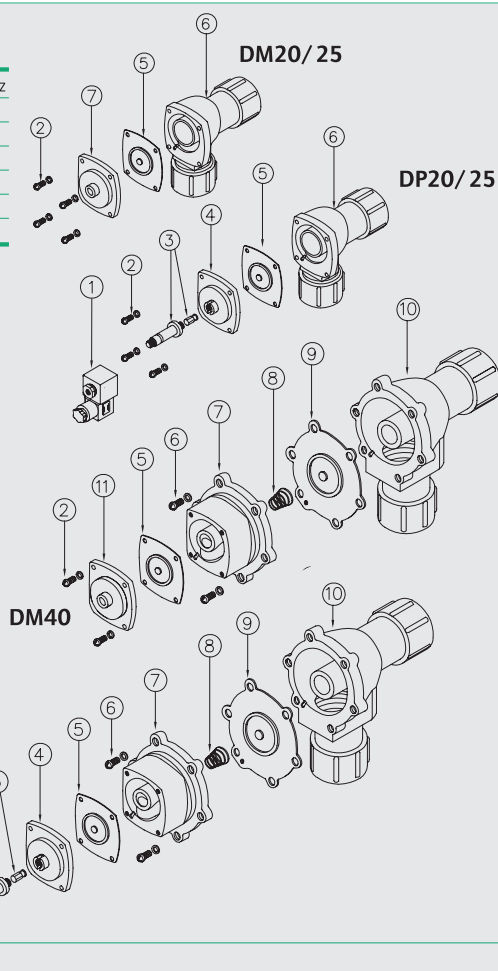
Fluid	Filtered and oilfree compressed air
Temperature range	STD diaphragm -40°C; +80°C Viton diaphragm -30°C; +200°C
Operating pressure	min. 0,5; max 7,5 bar
Body e coover	Die cast aluminium
Core tube	Stainless Steel
Plunger	Stainless Steel
Screws	Stainless Steel
Coil insulation	Class H
Connector	PG 9; IP65 DIN 43650 ISO 4400
Standard voltages	230-110-24V / 50-60VHz 19 VA 24VDC 15W

DESCRIPTION	DP/DM20	DP/DM25
1 Coil+Connector	BH10...V/50-60Hz	BH10...V/50-60Hz
2 Screws+Washer	VTE6x20+VRO56	VTE6x20+VRO56
3 Pole assembly	GPC 10	GPC 10
4 Cover	TCOP 25	TCOP 25
5 Diaphragm	M20	M25
6 Body	TCOR20/25MMG	TCOR25MMG
7 Cover remote operated	TCOP25FM	TCOP25FM

DP Integral solenoid pilot version
DM Remote pilot version

DESCRIPTION	DP/DM40
1 Coil+Connector	BH10...V/50-60Hz
2 Screws+Washer	VTE6x20+VRO56
3 Pole assembly	GPC 10
4 Cover	TCOP 25
4 Remote cover	TCOP25FM
5 Diaphragm	M25
6 Screws + Washer	VTE8x20+VRO58
7 Main cover	TCOP 40N
8 Spring	TMOL40
9 Main diaphragm	M40
10 Body	TCOR40MMG
11 Cover remote operated	TCOP25FM

DP Integral solenoid pilot version
DM Remote pilot version



6

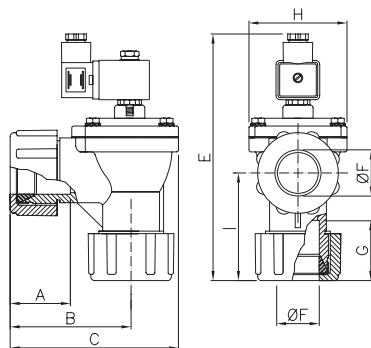


COMPRESSION FITTING PULSE VALVE

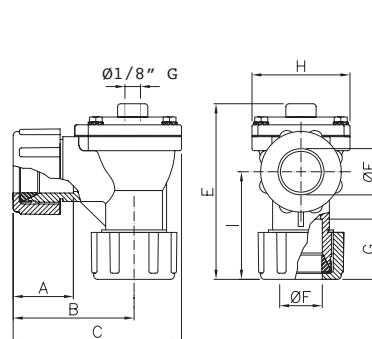
COMPRESSION FITTING PULSE VALVE B2

Dimensions mm **D** Series

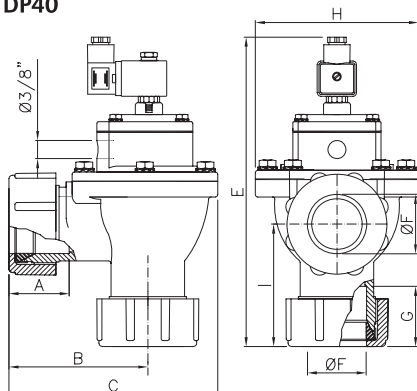
DP20 - DP25



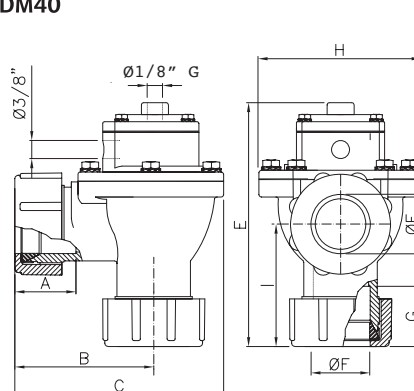
DM20 - DM25



DP40



DM40



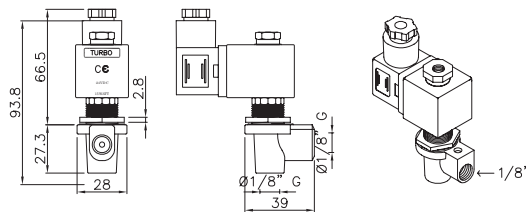
Model	\varnothing (nom)	A	B	C	E	F	G	H	I	L	Weight (Kg)	Model	E	Weight (Kg)
DP 20	$3/4''$	48	90	128	~189	28,5	48	74	80	30,5	1,1	DM 20	131	1
DP 25	1"	48	90	128	~189	35	48	74	80	30,5	1	DM 25	131	0,9
DP 40	$1 1/2''$	66	114	180	~264	50	66	140	101	39	2,4	DM 40	206	2,3



CHARACTERISTICS

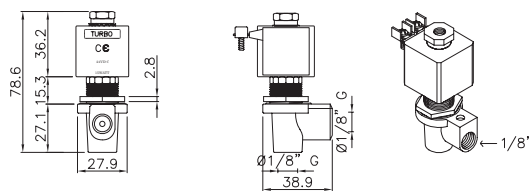
Fluid	Filtered and oilfree compressed air
Operating pressure	min. 0,5; max 7,5 bar
Temperature range	-20°C +80°C
Body	Brass
Core tube	Stainless Steel
Plunger	Stainless Steel
Coil insulation	Class H
Connector	PG9 / IP 65
Standard voltages	230 -110 - 24V/50-60VHz (19 VA) 24VDC (15W)

SRC IP65

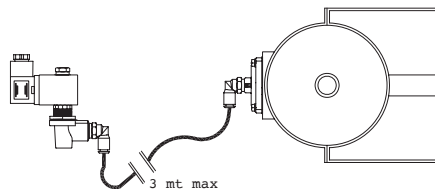


⊠ Available with ATEX coil zone 21 and zone 22

SRM IP00



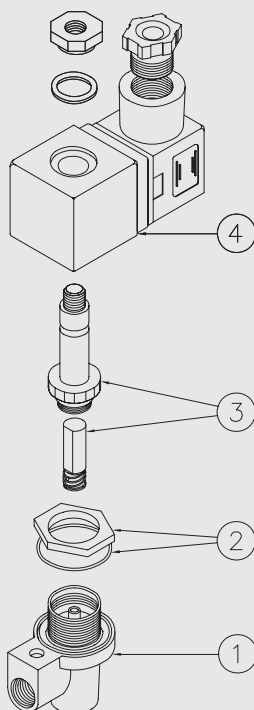
INSTALLATION



E1 PILOT VALVES

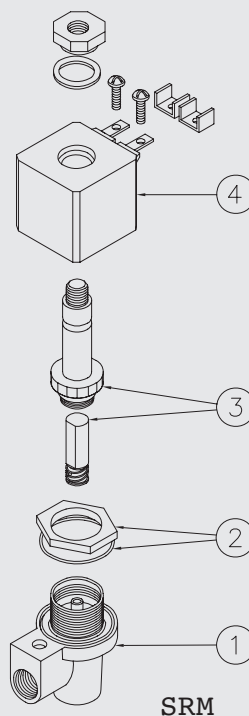
SR Series

SRC



DESCRIPTION	SRC
1 Body	PCRP
2 Lock nut + O-ring	TGHIERA 18x1 + OR3081
3 Pole assembly	GPC10/R
4 Coil + connector	BH10

DESCRIPTION	SRM
1 Body	PCRP
2 Lock nut + O-ring	TGHIERA 18x1 + OR3081
3 Pole assembly	GPC10/R
4 Coil	BH10-A9



SRM

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SPRING CLAMP CONNECTION TECHNOLOGY

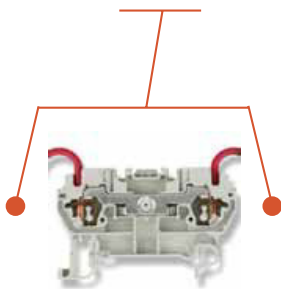
Spring clamp connection technology is becoming increasingly widespread.

Good resistance to vibration, non-operator dependent, no screwing operation, these are the main advantages of this front-side connection technology.

Compactness

Front-side connections leave all the space above and below terminal blocks free.

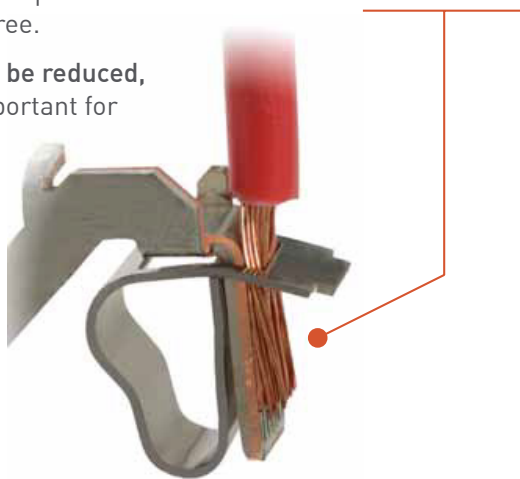
So, the distance between rails can be reduced, thus saving space, particularly important for machine electrical cabinets.



Principle

Stainless steel springs provide the right contact pressure and mechanical resistance.

The conductor is held against a copper terminal strip for transmitting the current.



Security

- Quality of clamping in no way dependent on variations in operator performance.
- Automatic adjustment of clamping pressure depending on the wire gage.
- Vibration and shock-resistant.
- Automatic compensation for any conductor distortion and pullout resistance well above requirements of IEC standard 60947-7-1.

