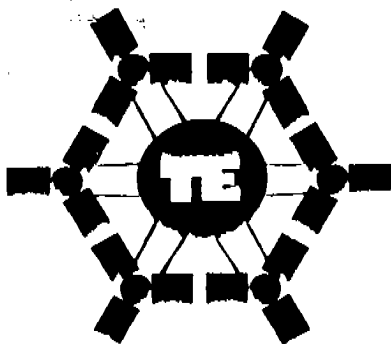




Tivoli Enterprises Ltd

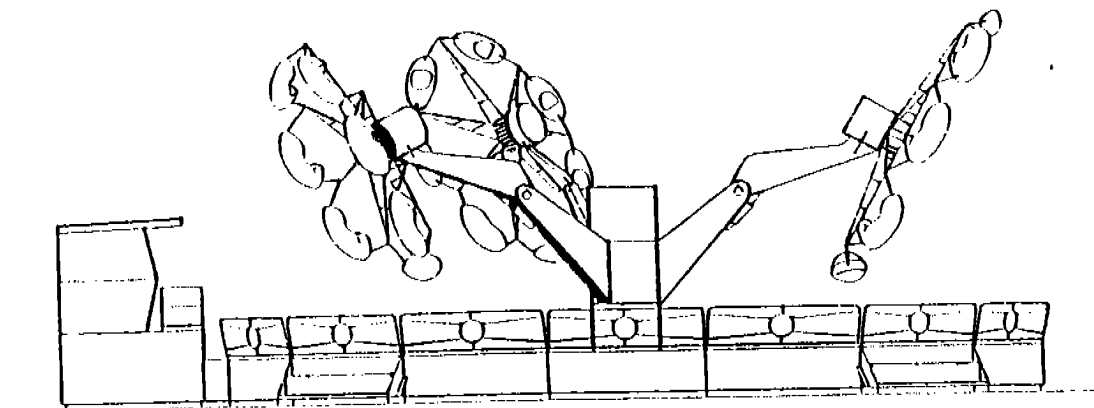
Howfield Lane, Chartham, Canterbury, Kent CT4 7HG England.
Telephone: 0227 731156

MFG: TIVOLI
NAME: STAR FORCE
TYPE: NON-KIDDIE

STAR FORCE

(SCORPION)

OPERATION AND MAINTENANCE MANUAL



This Manual has been prepared by TIVOLI ENTERPRISES LTD. for use by Owners and Operators of the STAR FORCE AMUSEMENT RIDE. It is our recommendation that this manual be read and understood so the Star Force Amusement Ride can be operated economically and safely.

The information in this manual is to be used in guiding the operator in daily inspections and maintenance procedures. Since it is the intent of TIVOLI ENTERPRISES LTD. to always upgrade and improve their products, some specifications may be different from previous equipment. If this situation arises, please contact manufacturer for additional information and / or upgrade.

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SECTION 1

SET UP INSTRUCTIONS

NOTE

Tivoli Enterprises Ltd., in effort to meet each operators needs, offers certain customized features to the ride platforms, scenery and fence. These set up instructions are general guidelines not including customized features. If there are any questions that arise, which are not explained in this manual, please contact the manufacture for more information.

SET UP INSTRUCTIONS

- STEP 1 Locate trailer on as level an area as possible. The length of the trailer should be located parallel to the midway with goose neck to the right side as viewed from the Midway. The trailer center should be located approximately 30 ft. from the midway edge. * See ride layout on previous page.
- STEP 2 Install adequate blocking under four mechanical leveling jacks on trailer. Note: Standard block size is approximately 24" square 6" thick, constructed of 2'x6' pine boards. Different ground or soil conditions can cause a change in blocking requirements, note this before supporting ride on blocks. Using the two front independent landing legs, raise trailer enough to remove tractor. When tractor is out of the way, lower trailer until approximately eye level. Proceed to level trailer using four manual leveling jacks. When level install screw jacks with similar blocking under center of trailer, tighten until jack starts to support trailer weight.
- STEP 3 Unhook hanging platforms by lifting and turning "U" shaped pin at two places for each platform. (pins located approximately a quarter of the way in from both front and back of trailer). Pull out hanging platform to check that they are free.
- STEP 4 Unlatch both main outriggers at front of the trailer. Swing out each outrigger until they are perpendicular with the trailer and top surface of outrigger is directly under platform roller. **ATTENTION; Swinging out the outrigger also pulls out the hanging platform, this will cause a force against the outrigger when pushing into position. Take caution during this operation.** Swing out free end of cross brace attached to outrigger and pin to receptacles on trailer I beam. Complete this operation for both sides of trailer.
- STEP 5 Using 4 screw jack stands stored in possem belly block and level two main outriggers. Two (2) jack stands per outrigger.
- STEP 6 Remove main entrance steps racked on back end of trailer. Remove and set to outside of platform, diameter. Remove exit platforms racked under platform on front of trailer (passenger side).
- STEP 7 Let down rear platform on back end of trailer, by lifting and turning "U" pins on either side. Lower platform into position. **(This will require at least 3 persons to lower.)** Using hand crank jack stands, level platform.
- STEP 8 Unfold two (2) wing sections on rear and set in line with main platform. Note; When lowering platform watch so they lay properly on the rest stops on the rear platform.

- STEP 9 Remove platform support outriggers from the center possem belly and install in there respective receptacle, 4 places each side. Using Jack stands racked under platform on front of trailer, block and level with trailer.
- STEP 10 Remove spacer braces between platform at top of trailer where platforms hinge. One is located at front of trailer, one at rear.

IMPORTANT

BEFORE GOING TO STEP 14 - READ THE FOLLOWING CAREFULLY

Under no circumstances should a person be underneath the platforms when they are under the support of the "Winch Cable." It is necessary to attach a rope to the platform and pull platforms out from a safe distance outside the ride perimeter. Failure to abide by this notification can cause Severe Injury.

- STEP 11 **Lowering of platforms;** Before unpinning and lowering platforms attach a rope at least 30 feet long) to the bottom edge of the hanging platform to be lowered first. Extend the rope until it clears the ride perimeter.
- STEP 12 Turn control key to the maintenance / setup position. Start hydraulic pump. Have two persons climb to the top center of the ride and locate the winch.

Platform opposite winch is first to be lowered and last to be raised

- STEP 13 The winch cable is set for traveling by going through the pulleys on both platforms. Using winch control lever located next to winch, loosen cable enough to allow the cable to be removed from the pulley on the winch side platform. Run cable out of winch directly over pully above winch, over pully on oppisite sine of center, through platform pully, and hook to plate attached to ride center. **ASSURE THAT CABLE HOOK IS ATTACHED, SAFETY CLIP IS INTACT AND OPERATING PROPERLY BEFORE PUTTING CABLE UNDER LOAD.** Tighten cable and assure the cable is rolled evenly on the winch drum, connections to platform are secure and cable runs properly through pulleys.
- STEP 14 With cable taut, remove two platform securing brackets for side being lowered. **As persons pull on rope from outside ride perimeter** to pull out wing in order to allow hanging platform to clear outrigger, Start to lower platform. When platform is low enough to allow hanging platform to roll along the outrigger on it's own release rope and let platform roll on it's own. Lower platform down completely.
- STEP 15 Disconnect cable from platform pulley, roll up cable on winch , being careful to roll cable evenly on drum.

- STEP 16 Run cable through pulley on winch side of platform, over pulley above winch and attach cable hook back onto bracket. Check to assure cable is secure and running properly through pulleys.
- STEP 17 Follow steps 14 and 15 to lower winch side platform. When Platforms are completely down, re-roll cable completely on winch and leave slightly taught.
- STEP 18 Remove from underneath platform safety keys of vehicle racking pins which are attached to folding platforms on both sides of trailer. **DO NOT REMOVE THESE PINS UNLESS PLATFORMS ARE COMPLETELY DOWN.**
- STEP 19 Assemble car installation dolly. Using dolly move cars racked on folding platforms to the outside perimeter edge of the platform.
- STEP 20 Remove sweep locking and support brackets from between center and sweep flange of the two sweeps hinged forward for transport. 2 brackets each sweep. Remove platform protection block from sweep flange. Store all brackets under ride platform.
- STEP 21 Swing sweeps into operating position. Install bolts in holes provided on sweep flange and tighten in a cross pattern. **Torque bolts to 390 ft. lbs.**
- STEP 22 Spread short Spinner sweeps of the two sweeps described above into position (third sweep will be assembled later). Swing out and pin in place spreader frames. Swing over cross braces and pin in place. Two cross braces between each sweep
- STEP 23 Remove spinner sweep locking plate from spinner hub to release sweeps to allow them to turn freely. Locking plates are small and should be stored in safe place.
- STEP 24 Unrack and install fence light columns in sockets between fence and plug in under platform. Assemble and install 4 quartz light poles in sockets provided between fence. Plug in under platform.
- STEP 25 Remove scenery panels from racks on platform and install in receptacles around front half of ride platform. Install canvas bally cloth around back half of platform.
- STEP 26 Using vehicle installation dolly, place cars between sweeps with pivot balls in sockets of two assembled sweeps. The cars must be lifted, and installed with lap bar release handle to outside of circle.
- STEP 27 When all vehicles are installed on two sweeps, rotate entire ride so that unassembled sweep clears cars racked on trailer portion of platform. Turn off hydraulic pump.
- STEP 28 Assemble spinner sweeps and spreaders as described in Step 22.

- STEP 29 Install vehicles as described in Step 26
- STEP 30 Install car arm ball cap bushing into receptacle of each car (two per car) Push in firmly or tap in with rubber hammer. Swing down locking plate and pin in place. When plate is pinned it should be firmly hold in bushings, it shouldn't move easily by hand. If loose, tighten adjuster nut on either cap slightly until plate is firm.
- STEP 31 Install safety chains between car arm and sweep. Plug car light cord into receptacle under sweep.
- STEP 32 Assemble front entrance platform and steps.
- STEP 33 Install fence into sockets provided , Install flag poles in center of each fence section.
- STEP 34 Install exit ramps on both outside edges of platform. Install hand rails and gates.
- STEP 35 Switch over hydraulic redirectional valve located in top center of ride. This transfers fluid from winch service to operate one spinner motor.
- STEP 37 Sign assembly. Attach sign support poles to brackets at rear of ride, (in respect to midway) Install sign on brackets and lift into place.
- STEP 38 Install all center scenery.
- STEP 39 Using sweep lift override located on control panel, raise sweeps until they are approximately fully extended. **STANDING ON THE OUTSIDE OF THE CAR** remove three racking pins from each car by unscrewing pins. Store pins until tear down.

WARNING

Never let a person go under the sweeps while they are raised. In case of power failure sweeps will come down and possibly cause injury to persons under sweeps.

It is absolutely necessary to remove racking pins from vehicles before ride is put into operation. If left in during operation they could come loose and fly off ride causing injury to bystanders.

- STEP 40 Inspect all car hanger assemblies, assure all are keyed correctly and ball caps are tight. Check all sweep spreader pins and keys.
- STEP 41 Test Run Ride

IMPORTANT

When testing the "Star Force Amusement Ride" always check for unusual sounds or conditions which are not normally associated with the operation of the ride. Investigate all instances and report any problems to appropriate personnel, so that they can be rectified immediately. **REPORT ANY REOCCURRING PROBLEMS TO TIVOLI ENTERPRISES LTD.**

SECTION 2

OPERATING PROCEDURES & SPECIFICATIONS

RIDE NAME: STAR FORCE
OTHER NAMES: SCORPION

Manufacture:

Tivoli Enterprises Ltd.
Howfield Lane
Chartham, Canterbury
Kent, CT4 7HG
England

U. S. A. Representative

AmTech / Amusement Technologies Intl. Inc.
3306 N. Main Street
Cleburne, Texas 76031

Date of inception and completion of first unit:	1993
Number of rides operating in U.S.A.:	3
Number of rides operating World wide:	3

OPERATING SPECIFICATIONS

Dimensions: (Approximate)

Static (No Clearance)

Height	16 ft.
Width	54 ft.
Depth	58 ft.

Dynamic (No Clearance)

Height	18 ft.
Width	54 ft.
Depth	58 ft.

Total Weight Static:	62,000.00 lbs.
Ride Speed:	Center: 10 rpm, Spinners 33 rpm
Passenger Capacity:	42 Adults, 42 Children
Number of Vehicles:	21
Estimated Capacity per Hour:	840

OPERATING REQUIREMENTS

Passenger Height:	42"
Passenger Age Restriction Unless Accompanied by Adult:	7 Years

Recommended Ride Duration:	1.5 Minutes
Passenger Load Balancing Restrictions:	6 Persons out of Balance
Maximum Wind speed for operation with Passengers:	35 MPH

ELECTRICAL REQUIREMENTS

Voltage:	208 minimum, 230 Maximum
Type:	5 wire, 3 Phase, Neutral, Ground.
Cycles:	60 Hz.
Amperage / KW (Drive)	200 Amps (Approximately) 70 KW
Amperage / KW (Lights)	50 Amps (Approximately) 25 KW

TRAILER INFORMATION

Length:	53 Ft.
Width:	8ft. 6 ins.
Height:	13 ft. 6 ins.
Weight:	62,000 lbs. Gross.
	39,000 lbs Rear Split (10 ft.) Tandem
	23,000 lbs Kingpin

LOADINGS AT JACK STANDS

OPERATING PROCEDURES

1. PERSONAL REQUIREMENTS:

The Star Force Amusement Ride requires a minimum of two (2) persons to operate and monitor the ride during operation. One (1) operator must be at the controls at all times, and be in constant view of the ride operation. A second operator must be located at the entrance with the duty of controlling the entrance, the exit and assisting patrons. During high traffic times additional personal should be added to assist in the more efficient flow of patrons.

2. PASSENGER RESTRICTIONS:

The Star Force Amusement Ride is designed to accept up to 42 passengers. Only two (2) persons per vehicle. This number should not be exceeded for any reason. Maximum weight per vehicle is 400 lbs. The following is a list of special restrictions which should be posted so that all potential riders are aware prior to entering the ride.

1. No Riders under 42 inches tall allowed.
2. No riders under 48 inches unless accompanied by an adult.
3. No food or drink allowed on ride.
4. Remove all loose articles before entering ride.
5. Anyone under medical care, or with back or neck problems should not ride.
6. Pregnant women are not allowed to ride.
7. Only TWO (2) passengers per vehicle.
8. Riders acting in an unsafe manner will be evicted from the ride immediately.
9. DO NOT SWING THE VEHICLES

Note:

It is extremely important that the operator monitor all patrons riding the ride. Entrance must be denied to any persons which may be under the influence of alcohol, drugs, or acting in such a way that they may compromise the safety of other riders.