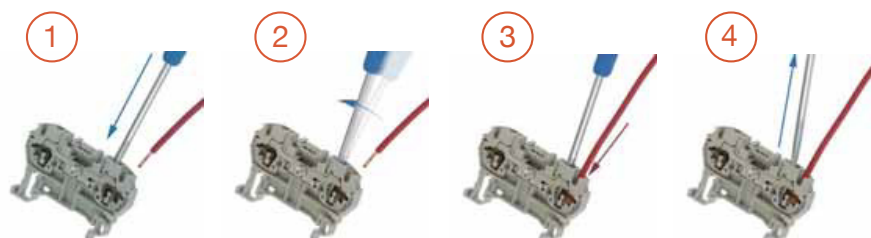
Particularity

With a purely mechanical spring function, the best possible specific materials can be chosen for:

- High resistance to corrosion (90 hour resistance to saline mists as per IEC 68-2-4).
- Good contact pressure (for preventing voltage drops above IEC standard 60947-7-1).

Simplicity

Only a few gestures are required, a method that is both simple and rapid.



NEMA 4-12 ENCLOSURES**5412 ESCH****JIC enclosures**

The **5412 ESCH** are used indoors or outdoors to protect the enclosed controls from dust, dirt, oil and water splashing. The 5412 ESCH are made from quality 16 GA steel, with corner seams continuously welded.

The opening has a curled lip around all sides to prevent dripping water from entering the enclosure when the door is open, it also increases rigidity. A high quality robotically poured-in-place seamless gasket ensures a complete and durable water tight

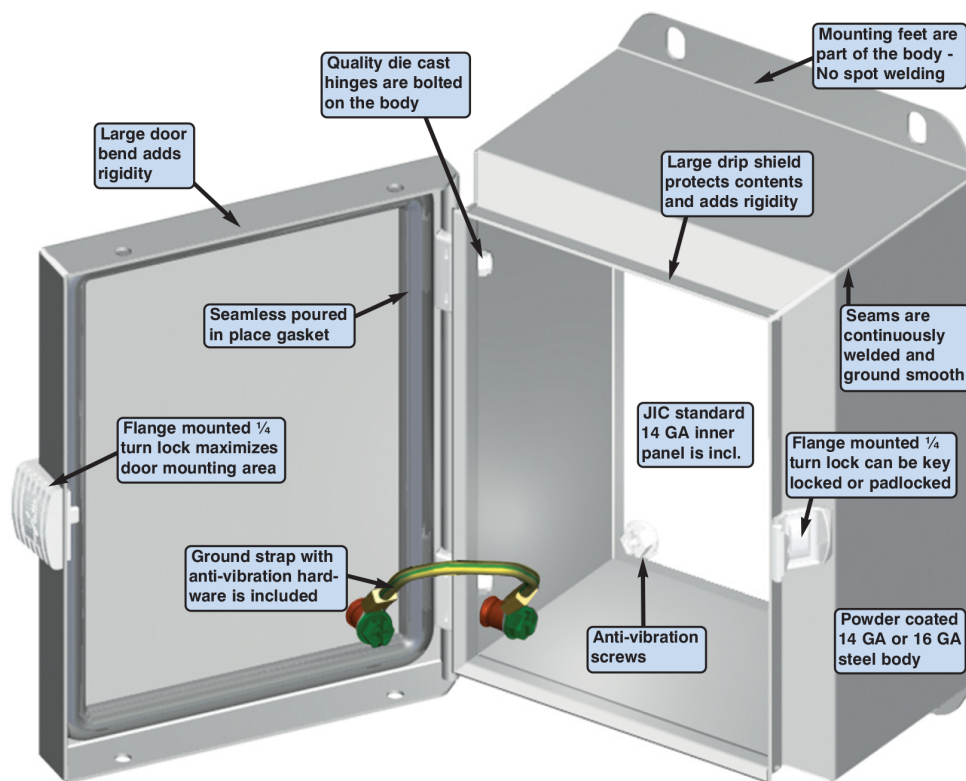
seal.

The enclosures feature die cast hinges, which are bound to the cover by an exclusive concealed hinge pin system. The covers are interchangeable and can be removed by unfastening the anti-vibration lock nuts.

EXM's exclusive flange-mounted 1/4 turn locking system ensures positive closing while leaving a full workable mounting surface on the door. Each enclosure comes **complete with a 14 GA inner panel** which mounts on

weld nuts. The four external wall-mounting holes are oblong to facilitate installation and the mounting feet are incorporated into the body of the enclosure. Enclosures and panels are finished with heat fused polyester powder, electrostatically applied on a pretreated base. Box is ANSI/ASA 61 gray, panel is white (other colors available).

CSA Certified / UL Listed
NEMA/EEMAC 4-12 / IP66



**The 5412 ESCH -
Another EXM innovation**

Data subject to
change without
notice.

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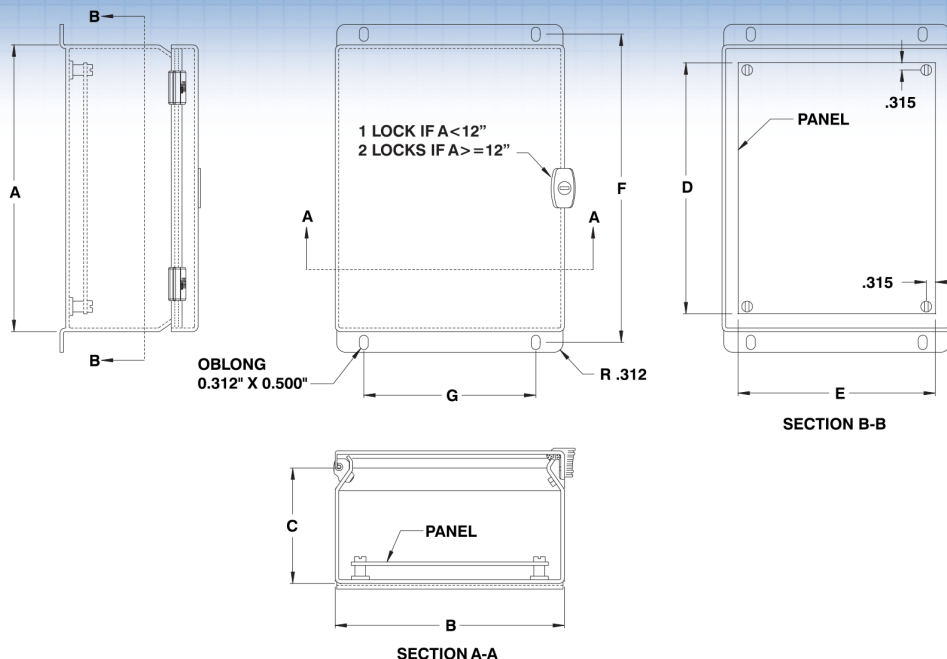
1-800-363-2423

Fax : 450-979-4626

info@exmweb.com

NEMA 4-12 ENCLOSURES

5412 ESCH



CATALOG NUMBER	DIMENSIONS							SHIP WGHT LBS.
	A	B	C	D	E	F	G	
5412 ESCH040403	4	4	3	No.Pan.	No.Pan.	4.75	2	2
5412 ESCH060403	6	4	3	4.88	2.88	6.75	2	3
5412 ESCH060404	6	4	4	4.88	2.88	6.75	2	4
5412 ESCH060604	6	6	4	4.88	4.88	6.75	4	5
5412 ESCH080604	8	6	4	6.88	4.88	8.75	4	6
5412 ESCH080804	8	8	4	6.88	6.88	8.75	6	8
5412 ESCH081004	8	10	4	6.88	8.88	8.75	8	10
5412 ESCH100804	10	8	4	8.88	6.88	10.75	6	10
5412 ESCH120604	12	6	4	10.88	4.88	12.75	14	8
5412 ESCH060605	6	6	5	4.88	4.88	6.75	4	6
5412 ESCH080605	8	6	5	6.88	4.88	8.75	4	7
5412 ESCH101005	10	10	5	8.88	8.88	10.75	8	14
5412 ESCH101205	10	12	5	8.88	10.88	10.75	10	16
5412 ESCH121005	12	10	5	10.88	8.88	12.75	8	16
5412 ESCH121205	12	12	5	10.88	10.88	12.75	10	18
5412 ESCH080606	8	6	6	6.88	4.88	8.75	4	7
5412 ESCH100806	10	8	6	8.88	6.88	10.75	6	12
5412 ESCH101006	10	10	6	8.88	8.88	10.75	8	14
5412 ESCH121206	12	12	6	10.88	10.88	12.75	10	18
5412 ESCH121406	12	14	6	10.88	12.88	12.75	12	19
5412 ESCH140806	14	8	6	12.88	6.88	14.75	6	10
5412 ESCH141206	14	12	6	12.88	10.88	14.75	10	19
5412 ESCH141606	14	16	6	12.88	14.88	14.75	14	23
5412 ESCH161006	16	10	6	14.88	8.88	16.75	8	19
5412 ESCH161206	16	12	6	14.88	10.88	16.75	10	21
5412 ESCH161406	16	14	6	14.88	12.88	16.75	12	23
5412 ESCH121008	12	10	8	10.88	8.88	12.75	8	16
5412 ESCH141208	14	12	8	12.88	10.88	14.75	10	20
5412 ESCH161208	16	12	8	14.88	10.88	16.75	10	25
5412 ESCH161408	16	14	8	14.88	12.88	16.75	12	26
5412 ESCH161410	16	14	10	14.88	12.88	16.75	12	27



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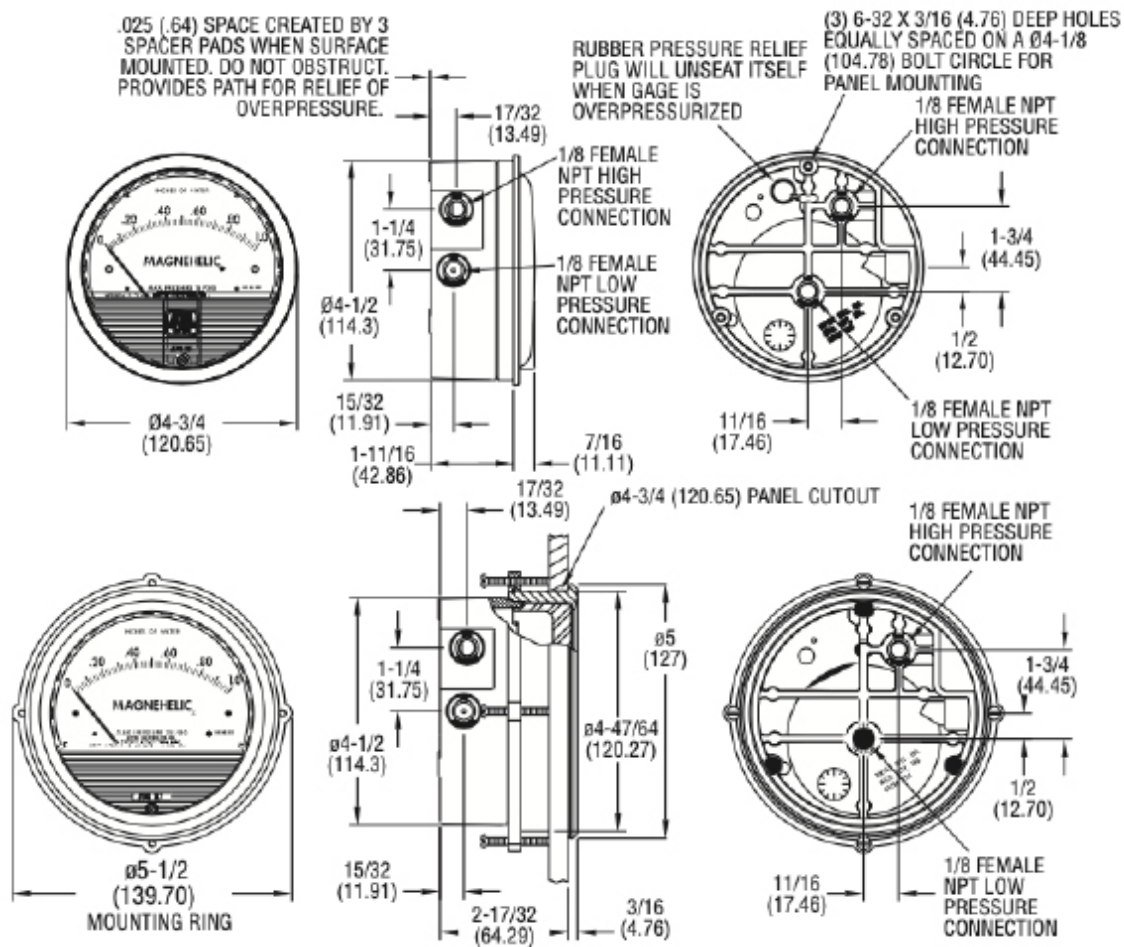
Fax : 450-979-4626



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MAGNEHELIC® DIFFERENTIAL PRESSURE GAGE



**The blowout plug is not used on models above 180 inches of water pressure, medium or high pressure models, or on gages which require an elastomer other than silicone for the diaphragm.*

STANDARD GAGE ACCESSORIES

Two 1/8"NPT plugs for duplicate pressure taps, two 1/8" pipe thread to rubber tubing adapters and three flush mounting adapters with screws.

MP AND HP GAGE ACCESSORIES

Mounting ring and snap ring retainer substituted for 3 adaptors, 1/4" compression fittings replace 1/8" pipe thread to rubber tubing adapters.

OVERPRESSURE PROTECTION

Standard Magnehelic® Differential Pressure Gages are rated for a maximum pressure of 15 psig and should not be used where that limit could be exceeded. Models employ a rubber plug on the rear which functions as a relief valve by unseating and venting the gage interior when over pressure reaches

MAGNEHELIC® DIFFERENTIAL PRESSURE GAGE

approximately 25 psig (excludes MP and HP models). To provide a free path for pressure relief, there are four spacer pads which maintain .023" clearance when gage is surface mounted. Do not obstruct the gap created by these pads.

SPECIFICATIONS

Service: Air and non-combustible, compatible gases. (Natural Gas option available.)

Wetted Materials: Consult factory.

Housing: Die cast aluminum case and bezel, with acrylic cover. (MP model has polycarbonate cover).

Accuracy: $\pm 2\%$ of full scale ($\pm 3\%$ on - 0, -100 Pa, -125 Pa, 10MM and $\pm 4\%$ on -00, - 00N, -60 Pa, -6MM ranges), throughout range at 70°F (21.1°C).

Pressure Limits: -20" Hg to 15 psig.† (-0.677 bar to 1.034 bar); MP option: 35 psig (2.41 bar), HP option: 80 psig (5.52 bar).

Overpressure: Relief plug opens at approximately 25 psig (1.72 bar), standard gages only. The blowout plug is not used on models above 180 inches of water pressure, medium or high pressure models, or on gages which require an elastomer other than silicone for the diaphragm.

Temperature Limits: 20 to 140°F (-6.67 to 60°C). *Low temperature models available as special option.

Size: 4" (101.6 mm) diameter dial face.

Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.

Process Connections: 1/8" female NPT duplicate high and low pressure taps - one pair side and one pair back.

Weight: 1 lb 2 oz (510 g), MP & HP 2 lb 2 oz (963 g).

Agency Approvals: RoHS.

NOTE

†For applications with high cycle rate within gage total pressure rating, next higher rating is recommended. See Medium and High pressure options.

NOTE

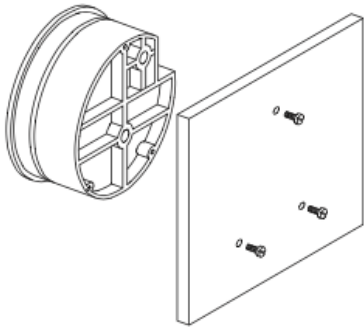
May be used with hydrogen when ordering Buna-N diaphragm. Pressure must be less than 35 psi.

MAGNEHELIC® DIFFERENTIAL PRESSURE GAGE

INSTALLATION

Select a location free from excessive vibration and where the ambient temperature will not exceed 140°F (60°C). Also, avoid direct sunlight which accelerates discoloration of the clear plastic cover. Sensing lines may be run any necessary distance. Long tubing lengths will not affect accuracy but will increase response time slightly. Do not restrict lines. If pulsating pressures or vibration cause excessive pointer oscillation, consult the factory for ways to provide additional damping.

All standard Magnehelic® Differential Pressure Gages are calibrated with the diaphragm vertical and should be used in that position for maximum accuracy. If gages are to be used in other than vertical position, this should be specified on the order. Many higher range gages will perform within tolerance in other positions with only rezeroing. Low range models of 0.5" w.c. plus 0.25" w.c. and metric equivalents must be used in the vertical position only.

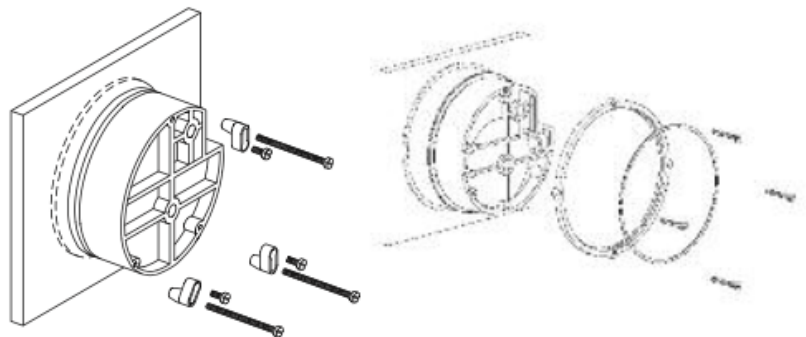


SURFACE MOUNTING

Locate mounting holes, 120° apart on a 4-1/8" dia. circle. Use No. 6-32 machine screws of appropriate length.

FLUSH MOUNTING

Provide a 4-9/16" dia. (116 mm) opening in panel. Provide a 4- 3/4" dia. (120 mm) opening for MP and HP models. Insert gage and secure in place with No. 6-32 machine screws of appropriate length, with adapters, firmly secured in place.



PIPE MOUNTING

To mount gage on 1-1/4" - 2" pipe, order optional A-610 pipe mounting kit.

TO ZERO GAGE AFTER INSTALLATION

Set the indicating pointer exactly on the zero mark, using the external zero adjust screw on the cover at the bottom. Note that the zero check or adjustment can only be made with the high and low pressure taps both open to atmosphere.

MAGNEHELIC® DIFFERENTIAL PRESSURE GAGE

OPERATION

Positive Pressure: Connect tubing from source of pressure to either of the two high pressure ports. Plug the port not used. Vent one or both low pressure ports to atmosphere.

Negative Pressure: Connect tubing from source of vacuum or negative pressure to either of the two low pressure ports. Plug the port not used. Vent one or both high pressure ports to atmosphere.

Differential Pressure: Connect tubing from the greater of two pressure sources to either high pressure port and the lower to either low pressure port. Plug both unused ports.

When one side of the gage is vented in dirty, dusty atmosphere, we suggest an A-331 Filter Vent Plug be installed in the open port to keep inside of gage clean.

A. For portable use of temporary installation use 1/8" pipe thread to rubber tubing adapter and connect to source of pressure with flexible rubber or vinyl tubing.

B. For permanent installation, 1/4" O.D., or larger, copper or aluminum tubing is recommended.

MAINTENANCE

No lubrication or periodic servicing is required. Keep case exterior and cover clean. Occasionally disconnect pressure lines to vent both sides of gage to atmosphere and re-zero. Optional vent valves should be used in permanent installations. The Series 2000 is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.

WARNING

Attempted field repair may void your warranty. Recalibration or repair by the user is not recommended.

TROUBLE SHOOTING TIPS

Gage won't indicate or is sluggish.

1. Duplicate pressure port not plugged.
2. Diaphragm ruptured due to overpressure.
3. Fittings or sensing lines blocked, pinched, or leaking.
4. Cover loose or "O"ring damaged, missing.
5. Pressure sensor, (static tips, Pitot tube, etc.) improperly located.
6. Ambient temperature too low. For operation below 20°F (-7°C), order gage with low temperature, (LT) option.

These instructions cover the set screw and Skwezloc® style ball bearings. It is important that they be read in their entirety before attempting installation or removal. The procedures indicated should be carefully followed. Failure to do so can result in mis- installation which could cause bearing performance problems as well as serious personal injury.

BEARINGS IN BOLT-ON HOUSINGS (UNITS)

1. **CHECK AREA** - Clean and organize bearing installation area, keep well lighted. Be sure mounting surfaces are clean and flat.
2. **CHECK SHAFT** - Shaft should be within tolerance range shown in Table 1, clean, and free of nicks and burrs. Mount bearing on unused section of shafting or repair/replace shafting as required.

TABLE 1 - SHAFTING

SHAFT DIA	SHAFT TOLERANCE
1/2 - 1 15/16 in (12-49mm)	+0 to -.0005in (+0 to -.0125mm)
2 - 3 3/16 in (50-80mm)	+0 to -.0010in (+0 to -.025mm)
3 1/4 - 4 15/16 in (82-125mm)	+0 to -.0015in (+0 to -.040mm)

3. **INSTALL UNIT** - Slide unit onto shaft. If it is difficult to mount bearing on shaft, use a piece of emery cloth to reduce any high spots on shaft. **Do not hammer on any component of the bearing.**
4. **FASTEN UNIT IN PLACE** - Install housing mounting bolts, check and align bearing and tighten mounting bolts to recommended fastener torques. Exercising extreme caution and safety, rotate shaft slowly to center bearing.
5. **SET SCREW INSERTS**
 - a) Set screws in a multiple bearing application should be aligned.
 - b) Torque first set screw to one half recommended torque in Table 2. Torque second set screw to full torque. Torque first set screw to full torque.
6. **DOUBLE LOCK SET SCREW INSERTS**
 - a) Set screws in a multiple bearing application should be aligned.
 - b) On one end of the inner ring, torque first set screw to one half the recommended torque in Table #2. Torque second set screw to full torque. Torque first set screw to full torque.
 - c) Repeat step 5b on opposite end of inner ring.

SEAL MASTER BALL BEARINGS

TABLE 2 - SET SCREW TIGHTENING

SCREW SIZE	HEX. SIZE	TORQUE		
		(in.-lbs.)	(ft.-lbs.)	(N-m)
1/4-28	1/8	65-85	-	7-10
5/16-24	5/32	125-165	-	15-18
3/8-24	3/16	230-300	-	25-34
7/16-20	7/32	350-450	30-40	40-55
1/2-20	1/4	500-650	40-55	55-75
5/8-18	5/16	1100-1440	90-120	120-165

7. SKWEZLOC® INSERT

- Be sure that the Skwezloc® collar is fitted square and snug against the shoulder on the inner ring.
- Torque the Skwezloc® collar cap screw to torque recommended in Table 3.