3. **OPERATORS RESPONSIBILITIES PER RIDE CYCLE:**

When operating the Star Force Amusement Ride with Patrons, the **Operator must assure** that the following points are followed before, during and after each ride cycle.

1. Allow a maximum of 42 passengers to enter ride.
2. Check all patrons to assure they meet passenger restrictions.
3. Check all seats to assure passengers are seated and lap bars are closed and securely locked.
4. Make sure that all entrance and exit gates, or chains are closed and all non-riding patrons are behind the fence.
5. **No patrons or operators are allowed on platform during operation.**
6. Start ride in slow speed first. During one revolution check all passengers to assure they are properly seated and lap bars are down and locked.
7. Start Ride in fast speed.
8. Monitor ride during operation.
9. After ride cycle is over and vehicles come to a complete stop, assist passengers in exiting the ride. Only when passengers have exited, allow new patrons to enter.

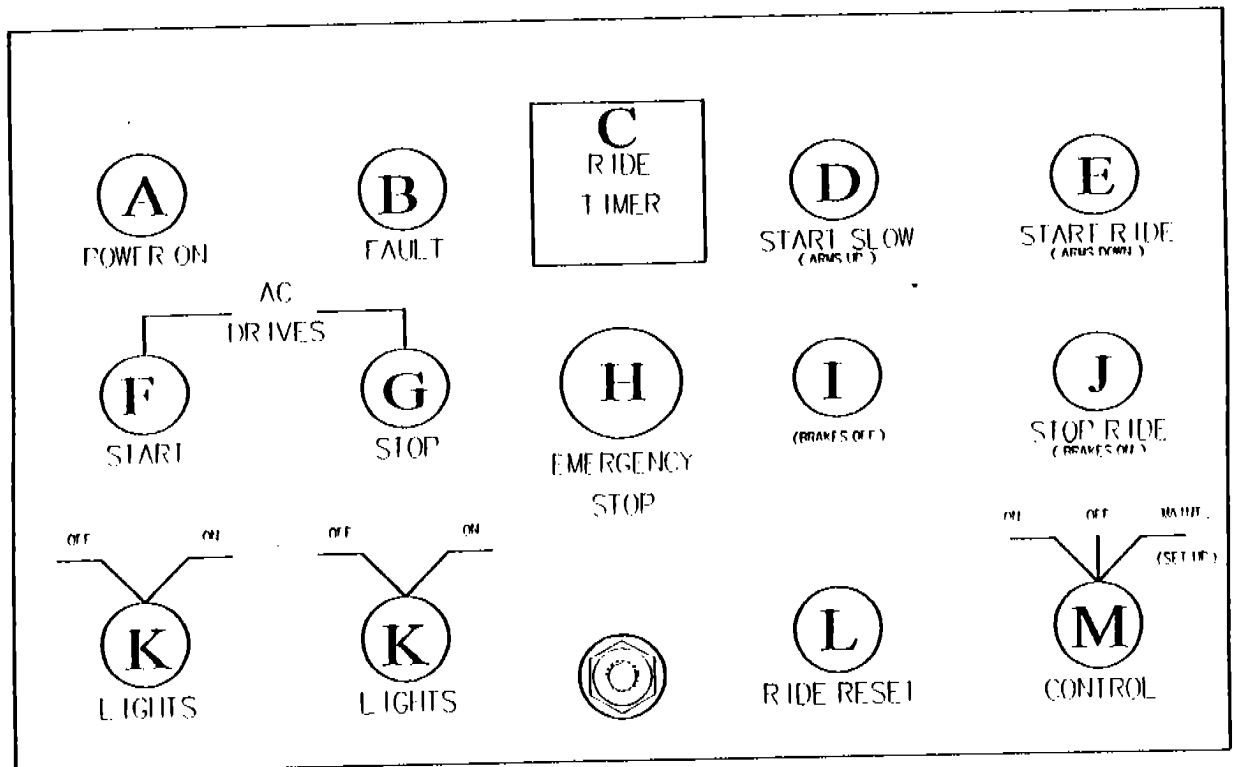
4. **RIDE CONTROLS**

The Star Force Amusement ride is fitted with an Operators control panel located on the counter of the control cabin. This console contains all necessary controls to safely operate the ride. The following is a description and explanation of each control.

- A. **Power On Light** This red indicator light when illuminated shows that there is power to the operator panel and main control panel .
- B. **Fault Light** The yellow indicator light shows whether one of the electrical motors has overloaded, or a ground fault has tripped etc. when this light is illumanted check PLC red indicators for explanation of fault.
- C. **Ride Duration Timer** Set this timer to control the length of ride. It is recommended that this timer be set for no more than 1.5 minutes. Timer activates when fast start button is depressed.
- D. **Slow Start/(Arms Up)** This illuminating green button activates the slow speed rotation. This button is active only when it is illuminated. Slow speed allows only the center to rotate at a slow speed to check riders before full ride operation. The spinners will not rotate in this mode. This button also has an additional function. When the control key switch is in the Maintenance /(setup) position, this button will activate the manual arm lift. This raises the arms for maintenance and setup. Note; Arms will still come down in the case of a power failure.

- E. **Fast Start** This illuminating green button activates full ride cycle and ride duration timer (C). This mode cannot be activated unless button is illuminated. This button also has an additional function. When control key is in the Maintenance / (setup) position this button will activate the manual lower. This lowers the arms during maintenance and setup.
- F. **Drives Start;** This activates the center hydraulic motor, and AC inverters for center and spinner rotation. The drive system is activated once and left on during the days operation.
- G. **Drives Off;** This turns off the AC inverters and the hydraulic motor.
- H. **Emergency Stop** This Red emergency button operates by pushing to latch and turn to release. When activated, hydraulic pump, AC inverters and controls are shut off. Ride arms come down, spinners, and center come to a complete stop.
- I. **(brakes off);** This control only works when the key switch is in the maintenance / (setup) position. This is used to release the electric brakes on the motors and let the ride Freewheel during set up and maintenance.
- J. **Stop / (brakes on)** The red button when activated will bring ride to a normal stop any time during a ride cycle. When the key switch is in the maintenance / (setup) position this control activates the brakes on all motors. **Important; If ride is sitting for a long period of time (over 15 minuits) the brakes should be switched on in order to deenergize brakes in order to extend life of brake coils**
- K. **Light Switch (s)** These switches control main ride, vehicle , and platform lighting.
- L. **Reset** This yellow illuminated button activates ride control system. When the button is illuminated, the control system is not active. The control system will become inactive for three reasons,
1. The emergency button has been activated.
2. The ride control key switch (M) has been turned off.
3. There has been a ground fault.
Before resetting assure all problems have been corrected.
- M. **Control Key Switch** Activates and deactivates control panel. It also puts the controls on maintenance / (setup) mode.

STAR FORCE CONTROL PANEL



5. EMERGENCY PROCEDURES

1. Emergency Button

This button is designed to be used to completely shut down the ride in an emergency situation. When activated all hydraulic pumps, and AC inverters are shut down, control panel is deactivated, and ride is brought down to a quick controlled stop. These procedures should be followed whenever the emergency shut down button is used:

- A. Let ride come to a complete stop before unloading all passengers.
- B. Make sure all passengers have exited platforms completely, before investigating cause of emergency.
- C. Investigate cause and inform necessary personnel as to the problem.
- D. Correct the cause and do a full "start up" inspection of the ride.
- E. Test run ride and get management approval before opening ride to the public.