TABLE 3 - SKWEZLOC® COLLAR TIGHTENING

ENGLISH SCREW SIZE	HEX. SIZE	TORQUE	
		(in.-lbs.)	(N-m)
#8-32	T-25	65-70	7-8
#10-24	T-27	90-100	10-11
1/4-20	T-30	220-240	25-27
5/16-18	T-45	450-495	51-56

WARNING

High voltage and rotating parts may cause serious or fatal injury.

Turn off power to install or service. Operate with guards in place. Read and follow all instructions.

8. MONITOR INSTALLED BEARING

After bearing has been run for several minutes, and again after several hours, check bearing for excessive noise or vibration. Shutdown machine and check housing temp: typical applications operate at 100°F - 150°F (38°C - 66°C) (Similar feel to household hot tap water temp). Tighten all locking devices after 500 hours or 3 months, whichever comes first.

CYLINDRICAL OD INSERTS & INSERTS IN CYLINDRICAL OD HOUSINGS

INSTALL INSERT- Be sure housing bore is clean and free of debris.

Press bearing into housing by applying force to face of outer ring. **Do not hammer on any component of the bearing or apply force to inner ring.** Proceed with Step #1- 6 above. For recommended housing bore tolerance, consult Sealmaster® catalog or phone Sealmaster® application engineering*.

SPHERICAL O.D. & (AR) EXPANSION INSERTS

IMPORTANT

Replacement Sealmaster® bearing inserts are intended for use in Sealmaster® housings. Housings should be thoroughly inspected for damage such as cracks, excessive wear or galling of the spherical seat, obstruction of grease port, etc. prior to installation.

INSTALL INSERT- Housing bearing seat should be wiped clean. Check grease port and clean free of debris. Wet housing bearing seat with oil or grease. Secure housing in a vise.

FOR SPHERICAL OD:

- a) Place bearing insert into housing load slot, positioning the insert outer race dimple and lube hole in line with the casting lube port.
- b) Using a bar slipped into the insert bore as a lever, swing insert into place within the casting. Insert should have a snug fit in housing bore. Do not hammer. (Note: If insert can be made to swivel by hand in the housing bore, fit is too loose - REPLACE ENTIRE UNIT. If heavy force is required, fit is too tight - REPLACE ENTIRE UNIT).
- c) Insure alignment of housing grease port hole and bearing dimple and lube hole.
- d) Place locking pin into lube port and thread lubrication fitting into threaded lube port hole. Grease fitting adjustment is critical (overtightening or undertightening can result in poor bearing performance), snug fit with wrench, then loosen 1/4 turn. Proceed with steps 1-6 above.

SEAL MASTER BALL BEARINGS

FOR EXPANSION TYPE:

- a) Slide bearing into housing. **Do not hammer.**
- b) Insure alignment of housing grease port hole, brass ring lube hole, and bearing dimple.
- c) Place locking pin into housing grease port hole, brass ring lube hole, and bearing dimple. Thread lubrication fitting into threaded housing grease port hole. Grease fitting adjustment is critical (overtightening or undertightening can result in poor bearing performance), snug fitting with wrench, then loosen 1/4 turn. Axial positioning is critical.
- d) Position bearing insert to maximize axial expansion. Proceed with steps 1-6 above.

RELUBRICATION INSTRUCTIONS

Sealmaster® GoldPlex™-HP has been developed based on the performance characteristics of Sealmaster® brand bearings. Sealmaster® brand bearings are factory filled with GoldPlex™-HP and do not need to be greased upon initial installation. GoldPlex™-HP is a lithium complex base, petroleum oil, NLGI grade 2 consistency. If not using GoldPlex™-HP grease, Table #5 is given as a very general recommendation for typical lithium or lithium complex, petroleum oil, NLGI#2 greases. Contact the grease supplier for a more specific lubrication schedule.

Relubricatable Sealmaster® brand bearings are supplied with grease fittings or zerks for ease of lubrication with hand or automatic grease guns. Always wipe the fitting and grease nozzle clean. For safety, stop rotating equipment. Add one half the recommended amount shown in Table #6. Start bearing, and run for a few minutes.

Stop bearing and add the second half of the recommended amount. A temperature rise, sometimes 30°F, after relubrication is normal. Bearing temperatures should not exceed 250°F (121°C). For any applications that are not in the ranges of the table, contact Sealmaster® for suffix modified bearings that can handle temperatures up to 400°F (204°C).

NOTE

The tables on the next page state general lubrication recommendations based on our experience and are intended as suggested or starting points only. For best results, specific applications should be monitored regularly and lubrication intervals and amounts adjusted accordingly.

TABLE 4 - LUBRICATION SCHEDULE FOR SEALMASTER® GOLDPLEXTM-HP

Contamination Level - Clean to Light			
Bearing Temperature	0-500 RPM	500 RPM to 75% of Max Catalog Speed	75% of Max Catalog to Max Catalog speed
-50°F to -30°F	12-24 Months	12-24 Months	12-18 Months
-30°F to 120°F	12-24 Months	12-24 Months	8-18 Months
120°F to 180°F	8-12 Months	6-12 Months	4-8 Months
180°F to 250°F	4-8 Months	3-6 Months	2-4 Months
Contamination Level - Medium			
Bearing Temperature	0-500 RPM	500 RPM to 75% of Max Catalog Speed	75% of Max Catalog to Max Catalog speed
-50°F to -30°F	1 Week-1 Month	1 Week-1 Month	1 Week-1 Month
-30°F to 120°F	1 Week-1 Month	1 Week-1 Month	1 Week-1 Month
120°F to 180°F	Daily-2 Weeks	Daily-2 Weeks	Daily-2 Weeks
180°F to 250°F	Daily-2 Weeks	Daily-2 Weeks	Daily-2 Weeks
Contamination Level - Heavy			
Bearing Temperature	0-500 RPM	500 RPM to 75% of Max Catalog Speed	75% of Max Catalog to Max Catalog speed
-50°F to -30°F	Daily-2 Weeks	Daily-2 Weeks	Daily-2 Weeks
-30°F to 120°F	Daily-2 Weeks	Daily-2 Weeks	Daily-2 Weeks
120°F to 180°F	Daily-2 Weeks	Daily-2 Weeks	Daily-2 Weeks
180°F to 250°F	Daily-2 Weeks	Daily-2 Weeks	Daily-2 Weeks

TABLE 5 - GENERAL LUBRICATION SCHEDULE

Contamination Level - Clean to Light			
Bearing Temperature	0-500 RPM	500 RPM to 75% of Max Catalog Speed	75% of Max Catalog to Max Catalog speed
-50°F to -30°F	Not recommended	Not recommended	Not recommended
-30°F to 120°F	6-12 Months	6-12 Months	4-8 Months
120°F to 180°F	1-3 Months	1-3 Months	Monthly
180°F to 250°F	Daily-2 Weeks	Daily-2 Weeks	Daily-2 Weeks
Contamination Level - Medium			
Bearing Temperature	0-500 RPM	500 RPM to 75% of Max Catalog Speed	75% of Max Catalog to Max Catalog speed
-50°F to -30°F	Not recommended	Not recommended	Not recommended
-30°F to 120°F	1 Week-1 Month	1 Week-1 Month	1 Week-1 Month
120°F to 180°F	Daily-2 Weeks	Daily-2 Weeks	Daily-2 Weeks
180°F to 250°F	Daily-2 Weeks	Daily-2 Weeks	Daily-2 Weeks
Contamination Level - Heavy			
Bearing Temperature	0-500 RPM	500 RPM to 75% of Max Catalog Speed	75% of Max Catalog to Max Catalog speed
-50°F to -30°F	Not recommended	Not recommended	Not recommended
-30°F to 120°F	Daily-2 Weeks	Daily-2 Weeks	Daily-2 Weeks
120°F to 180°F	Daily-2 Weeks	Daily-2 Weeks	Daily-2 Weeks
180°F to 250°F	Daily-2 Weeks	Daily-2 Weeks	Daily-2 Weeks

SEAL MASTER BALL BEARINGS

Compatibility of grease is critical, therefore, if not using Sealmaster® GoldPlex™-HP, consult your grease supplier to ensure compatibility. GoldPlex™-HP is a lithium complex base grease, petroleum oil, NLGI grade 2 consistency.

⚠ NOTE ⚠

Sealmaster® brand bearings with the RM suffix are Reduced Maintenance Bearings (ex. NP-16 RM). Sealmaster® brand reduced maintenance bearings are designed to run with the standard factory fill of GoldPlex™-HP Grease. Units are designed not to be lubricated.

TABLE 6 - RECOMMENDED RELUBRICATION GREASE CHARGE

Shaft Size (in)	oz.	Shaft Size	grams
1/2 to 3/4	0.03	20	0.85
7/8 to 1 3/16	0.10	25-30	2.84
1 1/4 to 1 1/2	0.15	35-40	4.25
1 11/16 to 1 15/16	0.20	45-50	5.67
2 to 2 7/16	0.30	55-60	8.51
2 1/2 to 2 15/16	0.50	65-70	15.59
3 to 3 7/16	0.85	75-80	24.10
3 1/2 to 4	1.50	85-105	42.53

Sealmaster® brand ball bearings now incorporate a unique, color-coding system to help identify the type of grease in the bearings. Each relubricatable Sealmaster® brand bearing features a colored fitting cap to help indicate the type of grease used in the individual bearings. Below is a list of the colored fitting caps and the type of grease they represent. Yellow - Yellow grease fitting caps indicate that bearings are filled with Sealmaster® GoldPlex™-HP high performance mounted bearing grease.

Red - Red grease fitting caps indicate that bearings are filled with factory standard high-temperature grease. (Lithium complex base with synthetic hydrocarbon oil)

White - White grease fitting caps indicate that bearings are filled with factory standard food grade grease. (Aluminum complex with synthetic oil)

Black - Black grease fitting caps indicate that bearings are filled with a non-standard grease.

LINK-BELT BEARING UNITS SERVICE INSTRUCTIONS

Series 6600, 6800, and 6900

IMPORTANT –Read Carefully

These instructions are provided to aid in the proper installation, operation and maintenance of Link-Belt Series 6600, 6800, and 6900 tapered bore spherical roller bearing units. They should be carefully read and followed. Failure to do so may result in unsatisfactory service as well as serious personal injury or property damage.

CAUTION

The reliability built into all Link-Belt bearings can be realized in service only when they are correctly selected, properly installed, protected and maintained.

The correct selection of bearings requires that the magnitude and nature of all loads, speeds, alignment, mounting, operating requirements and maintenance be adequately considered. The selection of materials for and design of housings, shafting, fasteners, seals and accessories as well as provisions for installation and maintenance must follow good engineering principles.

Housings must be selected and installed with regard to the degree and direction of the forces that will occur. Housings should not be used under tension loads except with adequate safety factors. For this reason pillow blocks are best suited to withstand radial loads passing through the base. When heavy loads or shock loads are possible, it is most important to mount a unit so that the line of force passes directly into its base, so the unit is directly and substantially supported other than through its mounting bolts. Where the line of force falls outside the base, such as with horizontal or uplift loads on pillow blocks, serious housing and fastener deflection or failure may occur. These conditions require designs using different materials, fasteners, mounting design, stop bars, etc., together with proper safety factors. When these conditions are unavoidable, Link-Belt Bearing Division should be consulted.

The following general points of installation and operation are very important.

A. Cleanliness - Keep dirt, water, and metal chips off all parts. If cleaning is necessary, use only the solvents listed: Kerosene - Mineral Spirits - Naphtha.

B. Careful Handling - Hammer blows, overheating, or improper use of force can damage precision parts.

C. Adapter Sleeve Tightening - Bearings must be correctly forced up their tapered adapter sleeves to obtain the recommended clearance removal. Improperly tightened bearing and adapter assemblies may slip or turn on the shaft. When mounting bearings on a used or worn shaft, care must be taken to clean up the shaft journal and rebuild, as necessary, to the required tolerances. Never replace bearings on a shaft which is bent or which has been damaged or softened by a torch.

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D. Bolts - Housing mounting bolt and cap bolt tightness is important to prevent the housing from shifting, and to adequately support loads.

E. Free Rotation and Alignment - Check for free rotation before machine start-up to assure that final alignment is proper.

F. Lubrication - Units must be adequately lubricated. A bearing not properly lubricated can run to destruction and possibly cause damage to other components.

INSTALLATION

- 1. Preparation** – Remove parts from carton but do not remove parts from individual wrapping until ready to use. The preservative on the bearing is compatible with most petroleum lubricants and normally need not be removed. Cap and base are machined as matched units and are not interchangeable. Mark each before taking apart to prevent mixing with other bases or caps.
- 2. Mount Housing Base** – Use jack screws in dowel pin holes to disassemble base and cap. Avoid use of pry or wedge at the split line. If oil cup or feed line is used install at this time, using sealant on all plumbing threads. Be sure housing support plate is flat and free from warpage. Bolt base to support square with the shaft. Draw up base mounting bolts snugly, but not to final tightness.
- 3. Check Shaft** – Shafting must be clean, round, straight, free of burrs and nicks and of correct size. Shafts should measure as follows:

1 7/16" to 2"	Nominal to minus .0003"
2 1/16" to 4"	Nominal to minus .0004"
4 1/16" to 6"	Nominal to minus .0005"
6 1/16" to 13"	Nominal to minus .0006"

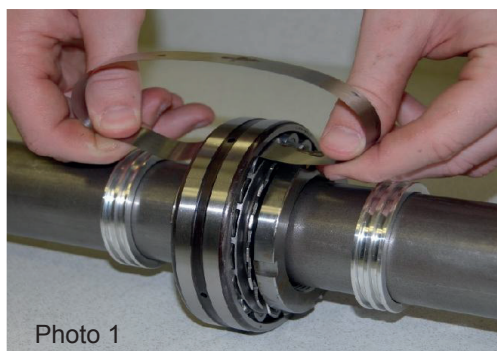
If felt "B" seals are used, be sure that any tool marks or ridges are removed under the seal area. For higher speed operation with felt seals, shaft should be polished or ground to 10-20 micro-inch finish.
- 4. Assembly on Shaft** – Slide steel seal rings if used, bearing, adapter and accessory parts on the shaft in the right order. If felt "B" seals are used, hold these until step 9. Apply mixture of white lead and oil or a powdered dry lubricant to tapered surface and threads of adapter sleeve and to the inside (small) face of the locknut.
- 5. Position on Shaft** – Locate the bearing and sleeve snugly on the shaft in the desired position. Fixed bearings are located with the bearing face opposite the locknut up against the housing shoulder. Expansion bearings are usually centered in the housing seat between the shoulders to allow for shaft expansion or contraction. A shaft with a pair of bearings normally has one fixed and one expansion pillow block. The fixed unit is usually located adjacent to the drive. The fixed bearing takes any thrust

LINK-BELT BEARING UNITS SERVICE INSTRUCTIONS

loads. In locating, take into account that tightening correctly will move the bearing further up the tapered sleeve. Do not tighten locknut beyond finger tight at this time.

6. Install Shaft Assembly – The shaft with bearing assemblies may be lowered into housing bases before or after tightening the bearings, depending on accessibility. Lower slowly and position bearings and seals to engage housing base. If bearing outer rings become misaligned do not force back into position. Instead, carefully work back by turning and sliding. Be sure that the inside of the housing is clean. For felt sealed units check step 10.

7. Tighten Bearings – Bearings must be mounted to achieve the required clearance removal.



a. Measure the initial built-in bearing clearance across the top rollers by sliding the largest possible feeler gage between the rollers and outer ring raceway as shown in Photo 1. A snug or hard feel is recommended. It must be possible to remove the shim by pulling it straight out.

b. Tighten the locknut forcing the bearing up the tapered O.D. of the sleeve until the bearing measured clearance is reduced by the amount shown in Table 1. Follow the tightening procedures outlined in Step 8.

TABLE 1 – BEARING CLEARANCE REDUCTION

Basic Bearing Size, 22200, 22300, 23000		Reduction of Clearance (inches)	
From	Incl	Min.	Max.
09	10	0.0010	0.0012
11	13	0.0012	0.0016
15	16	0.0016	0.0020
17	20	0.0018	0.0024
22	24	0.0020	0.0028
26	28	0.0026	0.0035
30	32	0.0030	0.0039
34	36	0.0031	0.0043
38	40	0.0035	0.0051
44		0.0039	0.0055
48		0.0043	0.0059
56		0.0047	0.0067
60		0.0051	0.0075

8. The preferred method of tightening for easy installation and for not damaging the bearing is illustrated in the two photos 2 and 3. Using a Spanner wrench, tighten the locknut until snug. Hold the adapter sleeve from turning until firmly seated. Using a soft steel bar and a hammer, drive against the face of the locknut as shown to relieve the thread pressure. Retighten the locknut and repeat until

LINK-BELT BEARING UNITS SERVICE INSTRUCTIONS

the correct adjustment specified in Step 7 is obtained. Where space limitations prohibit the above method, use a heavy duty spanner wrench and strike on its handle with a hammer so as to tighten the unit. This is more difficult and requires care to avoid damaging the lockwasher, locknut and housing machine surfaces. With large units a combination of both methods can be successfully used.

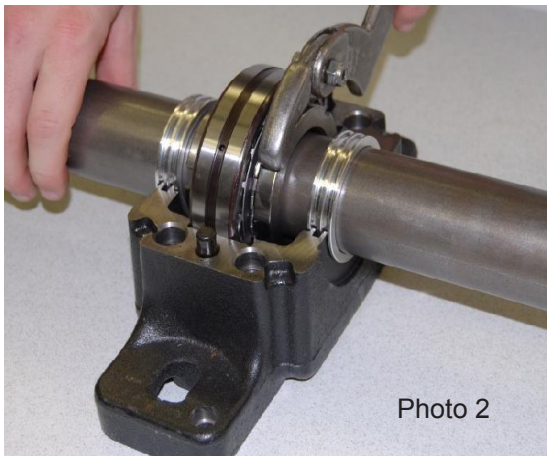


Photo 2

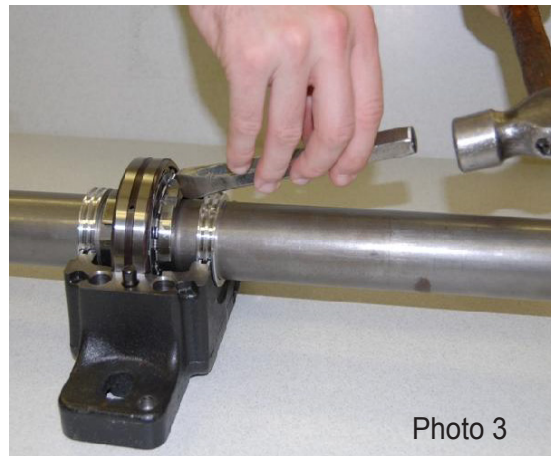
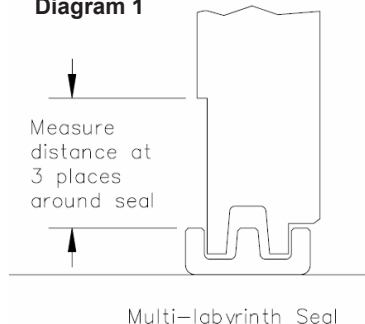


Photo 3

- 9. Secure Locknut** – Bend a tang of the lockwasher down into one of the locknut slots. Use the slot which is most nearly lined up with a tang. On larger units with a lockplate, engage the key of the lockplate in the adapter and bolt to the locknut. Insert “C” spacer in fixed bearing housing, usually on locknut side.
- 10. Felt “B” Seals (if used)** – If felt seal halves are not fastened to the cap with adhesive this should be done. Dry the seal grooves in both sides of the cap to remove oil and preservative. Apply a good quality rubber cement evenly to both the seal O.D. and the housing seal bore. Do not get adhesive on the felt. When adhesive dries to slight tackiness, install the seal halves in the cap. Install the other halves in the base before the shaft is in place, then wet the felts with oil. The shaft holds seals in place for complete drying. Do not operate until adhesive is set.
- 11. Lubricate** – Lubricate before operation. Consult the sections on grease and oil lubrication.
- 12. Install Housing Cap** – For oil lubricated bearings, apply non-hardening gasket compound to cap surfaces which contact the base (Not needed for grease lubrication). Tighten cap nuts or bolts securely. Bolts should be fully tightened with a torque wrench to values in Table 2. Where bearings are to be periodically removed, use 75% of these values. Use oil only on the bolt threads.
- 13. Complete Assembly** – With the mounting bolts snug, check the alignment and freedom of rotation.
“B” seals: Visually check the clearance between the shaft and the bore of the seal. This clearance is small and can be visually checked for uniformity all the way around the seal. “R” or “H” seals: Measure the distance between the outside diameter of the seal and the diameter of the housing counterbore in three places. Be sure that each measurement is taken 90 degrees from the previous measurement. All three measurements should be uniform to insure proper alignment. See Diagram 1.

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Diagram 1



Align by shimming or shifting as necessary. Use large area shims to avoid distorting the housing and pinching the bearing. Appropriate use of stop bars against faces or ends of feet opposite the direction of load or vibration to avoid shifting of the housing is recommended. Dowel pins can be equally effective if properly used. This is especially important where loads are not directly down through the base. Finally, tighten or torque mounting bolts securely. Up to SAE Grade 5 mounting bolts can be used, properly torqued, to mount cast iron housings. Up to SAE Grade 8 mounting bolts can be used, properly torqued, to mount cast steel housings.

TABLE 2 – RECOMMENDED HOUSING CAP BOLT TIGHTENING TORQUES*

Cast Iron Pillow Blocks			
Series 6800/6600	Tightening Torque (lb-ft)	Series 6900/SAF22600	Tightening Torque (lb-ft)
6823-6840	45-50	6923-6932	45-50
6841-6852	90-100	6933-6944	90-100
6853-6868	160-180	6945-6948	160-180
6869-6872	280-330	22618	90-100
6873-68104	400-430	22620-22622	160-180
68105-68115	630-700	22624-22626	160-180
68117-68128	800-890	22628-22630	220-250
66129-66144	630-700	22632	320-350
66145-66168	800-890	22634	450-500
66169-66176	1400-1500		

Cast Steel Pillow Blocks			
Series 6800	Tightening Torque (lb-ft)	Tightening Torque (lb-ft)	
		Load Directed into Base	Load Directed into Cap
6839-6840		50-65	80-110
6841-6848		100-130	160-220
6853-6864		170-230	300-400
6869-6872		280-370	490-650
6873-6880		410-550	730-970
6883-68104		580-780	1030-1370
68105-68116	66129-66144	820-1100	1450-1940
68117-68128	66B151-66168	1430-1900	2530-3370
	66169-66176	1400-1550	2530-3370

*Lower torque values are for oil lubricated threads.