IMPORTANT

When ever the emergency system is activated due to the failure of any component of the ride or any lack of function of the ride, notify the manufacture so a determination may be made as to it's cause and proper repair procedures.

Emergency reset:

To reset emergency system and reactivate control panel

- A. Turn out emergency button.
- B. Turn on hydraulic pump motors.
- C. Assure control key switch is on.
- D. Press reset button.
- E. Start ride cycle and test run ride.

2. Power Failure Procedure.

In the case of a power failure ride will slow down , arms will come down and ride will come to a stop in the loading position. After ride has stopped, unload passengers and clear platforms. **Do not** re start ride until power is restored and correct voltage is determined.

6. **LAP BAR OPERATING PROCEDURE:**

The Star Force Amusement Ride vehicle is equipped with a racheting lap bar. This bar is designed to adjust to the largest passenger size. It is recommended that the larger person sit to the outside of the vehicle. The lap bar automatically locks when pulled down and is released by pulling up on release knob located on the top front outside of vehicle. The operator should check security of each lap bar before every ride cycle by pulling tightly on bar to assure it is locked. If a lap bar is found not to operate properly, that particular vehicle should be closed off until necessary repairs can be made.

7. **RIDE CYCLE DESCRIPTION:**

To better understand the operation of the Star Force, the following is a description on what actions take place per one ride cycle. The ride cycle is controlled by a programmable controller located in the main electrical cabinet. This controller has a pre-set program which activates different functions to form one complete ride cycle. When the slow speed button is depressed the whole structure of the ride begins to rotate at approximately 1 3/4 rpm. This function is not controlled by any timing process and will stay in this mode until the fast speed, stop ride, or emergency button is depressed. When the operator is ready to start a ride cycle the fast speed button is depressed. This action activates the main ride cycle timer and initiates the controller sequence. During this sequence the spinners AC inverters activate beginning vehicle rotation. After a short time period and the vehicles have reached there operating speed (30 rpm) the high speed center drive AC inverter engages, bring the center up to its operating speed (10 rpm). When the center reaches it's top speed the arm hydraulic cylinders activate raising the arm to their extended limit. The extension of these arms cylinder is regulated by a proximity switch which relays information to the controller. Prior to the expiration of the main ride cycle timer the arms dump valve deenergises the arms lower to the loading position. When the arms are completely down, the ride cycle timer expires causing the center and spinners to brake to a stop through their own internal braking system. When at a complete stop an auxelery brake activates on each motor.

8. DAILY OPERATORS PRE-OPENING INSPECTION PROCEDURES

The following are general guidelines as to the critical components and areas which require a daily inspection in order to assure the safe operation of the ride for passengers and operators. These points are guidelines for the operator to use in his/her daily inspection of the equipment. It is also necessary that the operator use their expertise and common sense in evaluating all components and procedures respective to their and / or rides particular environment and conditions.

1. Assure all pre-opening maintenance is complete.
2. Inspect all ride and trailer blocking.
3. Assure all fence, ramps, chains and gates are secure.
4. Check platforms for obstructions and any signs which may indicate a problem with ride. (oil spill, parts, etc.)
5. Inspect all lap bars for proper operation.
6. Assure all sweep spreader and cross braces are pinned and safety keyed.
7. Inspect car hanger ball caps to make sure they are tight and locking pin is secure.
10. Assure car safety chains are in good condition and secure.
11. Check vehicle attachment ball joint for security.
12. **Test run ride.** Check for any unusual noises or actions.
(investigate if necessary)
13. Test emergency system.
14. **Report any problems or concerns to proper personnel.**

NON-DESTRUCTIVE TESTING AND SAFETY MODIFICATIONS **POLICY FOR TIVOLI ENTERPRISES LTD.**

All Tivoli manufactured Amusement Rides are designed to the highest degree of safety and quality. In depth engineering and design analysis has been incorporated into all equipment produced. Tivoli Enterprises Ltd., therefore, requires no scheduled testing by non-destructive means for the engineered life of the components, unless listed below and issued to the operators in the form of a safety bulletin, or indicated in the operations manual.

It should also be understood that this policy is based on the operator / owner exercising proper maintenance and care procedures of all components according to the manufacture's specifications, along with routine visual inspection of all structural components for any unusual circumstances. Any unusual circumstances must be reported to the manufacturer immediately.

In the event that a fault or potential safety problem is discovered through our own testing or field experience requiring an annual test or modification, information concerning these tests or modifications will be made available immediately to the owner of the equipment.

Below are listed current safety bulletins or equipment modification bulletin.

<u>BULLETIN NUMBER</u>	<u>RIDE</u>	<u>CONCERNING</u>	<u>EFFECTIVE</u>
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SECTION 3

GENERAL MAINTENANCE PROCEDURES

Important

This section deals with the general maintenance, visual inspections and safety checks of the Star Force Amusement Ride. They are designed to assist the operator / owner in the control of the operation of the ride. The maintenance and checks should be accomplished by a qualified technician capable of understanding purpose and function of the ride and all it's sub components. This equipment has been designed and built to handle normal wear and tear of every day operation. It is necessary to inspect all components and structures on a regular basis and to investigate and repair any irregular conditions. In the event that any abnormal conditions are found which is capable of causing a future failure or possible safety hazard, report immediately to a supervisor and if necessary notify Tivoli Enterprises Ltd. for consultation.

**ALWAYS USE PROPER SAFETY EQUIPMENT WHEN ERECTING, REPAIRING OR DOING
GENERAL MAINTENANCE**

MAINTENANCE AND INSPECTION PROCEDURES

Pre-Opening Maintenance and inspections

When erection of the Star Force Amusement Ride is complete and prior to opening ride to the public, the following maintenance and inspection procedures should be followed in order to assure trouble free operation. These points should be covered in addition to normal start up maintenance required prior to operation each day.

A. Power Supply:

Assure incoming power supply is correct and adequate for operation. Correct voltage, and power consumption requirements are indicated on the rides data plate fixed to the underside of one of the three (3) sweeps near the center of the ride.

B. Blocking:

Check all trailer, outrigger, and platform blocking to assure it is adequate for that particular soil consistency. For average condition it is recommended that the main trailer and outrigger blocking points have a minimum of an 24 in. x 24 in. x 6 in. block under each jack stand. Platform jacks require under average conditions a minimum of 6 in. x 6 in. x 2 in. under each jack stand. Inspect blocking for looseness and movement. If necessary readjust and relevel.

C. Fencing, Gates, and Platforms:

Check all fence and gates to assure they are fitted properly in their sockets and all are in their proper place. Inspect platform level and assure there are no obstructions which may cause a tripping hazard. Make sure all exit platforms and entrance steps are solid and blocked properly. Check all scenery panels and back bally cloth for proper installation.

D. Vehicle inspection:

Inspection of Passenger compartments and vehicle components is a part of normal daily and operational routine. Listed below is a more indepth control to be followed after the ride is erected.