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GREASE LUBRICATION

Grease lubrication is recommended wherever conditions in Table 3 exist. For conditions which are not completely covered in Table 3 consult Link-Belt Bearings Division. The greases listed are for a general guide. Don't use lubricants of dibasic ester types in bearings having polymeric roller cages without consulting Link-Belt Bearing Division. A reputable lubricant manufacturer should be consulted to confirm the lubricant selection and application.

How to Grease – Grease these units by packing the bearing full and filling the reservoir on both sides of the bearing up to the bottom of the shaft. Grease should be forced in one side of the bearing until it comes out the other side all the way around.

For slow speed application, bearings and housings can be 100% filled. This is good practice for lubrication under heavy loads, moisture or dirt. To assure 100% fill, add final grease through the fitting after final assembly until it comes out the seals.

Relubrication After Running – Relubrication of units in service should be through the fitting or hole in the center of the unit when bearings with lube holes and grooves are used as normally supplied. The amount of grease used should be enough to purge old grease from the bearing only (not the entire pillow block) and form a cushion of grease adjacent to the bearing face.

High Speed Operation – Consult Table 3 for a guide to correct greases and frequency of relubrication. High speed bearings will not operate satisfactory when packed full of grease. As relubrication will eventually fill the housing cavities, it may be necessary to remove the cap periodically, clean out the old lubricant and repack with the original amount.

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TABLE 3 – GREASE LUBRICATION OF ROLLER BEARING SPLIT PILLOW BLOCKS

Ambient conditions		Operating conditions		Bearing operating temperature		Suggested greasing interval **	Use these greases or equivalent
Dirt	Moisture	Load	Speed	Low	High		
Clean	Dry	Light to medium	Slow to medium	0	120	2 to 6 months	High quality NLGI #1 or 2 multi-purpose bearing greases are generally satisfactory. Consultation with a reputable lubricant supplier is recommended.
				120	200	1 to 2 months	
Moderate to Dirty	Dry	Light to medium	Slow to medium	0	120	1 to 4 weeks	
				120	200	1 to 7 days	
Extreme Dirt	Dry	Light to medium	Slow to medium	0	200	Daily-flushing out dirt	
*	High humidity Direct water splash	Light to heavy	Slow to medium	32	200	1 to 4 weeks grease at shutdowns	Exxon Mobil Oil Co., Exxon Ronex MP; Texaco Inc., RB2; Shell Oil Co., Alvania EP2
		Heavy to very heavy	Slow	0	200	1 to 8 weeks	Shell Oil., Alvania EP2
				-20	120	1 to 8 weeks	Mobil Oil Corp., Mobiltemp 78
		Light	High Speed	100	200	1 to 8 weeks	Imperial Oil & Grease Co., Molub-Alloy No. 2; Gulf Oil Corp., Gulfcrown No. 2; Texaco Inc., Molytex No. 2
	Possible frost	Light to heavy	Slow to medium	-65	+250	1 to 4 weeks grease at shutdowns	Esso, Beacon 325; Texaco Inc., 2346EP Low Temp; Shell Oil Co., Aeroshell 7A
Clean to moderate	Dry	Light to medium	Slow to medium	80	250	1 to 8 weeks	Union Oil Co., Unoba EP No. 2; Texaco Inc., 1999 Hi-Temp
Clean to dirty	Dry	Light	Slow	80	300	1 to 4 weeks	Keystone Lubricants Co., No. 89; Dow Chemical Co., DC44

* Additional bearing protection or special sealing may be required. Consult Link-Belt Bearing Division.

** Suggested starting interval for maintenance program. Check grease condition for oiliness and dirt and adjust greasing frequency accordingly. Watch operating temperatures. Sudden rises may show need for grease or indicate over lubrication on higher speed applications.

OIL LUBRICATION

Oil Cup or Oil Bath Lubrication – Oil cups can be applied for use as a self-contained oil bath system. Oil bath lubrication is not recommended for speeds above the catalog oil speed limits, where excessive oil churning or misting occurs, or where there is air flow across the housing, which will pull oil out through the seals due to different pressures.

Oil levels are controlled by sight gages, oil cups, etc. These should be used in conjunction with a vent or breather cap. Proper static oil levels are shown in Table 4. Cups or sight gages should be carefully marked.

Circulating Oil Lubrication – Oil circulation systems can be used under a wider variety, or under more extreme operating conditions than any other lubrication method. They are especially valuable for high

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speed and high temperature service to provide better lubrication and cooler operation.

A complete circulation system includes the use of pressure pump, a heat exchanger (or a method of cooling oil), an adequate sump, a filter to remove particles over 20 micron in size and safety devices such as pressure and temperature warning devices and filter bypasses. It is also best to tap oversize drain holes in the housing or to provide a suction pump to positively remove oil from the housing. Oil should be removed from both sides of the housing, but where speeds are not high one side may be sufficient. It is recommended that the circulation system have a separate motor so that the oil flow can be started in advance of bearing rotation. Experimentation with pressure flow rates, temperature, and viscosity is often necessary to establish the best possible bearing lubrication.

Oil Viscosity – The required viscosity for good lubrication depends on starting temperatures, operating temperatures, and speed. The recommended viscosity level for bearings operating within catalog speed limits is between 100 and 150 Saybolt seconds (SSU) at operating temperature for oil exit temperature on circulating systems. Slow speed heavily loaded bearings require much higher viscosities. Consult Link-Belt Bearing Division.

Where starting temperatures are very low compared to operating temperatures, heaters may be necessary to provide oil flow in the lines or to provide adequate lubrication at start-up.

Maintenance and Lubrication - Oil cup or oil bath systems require close attention because of the limited amount of oil in the system. Frequent changing of oil is necessary in these systems to avoid lubricant breakdown.

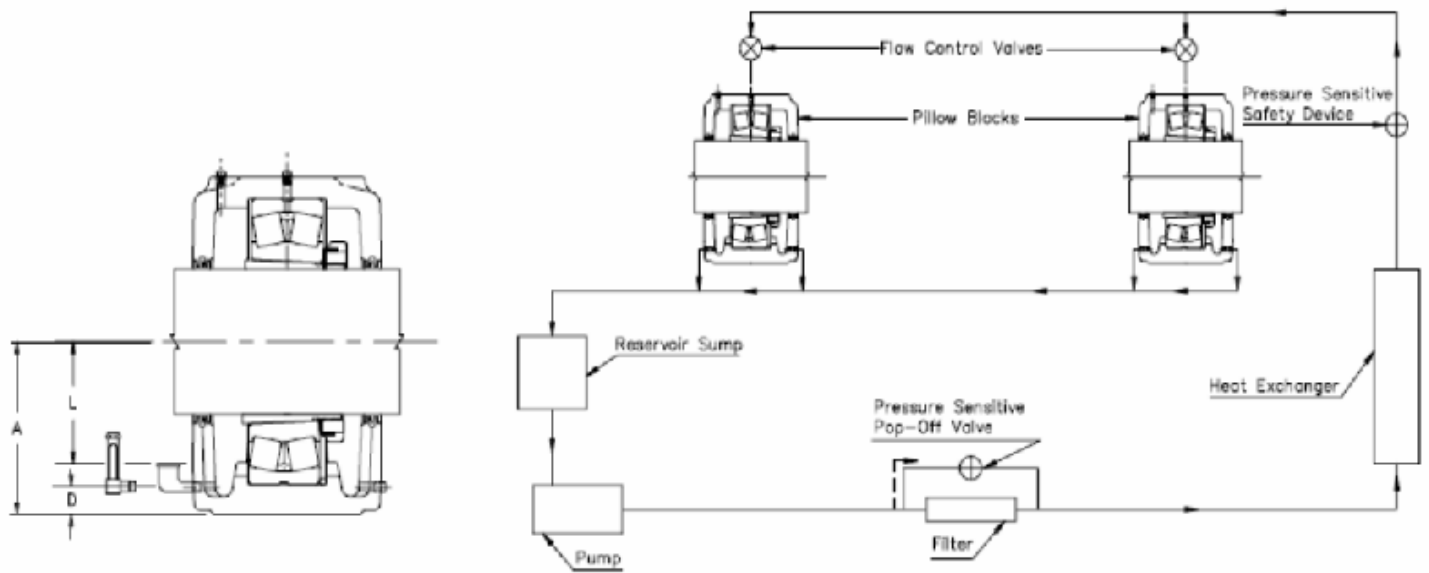
Oil circulating systems, properly equipped with safety devices, require minimum attention after they are once satisfactorily adjusted. Frequency of changing the oil in the system depends upon the severity of the operation and size of the reservoir. Also, summer and winter grades of oil may be required, to stay within the recommended viscosity limits for good lubrication.

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TABLE 4 – STATIC OIL LEVEL

Block Number	A	D	L		Block Number	A	D	L		Block Number	A	D	L	
			High	Low				High	Low				High	Low
	Inches					Inches					Inches			
6823, 6824	2 1/4	7/16	1 9/32	1 3/8	6887	6 11/16	1	4 15/32	4 21/32	6935	3 1/2	3/4	2 1/32	2 5/32
6827, 6828	2 1/2	9/16	1 3/8	1 15/32	6895, 6896	7 1/16	1 1/8	4 3/4	4 15/16	6939, 6940	4	3/4	2 11/32	2 1/2
6831, 6832	2 3/4	9/16	1 17/32	1 5/8	68103	7 1/2	1 1/8	4 31/32	5 9/32	6943	4 1/4	7/8	2 15/32	2 5/8
6835, 6836	3	1/2	1 27/32	1 15/16	68111, 68112	7 7/8	1 1/4	5 1/4	5 7/16	6947	4 1/2	7/8	2 23/32	2 13/16
6839	3 1/4	5/8	2 1/32	2 1/4	68115	8 1/4	1 3/8	5 9/16	5 3/4	22618	4 3/4	1 3/32	2 25/32	2 31/32
6843	3 1/2	3/4	2 3/16	2 9/32	68120 - 68128	9 1/2	2 1/2	6 5/32	6 11/32	22620	5 1/4	1	3 1/8	3 5/16
6847, 6848	3 3/4	13/16	2 3/16	2 15/32	66135 - 66144	8 1/4	1 3/8	5 15/16	6 1/8	22622	6	1 1/4	3 15/32	3 21/32
6851	4	3/4	2 15/32	2 5/8	66B151, 66B152	9 1/2	1 1/2	6 15/16	7 1/8	22624	6 5/16	1 3/16	3 25/32	3 31/32
6855, 6856	4 1/2	7/8	2 25/32	2 15/16	66159, 66160	9 1/2	1 1/2	6 15/16	7 1/8	22626	6 11/16	1 1/16	4 3/32	4 9/32
6859 - 6864	4 15/16	7/8	3 1/16	3 7/32	66167, 66168	9 1/2	1 1/2	6 15/16	7 1/8	22628	7 1/16	1 3/16	4 3/8	4 9/16
6867	5 1/4	1	3 5/16	3 1/2	66175, 66176	12	2 7/8	7 13/32	7 23/32	22630	7 1/2	1 3/16	4 11/16	4 7/8
6871, 6872	6	1 1/4	3 9/16	3 3/4	6923, 6924	2 3/4	11/16	1 7/16	1 17/32	22632	7 7/8	1 5/16	4 31/32	5 5/32
6879, 6880	6	1 1/16	3 7/8	4 1/16	6927	3	9/16	1 19/32	1 11/16					
6883	6 5/16	1 1/16	4 5/32	4 11/32	6931, 6932	3 1/4	13/16	1 23/32	1 13/16					

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Schematic Diagram of Circulating Oil System

LIMITED WARRANTY – LIABILITY

A. IT IS EXPRESSLY AGREED THAT THE FOLLOWING WARRANTY IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY. INCLUDING THOSE OF **MERCHANTABILITY** AND FITNESS FOR A PARTICULAR PURPOSE, AND OF ANY OTHER OBLIGATION OR LIABILITY ON OUR PART OF ANY KIND OR NATURE WHATSOEVER.

No representative of ours has any authority to waive, alter, vary or add to the terms hereof without prior approval in writing, to our customer, assigned by an officer of our company. It is expressly agreed that the entire warranty given to the customer is embodied in this writing; that this writing constitutes the final expression of the parties' agreement with respect to warranties; and that it is a complete and exclusive statement of the terms of the warranty.

We warrant to our customers that all Products manufactured by us will be free from defects in material and workmanship at the time of shipment to our customer for a period of one (1) year from the date of shipment. All warranty claims must be submitted to us within ten days of discovery of defects within the warranty period, or shall be deemed waived. As to Products or parts thereof that are proven to have been defective at the time of shipment, and that were not damaged in shipment, the sole and exclusive remedy shall be repair or replacement of the defective parts or repayment of the proportionate purchase price for such Products or parts, at our option. Replacement parts shall be shipped free of charge f.o.b. our factory.

This warranty shall not apply to any Product which has been subject to misuse; misapplication, neglect (including but not limited to improper maintenance and storage); accident; improper installation,

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modification (including but not limited to use of unauthorized parts or attachments), adjustment, repair or lubrication. Misuse also includes, without implied limitation, deterioration in the Product or part caused by chemical action, wear caused by the presence of abrasive materials, and improper lubrication. Identifiable items manufactured by others but installed in or affixed to our Products are not warranted by us but bear only those warranties, express or implied, given by the manufacturer of that item, if any.

Responsibility for system design to insure proper use and application of Link-Belt Products within their published specifications and ratings rests solely with customer. This includes without implied limitation analysis of loads created by torsional vibrations within the entire system regardless of how included.

B. It is expressly agreed that our liability for any damages arising out of or related to this transaction, or the use of our Products, whether in contract or in tort, is limited to the repair or replacement of the Products, or the parts thereof by us, or to a refund of the proportionate purchase price. We will not be liable for any other injury, loss, damage or expense, whether direct or consequential, including but not limited to loss of use, income, profit, production, or increased cost of operation, or spoilage of or damage to material, arising in connection with the sale, installation, use of, inability to use, or the replacement of, or late delivery of, our Products.

C. It is also expressly agreed that any cause of action for breach of any warranty must be brought within one year from the date of the breach.

TIRES & WHEELS



AXLES & COMPONENTS

SUSPENSIONS & COMPONENTS

BRAKES & COMPONENTS

TIRES & WHEELS

FENDERS & BODY

JACKS & COUPLERS

BRAKE CONTROL SYSTEMS

TOWING & ACCESSORIES

HARDWARE & ACCESSORIES

MARINE COMPONENTS

PAINT & LUBRICANTS

LIGHTS & ELECTRICAL

PACKAGED PRODUCTS

WHEEL TERMINOLOGY

Capacity

A load rating based upon the physical and design properties. Factors such as materials, vertical load, side load, mounting configuration, tire pressures, rotational torque and speed all affect a given rating. Wheels designed for vehicle applications at highway speeds receive special side load testing and will have a D.O.T. designation stamped on the inner rim. Some wheels are designed and designated "For Trailer Use Only" and will bear a stamped identification of this purpose located on the inner rim. Always take notice of pressure ratings when choosing a tire and wheel combination. Not all wheels are rated at the pressures required by some modern tire constructions to achieve a desired load rating. Consult your local branch or tire distributor for more information when in doubt of a possible tire and wheel combination capacity.

Width

The normal width measured between the bead seats.

Diameter

The nominal diameter measured from the bottom of the bead seat.

Backset

The distance measured from the mounting face of the disc to the inboard bead seat of the rim.

Offset

The distance measured between the mounting face of the disc and the rim centerline. The offset is termed positive (+) when the mounting face is outboard of the rim centerline thereby

effectively increasing backset. The offset is termed negative (-) when the mounting face is inboard of the rim centerline thereby effectively reducing backset.

Pilot

The diameter of the pilot hole on the disc which coincides with the pilot diameter on the hub. Interference between these two measurements is critical when dealing with pilot mount wheels where the load is carried on the hub pilot.

Bolt Circle

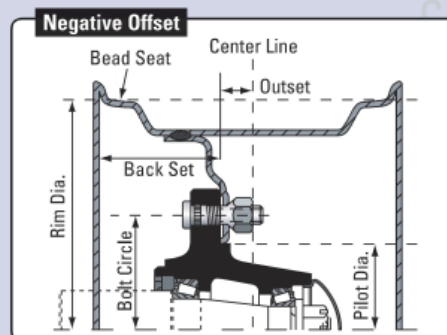
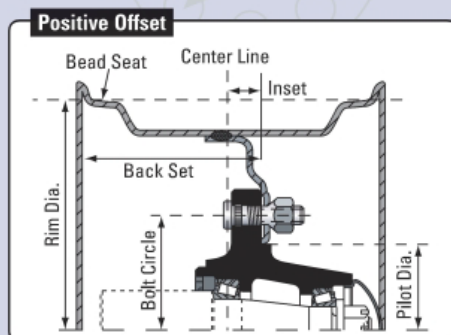
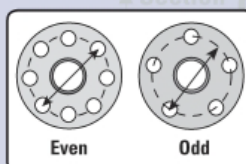
The diameter at which bolt holes are located for mounting purposes. Note: We offer a bolt circle template for measuring 5 bolt circles. (Part # "BCT")

Bolt Pattern

The mounting pattern including the number of bolt holes and the bolt circle.

Bolt Pattern Codes

CODE	DESCRIPTION
4-40	4 on 4.0"
5-45	5 on 4.5"
5-475	5 on 4.75"
5-50	5 on 5.0"
5-55	5 on 5.5"
6-55	6 on 5.5"
6-60	6 on 6.0"
6-875	6 on 8.75"
8-170	8 on 170mm
8-225	8 on 225mm
8-275	8 on 275mm
8-65	8 on 6.5"
8-80	8 on 8.0"
10-285	10 on 285.75mm
10-335	10 on 335mm
10-725	10 on 7.25"
10-875	10 on 8.75"
10-1125	10 on 11.25"



WHEEL CLAMPING METHODS

Stud Mount

A mounting method where the weight of the load is transferred from the axle to the wheel via the studs. Common in most steel wheels up to and including some 16" diameters. Typically uses .5" thru .625" studs and a 60 degree cone nut. The cone nut mates to a matching raised cone or coined surface in the wheel to effectively transfer the weight through the stud. The coined or raised surface also serves to retain nut torque by pushing outward against the

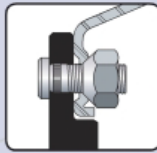
nut. This style of wheel generally does not have a pilot hole that closely matches the hub pilot.



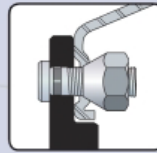
CAUTION!! Some custom style wheels incorporate a coined circle that encompass the entire bolt pattern area for torque retention purposes. Care must be taken to ensure that there is proper contact between the hub and the outer ring land of the coined circle. Failure to do so will greatly increase the risk of torque loss.



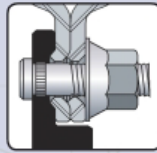
TIRES & WHEELS



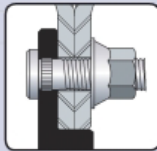
Stud Piloted Single
w/ 60 Deg Cone Nut



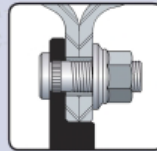
Stud Piloted Single
w/ 90 Deg Cone Nut



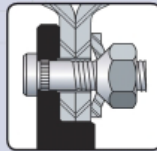
Stud Piloted Dual
w/ 1 Piece Flange
Nut



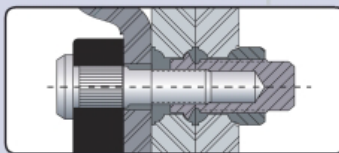
Hub Piloted Dual
w/ 1 Piece Flange
Nut



Hub Piloted Dual
w/ 2 Piece Flange
Nut



Hub Piloted Dual
w/ Clamp Ring & 90
Deg Cone Nut



Stud Piloted Dual w/ 2 Piece
Spherical Ball Seating Nut

Pilot Mount

A mounting method where the weight of the load is transferred from the axle to the wheel via the pilot. Common in steel wheels 16" in diameter and larger where there is a flat faced surface at the point where the nut mates to the wheel and the wheel mates to the hub. Typically uses either a clamping ring with a 90 degree nut, requiring less torque, or a flanged nut .625" or larger in thread diameter. The clamping ring method provides a coined surface to retain nut torque which is similar in method to a stud mount wheel. A flanged nut retains torque via the compression of the large outer flange. The measurement of the wheel pilot and the hub pilot is very closely matched so that the weight is transferred via the pilots and not the studs.

Torque Requirements

It is a necessary procedure to periodically check the torque levels of your wheel nuts. They must be maintained at the appropriate level to prevent loose or damaged wheels, potentially broken studs and to prevent wheel separation from the axle.



CAUTION!! On new axle and wheel combinations it is critical that the proper torque procedures are followed. Initial torque can and will be reduced by factors such as wheel stud stretch or seating, lug nut to wheel surface seating and hub to wheel mating surface seating.

Recommended Torque Values

BOLT PATTERN	WHEEL TYPE	THREAD SIZE	MOUNTING PILOT	NUT TYPE	TORQUE (FT. LBS)
5 on 4.5" to 5.5"	Single	.5"-20	Stud	60 Deg. Cone	80 - 90
6 on 5.5"	Single	.5"-20	Stud	60 Deg. Cone	80 - 90
8 on 6.5"	Single	.5"-20	Stud	60 Deg. Cone	80 - 90
8 on 6.5"	Single	.5625"-18	Stud	60 Deg. Cone	130 - 150
8 on 6.5"	Single	.625"-18	Hub	90 Deg. Cone	175 - 200
8 on 6.5"	Single	.625"-18	Hub	90 Deg. Cone	175 - 200
8 on 6.5"	Dual	.5625"-18	Hub	Two Piece Flange	125 - 165
8 on 6.5"	Dual	.625"-18	Stud	One Piece Flange	275 - 325
8 on 6.5"	Dual	.625"-18	Hub	Two Piece Flange	130 - 170
8 on 6.5"	Dual	.625"-18	Hub	90 Deg. Cone w/ Clamp Ring	175 - 225
8 on 6.5"	Dual	.625"-18	Hub	90 Deg. Cone w/ Clamp Ring	136 - 144
8 on 170mm	Dual	M14x2.0	Hub	Two Piece Flange	150 - 160
8 on 225mm	Dual	M14x2.0	Hub	Two Piece Flange	150 - 160
8 on 275mm	Dual	M20x1.5	Hub	Two Piece Flange	280 - 330
10 on 7.25"	Dual	.5625"-18	Hub	Two Piece Flange	125 - 165
10 on 7.25"	Dual	.625"-18	Hub	90 Deg. Cone w/ Clamp Ring	171 - 179
6 on 8.75" - 10 on 8.75" & 11.25"	Dual	.75"-16	Stud	.875" Spherical Radius Inner Ball Seat	450 - 500
6 on 8.75" - 10 on 8.75" & 11.25"	Dual	1.125"-16	Stud	.875" Spherical Radius Outer Ball Seat	450 - 500
8 on 275mm - 10 on 285.75mm & 335mm	Dual	M22x1.5	Hub	Two Piece Flange	450 - 500
Cast Spoke	Rim	.625"-11	N/A	Flat Nut	160 - 200
Cast Spoke	Rim	.75"-10	N/A	Flat Nut	200 - 260

Note: The above table is a generalization of basic values. Consult your wheel manufacture and axle manufacture for specific values.