1. **Lap Bars;** Check lap bar for proper operation by lowering completely. While bar is lowering a ratcheting sound will be detected, which will indicate the ratchet mechanism is working correctly. Pull up lap bar to assure it stops in the lowered position (It should lift slightly then stop). Release lap bar by pulling up on knob located on the top right side of car. Each vehicle should be checked.
2. **Car Hanger Ball Joint;** Visually check ball joint to car connection, assure ball is fitted properly and there are no signs the ball security nut has become loose. Check ball caps and cap cover to assure they are secure and tight. If cap cover is loose, adjust cover adjustment bolts to take out any play between ball cap and cover. Adjustment should be only enough that the cover cannot be moved easily by hand. Assure cover locking pin is installed and properly keyed.
3. **Safety Chains;** Check car to sweep safety chains to ensure that chains are in good condition and attachment clevises are screwed in completely.
4. **Fiberglass Body;** Inspect passenger compartment for any conditions which could possibly be of harm to riders, such as sharp edges, tears in fiberglass, or foreign objects. Make any repairs before opening to public.
5. **Racking Pins;** Check Vehicles to ensure all racking pins are removed from the underside of the vehicles. There are (3) three pins per car. **It is absolutely necessary to remove these pins before operation. If left on during operation these pins can fly off causing injury to bystanders.**

E. SPINNER Sweeps, Spreaders, and Cross Braces;

1. Inspect spreader and cross brace "L" pins. Ensure all are keyed with safety keys in good condition.

F. Center and sweep arms;

1. Inspect all light panels and fiberglass center scenery. Ensure all panels are secured.
2. Check arm flange bolts on two sweeps which hinge for transportation. All bolts should be torqued to 390 ft. lbs.
3. Inspect arm hinge pin for security and proper function.

G. Hydraulic system;

A regular inspection of hydraulic hoses, fittings, valves and other components are necessary for proper operation of the Star Force. Prior to opening check for leaks, fluid levels etc. Repair all problems quickly. Refer to the hydraulics section 4 for indepth maintenance and inspections.

H. Electrical system:

The following checks are general housekeeping information to keep the electrical system operating to its maximum efficiency. For a more detailed view of the Star Force electrical system refer to the electrical section 5.

1. Check all electrical enclosures to assure covers are closed and weather seals are in good condition
2. Inspect all exposed electrical cords, check insulation and look for any damage which may have arisen from transportation.
3. Check all electrical enclosures to insure all wire connections are tight on the components and terminal blocks.
4. Inspect lighting repair or replace any broken or burned out light fixtures.

DO NOT WORK ON ANY ELECTRICAL COMPONENTS WITH POWER ON. TURN OFF AT MAIN BEFORE ANY WORK IS STARTED.

I. Gearboxes:

Check fluid levels in spinner and center drive.

J. Lubrication:

Consult lubrication section 7 for daily and pre-opening lubrication schedule.

STAR FORCE Maintenance Schedule

<u>COMPONENT</u>	<u>PROCEDURE</u>	<u>FREQUENCY</u>
Structural		
Hinged sweep flange bolts	Replace	Annually
Fixed sweep flange bolts	Check Tightness	Monthly
Main Center Bearing Bolts	Check Tightness	Monthly
Spinner Bearing Bolts	Check Tightness	Monthly
Spinner Drive Gear	Check Tightness	Monthly
Center Drive Gear	Check Tightness	Monthly
<u>Hydraulic System</u> (Review Hydraulic Section 6)		
Lift Cylinder Pressure Filters (3)	Replace	After First 100 Hours Every 500 Hours After If Bypass Indicator is Red
Lift Cylinder Suction Filter (2)	Replace	After First 100 hours Every 500 Hours After If Bypass Indicator is Red
Center Column Oil Reservoir	Replace	Bi-Annually
Hoses and Fittings	Check for leaks	Daily
Pressure Settings	Check gauges for Proper Settings	Monthly
<u>Lubrication</u> (Review Lubrication Section 7)		
Center Main Bearing	Lubricate through 3 fittings to right of center drive pinion gear. While ride is in slow Rotation.	Every 6 hours of operation
Spinner Center Bearing	Lubricate through 3 fittings directly into bearing located above sweeps.	Every 12 hours of operation

Sweep Arm Pivot Joint	Lubricate through fitting on end of pivot shaft	Every 12 hours of operation
Lift Cylinder End Bearings	Lubricate through fittings on cylinder end cap	Every 36 hours of operation
Vehicle Ball Joint Bearing	Place small film of grease on all bearing surfaces	Prior to each set up
Lap Bar Latching Mechanism	Spray with light oil	Bi-Monthly
All sweep and racking pins	Place small film of grease on contact surfaces	Every set up or as needed
Platform winch rollers and pulleys	Place light film of grease on bearing surfaces. Lubricate rollers through access hole.	Every set up or as needed

Electrical System

(Review Electrical Section 5)

Ground Fault Interrupters (GFI)	Test Function by tripping through test button on each GFI.	After each set up
Wiring and Component Connections	Tighten if necessary	Monthly
Center Brushes and Commutator	Clean and check spring tension on brushes	Monthly
Control Transformer	Check output voltage Adjust for 115-120 V	After each set up

STAR FORCE

WEAR TOLERANCES

COMPONENT	ALLOWABLE WEAR	ACTION
Sweep Arm Pivot Bushings	.0625"	Replace
Sweep Arm Pivot Shaft	.0625"	Replace
Spinner Sweep to Hub Pins	.09375"	Replace
Spinner Sweep Turnbuckle Pins.	.0625"	Replace
Spinner Sweep Turnbuckle Pin Receiver	.125"	Rebore
Spinner Spreader Pins.	.0625"	Replace
Spinner Spreader Pin Receiver	.125"	Rebore
Vehicle Pivot Ball	.0625"	Replace
Vehicle Pivot Ball Bushings	.0625"	Replace

NDT Requirements

In Conjunction with the annual thorough daily and weekly examination of the Star Force Amusement ride the following Non Distructive testing should be carried out.

After the first two years of operation and then every year after that;

Vehicle Frame:

A sample of four cars at random should be N.D. Tested by using Magnetic Partical inspection to monitor weld attachments at the upper and lower end of the vertical attachment posts. Should any signs of cracking occur in any of these samples then 100% examination of fault areas should be carried out. If cracks or any other irregularities are discovered the manufacture must be notified emmediatly so proper repair procedures can be determined.

Car Pivot Ball: A random sample of seven car ball connectors should be checked by Magnetic Partical Testing. All car ball connectors must be visually checked for wear and signs of damage to the neck of the ball. Any test failures must be reported to the manufacture immediatly.

Vehicle Spinners:

Vehicle Sweeps: The inner end of the seven sweep arms where the pivot pin is located along with "L" shaped sweep sections must be tested by M.P.T.

Two sweeps at random from each spinner should be removed and all welds should be tested with particular attention to the pin holes and hollow tube sections.

Sweep Spreaders: A random sample of 3 spreaders should be tested to monitor the weld attachments between the main hollow section and the cross bracing. Pin holes should also be included.

Main Sweep Arms:

Inner Fixed Arms: The outer end of the inner fixed arm should be tested to include the pivot shaft bosses and gussets, special attention should be given to the welds around the outer ends of the boss gusset plates.

SECTION 4

HYDRAULIC SYSTEM INSPECTION & MAINTENANCE

Hydraulic System Overview

The Star Force Amusement Ride has a hydraulic system which is designed to operate the arm lift cylinders and the platform lift and lower winch. This system is controlled by the central processor (PLC). The PLC is programmed to activate and deactivate the arm lift cylinders during a ride cycle. Described below is an overview of the system.