TORQUE (Continued On Next Page)

D-3

AXLES &
COMPONENTS

SUSPENSIONS &
COMPONENTS

BRACKS &
COMPONENTS

**TIRES &
WHEELS**

FENDERS
& BODY

JACKS &
COUPLERS

BRAKE CONTROL
SYSTEMS

TOWING &
ACCESSORIES

HARDWARE &
ACCESSORIES

MARINE
COMPONENTS

PAINT &
LUBRICANTS

LIGHTS &
ELECTRICAL

PACKAGED
PRODUCTS

TIRES & WHEELS



AXLES &
COMPONENTS

SUSPENSIONS &
COMPONENTS

BRAKES &
COMPONENTS

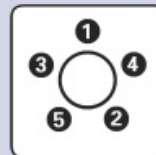
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LS

TORQUE (Continued)

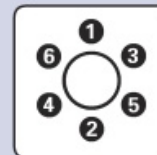
Torque Procedure

1. After mounting a wheel over the studs, thread and snug the lug nuts on the studs by hand. This will reduce the possibility of cross threading.
2. Following the order of the "Torque Sequence" illustration for your particular bolt pattern, torque the lug nuts to 25 ft lbs.
3. Again, in sequential order, torque the lug nuts to 50% of their final torque value.
4. Finally, in sequential order, torque the lug nuts to 100% of their final torque value.
5. Re-torque after the first 25 miles, 50 miles, and again at 100 miles of use. Check periodically thereafter

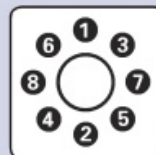
Note: "Torque Warning" decals are available.



Five Stud



Six Stud



Eight Stud



Ten Stud



PRODUCT DESCRIPTION

Mobilith SHC™ Series greases are supreme performance products designed for a wide variety of

applications at extremes of temperature. They combine the unique features of synthetic base fluids with those of a high quality lithium complex thickener. The wax-free nature of synthetic fluids and the low coefficient of traction (compared with mineral oils), provide excellent low temperature pumpability and very low starting and running torque. These products offer the potential for energy savings and can reduce operating temperatures in the load zone of spherical roller and ball bearings. The lithium complex thickener contributes excellent adhesion, structural stability and resistance to water. The greases have a high level of chemical stability and are formulated with special additive combinations to provide excellent protection against wear, rust and corrosion, and providing operating viscosity at high and low temperatures. Mobilith SHC Series greases are available in seven grades, varying in base oil viscosity from ISO VG 100 to 1500 and in NLGI grade from 2 to 00.

Mobilith SHC Series greases have become the products of choice for many users, in many industries worldwide. Their reputation is based on their exceptional quality, reliability, versatility and the performance benefits they deliver.

FEATURES AND BENEFITS

The Mobil SHC brand of oils and greases are recognized and appreciated around the world for their innovation and outstanding performance. The Mobilith SHC series symbolizes ExxonMobil's continued commitment to using advanced technology to provide outstanding products. A key factor in the development of the Mobilith SHC Series were the close contacts between our scientists and application specialists with key Original Equipment Manufacturers (OEMs) to ensure that our product offerings would provide exceptional performance in the continually evolving industrial equipment designs.

Our work with equipment builders has helped confirm the results from our own laboratory tests showing the exceptional performance of the Mobilith SHC Series lubricants. These benefits include longer grease life, enhanced bearing protection and bearing life, wide temperature range of application, and the potential for improved mechanical efficiency and energy savings.

To combat high thermal exposure of the oil our product formulation scientists chose proprietary synthetic base oils for Mobilith SHC Series oils because of their exceptional thermal/oxidative resistance potential. Our scientists developed a state-of-the-art lithium complex thickener technology and used specific additives to enhance the performance of each grade of the Mobilith SHC Series product family. The Mobilith SHC Series greases offer the following features and benefits:

Features

- Outstanding high temperature and low temperature performance

MOBILITH SHC SERIES GREASE

- Excellent protection against wear, rust and corrosion
- Excellent thermal stability and oxidation resistance
- Low traction coefficient
- Includes both high and low viscosity grades
- Outstanding structural stability in the presence of water
- Low volatility

Advantages and Potential Benefits

- Wide application temperature ranges, with excellent protection at high temperatures and low torque, easy start-up at low temperatures Reduced downtime and maintenance costs because of reduced wear, rust and corrosion Extended service life with longer intervals between relubrication and improved bearing life Potential improved mechanical life and reduced energy consumption.
- Options for outstanding protection of slow speed, heavily loaded bearings, and options for good low temperature performance.
- Retains excellent grease performance in hostile aqueous environments.
- Helps resist viscosity increase at high temperatures to maximize relubrication intervals and bearing life.

APPLICATIONS

Application Considerations: While Mobilith SHC Series greases are compatible with most mineral oil based products, admixture may detract from their performance. Consequently it is recommended that before changing a system to one of the Mobilith SHC Series, it should be thoroughly cleaned out to achieve the maximum performance benefits. While the Mobilith SHC Series greases share many performance benefits, their applications are best described in terms of each product grade:

- Mobilith SHC 100 is an antiwear and extreme pressure grease primarily recommended for higher speed applications such as electric motors, where reduced friction, low wear and long service life are required. It is an NLGI 2 Grade / ISO VG 100 grease with a synthetic base fluid. Its operating temperature range is -40° C* to 150° C.
- Mobilith SHC 220 is a multi-purpose, NLGI 2 extreme pressure grease recommended for heavy-duty automotive and industrial applications. It uses an ISO VG 220 synthetic base fluid. Mobilith SHC 220 has a recommended operating temperature range of -40° C* to 150° C.

- Mobilith SHC 221 is a multi-purpose, extreme pressure grease recommended for heavy-duty automotive and industrial applications, particularly where centralized grease systems are utilized. It uses an ISO VG 220 synthetic base fluid. Mobilith SHC 221 has a recommended operating temperature range of -40° C to 150° C.
- Mobilith SHC 460 is an NLGI 1.5 Grade grease with ISO VG 460 synthetic base fluid and is an extreme pressure grease recommended for tough industrial and marine applications. It provides outstanding bearing protection under heavy loads at low-to- moderate speeds and in applications where water resistance is a critical factor. Mobilith SHC 460 has demonstrated outstanding performance in steel mills, paper mills and marine applications. The recommended operating temperature range is -30° C* to 150°C.
- Mobilith SHC 1000 Special is an NLGI 2 Grade grease with ISO VG 1000 synthetic base fluid and strongly fortified with solid lubricants including 11% graphite and 1% molybdenum disulphide for maximum protection of plain or rolling element bearings operating under boundary lubrication regimes. This product is designed to extend bearing life under conditions of extremely slow speeds, sliding contacts, and high temperatures. Mobilith SHC 1000 Special has a recommended operating temperature of -30°C* to 150°C with appropriate relubrication intervals.
- Mobilith SHC 1500 is an NLGI 1.5 Grade / ISO VG 1500 grease with a synthetic base fluid. It is intended for use in plain and rolling element bearings operating at extremely slow speeds, under heavy loads and high temperatures. Mobilith SHC 1500 has a recommended operating temperature range of -30°C* to 150°C with appropriate relubrication intervals. Continuous lubrication with Mobilith SHC 1500 has been very effective in prolonging bearing life in a severe roll press application. Mobilith SHC 1500 has also provided excellent performance in rotary kiln roller bearings and in slag transfer rail car bearings.
- Mobilith SHC 007 is an NLGI 00 Grade / ISO VG 460 grease with a synthetic base fluid; it has a recommended operating temperature range of -50° C to 150° C with appropriate relubrication intervals. Its primary uses are in grease filled industrial gear cases subject to high temperatures, where conventional semi fluid greases will not provide acceptable lubricant life and in non-driven heavy-duty truck trailer wheel hubs.

*Low temperature claims based on ASTM D 1478 results vs. maximum limits of 10,000 / 1000 gcm @ startup and 1 hour respectively.

MOBILITH SHC SERIES GREASE

SPECIFICATIONS AND APPROVALS

**Mobilith SHC Series meets
or exceeds the
requirements of:**

	100	220	221	460	1000 Special	1500	007
DIN 51825: (2004-06)	KPHC 2N-40	KPHC 2N-30	-	KPHC 1- 2N-40	KPFHC 2N-30	KPHC 1- 2N-30	-
DIN 51826: (2005-01)	-	-	-	-	-	-	GPHC

**Mobilith SHC Series meets
or exceeds the
requirements of:**

100	220	221	460	1000 Special	1500	007
						00K-30

**Mobilith SHC Series has
the following builder
approvals:**

	100	220	221	460	1000 Special	1500	007
AAR-942	X	-	X	-	-	-	-
MAG IAS, LLC	P-73			P-64			P-81

SPECIFICATIONS AND APPROVALS

Mobilith SHC Series	100	220	221	460	1000 Special	1500	007
NLGI Grade	2	2	1	1.5	2	1.5	00
Thickener Type	Lithium Complex	Lithium Complex	Lithium Complex	Lithium Complex	Lithium Complex	Lithium Complex	Lithium Complex
Color, Visual	Red	Red	Light Tan	Red	Grey Black	Red	Red
Penetration, Worked, 25°C, ASTM D 217	280	280	325	305	280	305	415
Dropping Point, °C, ASTM D 2265	265	265	265	265	265	265	-
Viscosity of Oil, ASTM D 445 cSt @ 40°C	100	220	220	460	1000	1500	460
4-Ball Weld, ASTM D 2596, Load, Kg	250	250	250	250	620	250	250
Water Washout, ASTM D 1264, 79 °C, % Wt. Loss	6	3	4	3	2.6	2.5	-
Rust Protection, ASTM D 6138, Distilled Water	0,0	0,0	0,0	0,0	0,0	0,0	-
Corrosion Protection, ASTM D 1743, Rating	Pass	Pass	Pass	Pass	Pass	Pass	-
4-Ball Wear, ASTM D 2266, Scar, mm	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Low Temperature Torque, ASTM D 1478, Torque @	9520/21994	361/836	---	9060/2944	---	1874/1000	---
Startup/1 Hour in gm and Test T°	@ -50 °C	@ -40 °C	---	@ -40 °C	---	@ -20 °C	---
U.S. Mobility, AM-S 1390, -18 °C, gms/min	20.0	11.0	---	5.0	---	3.0	---

MOBILITH SHC SERIES GREASE

HEALTH AND SAFETY

Based on available information, this product is not expected to produce adverse effects on health when used for the intended application and the recommendations provided in the Material Safety Data Sheet (MSDS) are followed. MSDS's are available upon request through your sales contract office, or via the Internet. This product should not be used for purposes other than its intended use. If disposing of used product, take care to protect the environment.

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11-2012

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NOTES

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