Arm Lift System (Refer to Drawing 1589.01)

The arm Raise system is composed of three independent lift control systems (one for each arm) with a common descent (dump) valve. All valves are assembled on a common manifold block. This manifold block is supplied by a triple fixed displacement hydraulic pump, one to operate each lift cylinder. It is located at the center of the ride, rotates with the ride. The components of the system are listed below and referenced to drawing 2427.01

- 5 - 7 **Pressure Relief Valve.** This valve regulates the pressure to extend the arm lift cylinders. There is one relief valve per cylinder. The relief pressure is factory set and should need no further adjustment. If it becomes necessary to adjust this valve, adjustment can be made by a unlocking and rotating the adjustment screw located on top of the valve. Pressure reading are taken through test point 14 - 16 as described below.
- 2 - 4 **Directional Solenoid Valve (s).** Controls and directs pressurized hydraulic oil to each of the arm lift cylinders. When energized the arm lift cylinders are driven to their full extended position. The extension length is regulated by a proximity switch which signals the main ride controller. This valve (s) operates only the lifting sequence, the lowering is controlled through valve 1.
- 8 - 13 **Check valve (s).** The check valves installed at certain points within the hydraulic circuit are used to control fluid flow and to prevent pressurized fluid from flowing to the wrong areas. These pressure controlled check valves help keep fluid in the system and prevent leakage through gravity. These valves also prevent pressurized fluid from one cylinder to affect another.
- 1. **Directional Solenoid (Dump) Valve** The directional valve controls the fluid from a common connection of the three cylinders to lower the arms. This valve is a normally open valve which requires power to let the cylinders extend. The valve acts as a safety (dump) valve which allows the cylinders to retract and the arm to lower in the case of a power failure.

14-16 **Test Point (s)** The test point (s) accepts a pressure gauge to indicate operating pressure of each lift system. The gauge should read between 2000 and 2500 psi. while the cylinders are extending. Adjustments are made through pressure relief valves 5 - 7 above.

17-19 **Flow Control (s)** These flow control valve are fitted to the piston port of the lift cylinders. The valves are used to control the rate of descent in normal operation and in the case of a hose failure. Valves are factory set and should not need any further adjustment.

0.1 **Manifold Block** A steel block machined in such away as to accept the directional valves, check valves, hoses etc. to prevent the need for excessive hose connections.

Main Lift Pump A fixed displacement triple hydraulic pump. There are three individual pumps tied together, one pump for each arm. All three pumps are driven buy a single electric motor.

Hydraulic Maintenance

Proper hydraulic system maintenance is essential to insure many years of trouble free service. Careful attention to leaks, oil temperature, and oil levels is the most important maintenance procedure, this will keep problems to a minimum and reduce down time. The following lists the important maintenance procedures in caring for this equipment.

Housekeeping A clean hydraulic system will help the system keep cooler and offer you the ability to detect small leaks much sooner to prevent major problems. All hoses, Valves, filters, and Oil Coolers should be wiped clean on a daily bases. Dirt build up prevents heat from dissipating, thus putting a greater work load on the equipment. Minor leaks should be repaired immediately, oil acts like a magnet to dirt and will quickly make the area dirty. Always check the oil cooler fins and fan blade and assure they are clean.

Filters The Star Force is equipped with suction filters and pressure filters located in the center of the ride.

Pressure Filters; The system has 3 pressure filters one per pump. They are located directly above the pump. Each filter has it's own bypass indicator with the red zone indicating filter bypass. These filters should be changed before indicators reach the yellow zone or on the following schedule;

Initial change
Subsquent changes

After first 100 hours
After every 500 hours

Tank Strainer; Located inside the hydraulic tank, where the supply pipe for the cylinder pump is located, is a suction strainer. This strainer should be removed and cleaned with a cleaning solvent at least once per year.

Hydraulic Oil; The hydraulic system on this equipment uses a mineral base hydraulic oil, it is not recommended to use a synthetic oil. Oil viscosity varies depending on geographic location of equipment. When replacing hydraulic oil, use viscosity recommended for your area and climate. This information is readily available from your oil supplier. It is recommended that the oil be changed after every two years of operation.

Oil Temperature; The operating temperature of the oil is a critical factor in the operation of the hydraulic system. Normal operating temperature of the oil is approximately 160 degrees Fahrenheit. Excessive heat can cause serious damage to the hydraulic components, and excessive leaking of oil. As a rule of thumb, the oil is too hot if you have difficulty keeping your hand on the tank for 3 or 4 seconds. If heat builds up check hydraulic system for problems, stuck valves low oil etc. can cause oil to heat up. Repair as soon as possible.



1001 1002 1003 1004

MAINTENANCE
Systèmes d'entraînement

**INBETRIEBNAHME
UND WARTUNG**
Antriebssystemen

MANUTENZIONE
Sistemi di motorizzazione

MAINTENANCE
Drives

MAINTENIMIENTO
Sistemas
de accionamiento

**INBEDRIJFNAME
EN ONDERHOUD**
Aandrijvingssystemen

Vous venez d'acquies un système d'entraînement de haute qualité utilisant les matériaux les plus modernes; LEROY SOMER a apporté le plus grand soin à sa réalisation et effectué un contrôle rigoureux avant son expédition. Afin qu'il vous donne toute satisfaction, il est indispensable de respecter les quelques consignes suivantes.

STOCKAGE

Les réducteurs et moteurs doivent être stockés dans un lieu à l'abri de l'humidité (< 80%) et du froid (température supérieure à -40°C).

Stockage prolongé (> 1 an)

- Remplir le réducteur complètement d'huile. Enduire le(s) joint(s) extérieur(s) de graisse.
- Envelopper le groupe dans une enveloppe scellée (plastique thermosoudable par exemple) avec sachet déshydrateur à l'intérieur.
- Pour les moteurs à démarrage manuel, desserrer légèrement le frein pour éviter le collage.

Avant mise en route :

- Faire tourner l'arbre à la main pour s'assurer du bon état du(s) joint(s);
- Vérifier le bon isolement (> 100 mégohms) des machines électriques après avoir déconnecté tous les circuits électroniques : cellules frein, etc.;
- remettre le frein en position serrée;
- vider le réducteur et mettre de l'huile jusqu'au bouchon de niveau;
- installer le bouchon renflard avec trou d'évent;
- régler les roulements des moteurs équipés de graisseurs (graisse FILGI grade 2 ou 3)

MISE EN SERVICE

- Monter les réducteurs sur des supports rigides et plans exempts de vibration.
- Enlever les protections des arbres et bûles(s) : utiliser un solvant si nécessaire.
- Pour les réducteurs à arbre creux en montage pendulaire, ne pas oublier de monter un bras de couple (voir les catalogues correspondants).
- Monter les accouplements, pignons, poulies, etc. sur l'arbre(s) avec le plus grand soin, de préférence à chaud; éviter le montage à coups de marteau. Les poulies et pignons seront montés le plus près possible de l'épaulement de l'arbre.
- Lors de l'assemblage du montage "U" : lubrifier les cannelures avec de la graisse Lithium + MO S2 grade 2.
- Pour les accouplements directs par manchon, vérifier l'alignement des axes.
- Pour les transmissions par courroie ou par chaîne, vérifier le parallélisme des arbres; se conformer aux recommandations des fabricants pour la tension des courroies (ne pas tendre les chaînes).
- Pour les réducteurs lubrifiés à l'huile, vérifier le niveau d'huile ; mettre en place le bouchon renflard au point haut du réducteur.
- Connecter le moteur au moyen de câbles de section adéquate et raccorder la carcasse à la terre.

ENTRETIEN

Contrôle après mise en route (50 heures de fonctionnement environ).

Vérifier le serrage des vis de fixation et la tension des courroies s'il y a lieu.

Visite d'entretien préventif (toutes les 5000 heures).

- Pour les réducteurs lubrifiés à l'huile minérale, effectuer la vidange : voir § lubrification pour le choix du type d'huile.
- Pour les réducteurs lubrifiés à l'huile synthétique SHC, vérifier le niveau d'huile et le compléter si nécessaire.
- S'assurer que le trou d'évent du bouchon renflard n'est pas obstrué.
- Nettoyer les grilles de ventilation du moteur.
- Graisser les roulements des moteurs équipés de graisseurs.
- Contrôler l'entree des moteurs frein.

Nota : pour les groupes avec moteur à courant continu (MFA, MFB, LSK...) vérifier l'état des balais après 200 heures, puis après 500 heures et ensuite toutes les 1000 heures de fonctionnement.

You have just purchased a high quality drive unit made from the most modern materials. It has been manufactured by LEROY SOMER with the greatest care, and thoroughly tested prior to shipment. In order for you to get the most out of it, we recommend you to follow these instructions.

STORAGE

Gearboxes and gear motors should be stored in a dry place (humidity < 80%) and in ambient temperature more than -40°C.

Storage for extended period of time (over 1 year)

- Fill the unit completely with oil. Coat external oil seal(s) with grease.
- Seal drive unit in a tight package (thermosolded plastic sheet for instance) with dessicant bags.
- For drive units that have a brake with manual release, the brake should be released.

Before starting up :

- turn the shaft by hand to make sure the oil seal(s) is (are) in good condition;
- check isolation resistance (minimum value 100 megohms) of motors : all electronic circuits (brake cells, ...) should be disconnected before performing insulation test;
- re apply the brake;
- drain the gearbox completely and fill it up to oil level plug; install breather;
- when equipped with grease nipples, motor bearings have to be refilled with grease (NLGI grade 2 or 3).

STARTING UP

- install the drive on rigid, flat and vibration free base.
- Carefully remove a shaft and flange protective coating, using a solvent if necessary.
- For a shaft-mounted gearbox, it is necessary to use a torque arm (refer to technical catalogue).
- install couplings, pulleys, sprockets, pinions on shaft(s) with great care, preferably by heating them up; avoid hammering on shaft(s). Pulleys, sprockets and pinions should be mounted as close to the shaft shoulder as possible.
- For universal "U" mounting : lubricate splines of input shaft and coupling with grease (Lithium + MO S2 grade 2) ; install motor on lantern.
- For direct couplings, check on shaft alignment.
- For belt or chain drive, check shaft parallelism; refer to manufacturer's recommendation for belt tension (tension should not be applied to chain drives).
- For oil lubricated gearboxes, check oil level; install breather plug in the plug hole at the highest point.
- Connect motor with appropriately sized cables and connect drive housing to earth.

MAINTENANCE

Check after starting up (after about 50 hours).

Check fixing screw tightening and belt tension (if applicable)

Preventive maintenance (every 5000 hours).

- For gearboxes lubricated with mineral oil, drain oil while the gearbox is still warm and refill it to the correct level; refer to lubrication paragraph for oil type.
- For gearboxes lubricated with "SHC" synthetic oil, check oil level and add oil if necessary.
- Make sure the vent hole in the breather is not blocked.
- Clean ventilation grilles of the motor.
- Grease bearings in motors equipped with grease nipples.
- Check the air gap of brake motors.

Note : for drives with DC motors (MFA, MFB, LSK...), check the brush condition after 200 hours, 500 hours and then every 1000 hours of operation.

SECTION 5

ELECTRICAL SYSTEM INSPECTION & MAINTENANCE

Electrical System Overview

The Star Force Amusement Ride is composed of two control systems:

Ride Lighting

Motive Control

The following indicates each of the major components of each system and there function.

Ride Lighting;

Main Ride Lighting: Main sweep, spinner and arm lighting is controlled through a solid state flasher located on the top center of the ride. A pre programmed electronic controller signals a group of solid state relays to open and close, this in turn causes the lights to flash in the desired pattern. Each group or channel of light has it's own relay and fuse (or circuit breaker if supplied). Current is supplied off main disconnect to circuit breaker, through a contactor, followed by commutator rings to the flasher itself. The circuit at the source is also protected by a ground fault interrupter. In the case of a ground fault the entire circuit will be shut down.

Vehicle Lighting: Each vehicle has a set of halogen and incandescent lighting. Current is supplied from the main disconnect , through a circuit breaker, a contactor, and commutator rings. Located in each vehicle is a transformer which reduces the incoming voltage to 24 volts which in turn operates the 12 volt lighting by having every two lights wired in series. Light wired in this way will cause both light in the series to go out if only one bulb fails. It is only necessary to replace the failed bulb to allow both to light. The transformers are protected by a fuse located on the back of the car. This circuit is also protected by a ground fault interrupter located at the source. In the case of a ground fault the entire vehicle lighting system will shut down.

Platform Quartz lighting: Located around the perimeter of the ride platform are four light poles holding three 500watt quartz lights each. Current is supplied from the main disconnect through a circuit breaker, and contactor. This circuit is also controlled by a ground fault interrupter which shuts down platform lighting in the case of a ground fault.

All lighting systems are controlled via toggle switches located on the operators control panel. These switches activate the contactors which close and supply current to the lighting systems. The following indicates each of the components common in each system along with proper maintenance information.

- ♦ **Main Disconnect:** This switch located on the main electrical panel in close proximity to where the service electrical connections are made. This switch is fitted with a safety off mechanism which prevents the power from being on when electrical panel door is open. This safety devise should always be in working order. Attention should be made to all electrical connections, assuring that they are tight and in good condition.

- ♦ **Ground Fault Interrupter (GFI):** Each branch circuit, off the main disconnect has a GFI installed. The GFI will detect very small leakages to ground and are very sensitive. They can trip from even small amounts of moisture. Since they are very sensitive they offer a high degree of safety. If tripped faults must be found before system can be turned on. Each GFI has a test button, pressing this button will trip GFI insuring proper operation. Reset switch to put back in operation.
- ♦ **Circuit breakers:** Each branch circuit is also protected by a circuit breaker valued in amps for maximum load for each circuit. It is extremely important to keep connections to these circuit breakers tight in order to insure the best connection. If connections become loose wires can heat up and burn causing serious damage to system. Never substitute a circuit breaker with one of a higher amperage without first consulting with the factory.
- ♦ **Contactors:** The contactors are used as mechanical switches to supply power instantly to the lighting circuits. Each contactor has a set of fixed and mobile contacts. The mobile contact are drawn into the fixed contacts through a magnetic solenoid. Control of the solenoid coil is accomplished through the toggle switch on the console. As in all electrical components it is necessary that all connections are tight.
- ♦ **Terminal blocks:** At the base of each of the electrical panels are a row of terminal blocks these are used to make the connections from the panel to the outside wiring. These connections should be checked for tightness.
- ♦ **Flasher enclosures:** All electronic flashers are composed of electronic boards, supply transformer, circuit breakers (or fuses), terminal blocks, and solid state relays. It is important than this equipment be kept clean , free of moisture an all connections be kept tight. When replacing relays a silicon heat sync paste must be used to aid heat transfer to the aluminum heat sync. Neglecting to do this can cause the relays to fail prematurely
- ♦ **External Wiring:** All external wiring is of high quality wire, designed for outdoor use. All wire should be checked on a regular bases for any damage and any repairs or replacement should be made immediately.
- ♦ **Incandescent Lighting:** Check plastic light fixtures to assure bulb, and cover caps are tight to prevent them from coming loose while ride is in motion. Replace any cracked or broken glass on platform quartz lights and car spot lights.

Ride Motive Control System:

All functions of the pumps, motors, cylinders of the ride are controlled through a programmable logic controller (PLC). This PLC is located in the operators booth. A pre- programmed EPROM (chip) incorporated in the PLC directs all functions concerning each ride cycle. The EPROM is factory set and cannot be changed without the use of a programming unit and new EPROM. On the face of the PLC are led (lights) with associated numbers, these numbers represent individual functions of the ride cycle. Each number is indicated on the electrical schematic with its function. It is important that the PLC remain clean and free of moisture. Check regularly to insure unit is mounted solidly in cabinet and all screw connections are tight. Review supplemental information on PLC in this manual before any repair is attempted. The following is a list of the major components of the control system, there function and maintenance.

1. **Motor Starter and Overloads:** Each of the five electric motors which drive the hydraulic pump, center and spinners have an overload relay. The overload relay is designed to protect the motor if increased loads caused by shorts, hydraulic pump, gearbox, or other component failure occur. If an overload trips, investigate wiring and motor for cause before resetting. Like all electrical components make sure all connections remain tight at all times. Loose connections will cause the wires to heat up and possibly cause damage to the motor.
2. **Control Transformer:** The ride is equipped with a 500 VA isolation transformer with a 220volt 1P primary and a 115volt 1p secondary. This transformer is used to protect the control circuit and provide a constant steady supply and protect from spikes and sharp changes in voltage. This transformer provides power for all contactors, timers, and the PLC. There are additional taps on both the primary and secondary side of the transformer. It is important that the secondary voltage be between 115 - 120 volts for proper operation of equipment. When changing primary power supplies voltage variations can occur. the tap on the primary and secondary side of the transformer can be moved to meet incoming voltage thus keeping your secondary voltage at the proper output.
3. **Ground Fault Interrupters:** See Lighting Section
4. **Circuit Breakers:** See Lighting Section
5. **Motors:** All motors are 220 volt 3P totally enclosed and require no regular maintenance. It is important, at least annually to check the wire connection in the motor and assure the seal on the wire connection cover is intact and tight.
6. **Solenoid Coils:** Located in the center on the arm lift manifold are three directional valves and one safety dump valve. each solenoid coil of the valves has a electrical (DIN) plug. Check to make sure that these plugs are in good condition and the screw which holds them in place is tight. The Plugs have a seal which prevents moisture from entering electrical connection, but if a plug becomes loose water can enter causing a ground fault and in turn tripping the control GFI. Also direct application water can leak into plugs, so it is important when cleaning to avoid this area with direct water sprays.
7. **Commutator rings:** In the bottom center of the center column and in the bottom center of the spinners are groups of commutator rings. These rings through contact with brushes transmit the current as the ride rotates. These commutator rings require a minimum of maintenance. **Make sure all power is off before performing any maintenance on the commutator rings.** Inspect rings and brushes monthly to assure rings are clean and brushes track properly. Adjust if necessary. Cleaning with a dry rag is all that is necessary to keep the rings in good operating condition.
8. **Terminal Blocks:** See Lighting Section
9. **Wiring:** See Lighting Section

TIVOLI ENTERPRISES LTD COMMISSIONING CERTIFICATE

Page 1 of 10

	CERT. No.	1010
DATE	23/08/94	ELECTRICAL REF. 2226
MACHINE MANUFACTURER	Tivoli Enterprises	
MACHINE TYPE	Tri-Star (Star Force) (Scorpion) TS02-73-58	
SERIAL No.	4870230	
TEST CONDITIONS:-	Fully assembled ride. Cars fully weighted.	

COMMENTS:-

<u>MAIN POWER</u>	<u>VOLTS</u>	<u>AMPERES</u>	<u>Hz</u>
L1	230	380	60
L2	230	380	60
L3	230	380	60
N	127		60

MOTORS

Arm Pump	Idle	29	Amperes
	Running	Nominal	80 Amperes
		Peak	155 Amperes
Main Drive	Peak	120	Amperes
Spinners	Peak	150	Amperes
Oil Cooler		2.2	Amperes

COMMENTS:-

LIGHTS

Running Lights	L1	Amperes
	L2	Amperes
	L3	Amperes
	N	Amperes
Channel	1	Amperes
Channel	2	Amperes
Channel	3	Amperes
Channel	4	Amperes
Channel	5	Amperes
Channel	6	Amperes
Channel	7	Amperes
Channel	8	Amperes
Channel	9	Amperes
Channel	10	Amperes
Channel	11	Amperes
Channel	12	Amperes
Channel	13	Amperes
Channel	14	Amperes
Channel	15	Amperes
Channel	16	Amperes
Static	1	Amperes
Static	2	Amperes
Static	3	Amperes

Sign Lights	L		Amperes
	N		Amperes
Channel 1			Amperes
Channel 2			Amperes
Channel 3			Amperes
Channel 4			Amperes
Channel 5			Amperes
Channel 6			Amperes
Channel 7			Amperes
Channel 8			Amperes
Channel 9			Amperes
Channel 10			Amperes
Channel 11			Amperes
Channel 12			Amperes
Channel 13			Amperes
Channel 14			Amperes
Channel 15			Amperes
Channel 16			Amperes
Floodlights # 1	L	13	Amperes
	N	13	Amperes
Floodlights # 2	L	13	Amperes
	N	13	Amperes
Floodlights # 3	L	13	Amperes
	N	13	Amperes
Floodlights # 4	L	13	Amperes
	N	13	Amperes

Post Lights	L	5.5	Amperes
	N	5.5	Amperes
Platform Lights	L		Amperes
	N		Amperes
Car Lights	L1		Amperes
	L2		Amperes
	L3		Amperes
	N		Amperes
Ride Lights	L1	97	Amperes
	L2	120	Amperes
	L3	104	Amperes
	N		Amperes

COMMENTS:-

Ride lights values are the combined totals of the running lights and car lights.

KIOSK

L	Amperes
N	Amperes

COMMENTS:-

110VAC CONTROL

Primary	1	Amperes
Secondary		Amperes

24VDC CONTROL

Input	Amperes
Output	Amperes

<u>RCD SETTINGS</u>	<u>mA</u>	<u>t(ms)</u>
1RCD	300	500
2RCD	30	100
3RCD	30	30 fixed
1RCCB	30	30 fixed
2RCCB	30	30 fixed
3RCCB	30	30 fixed
4RCCB	30	30 fixed
5RCCB	30	30 fixed
6RCCB	30	30 fixed
7RCCB	30	30 fixed
8RCCB	30	30 fixed

MCCB SETTINGS

1CB	125 fixed	Amperes
2CB	125 fixed	Amperes
3CB	125 fixed	Amperes

COMMENTS:-

OVERLOAD SETTINGS

10L

80 Amperes

CONTROL FUNCTIONS

Tested

Operator Console

OK

COMMENTS:-

FUSE RATINGS

Cars	10	Amperes $1\frac{1}{4} \times 1\frac{1}{4}$
Spinner Channels	10	Amperes $1\frac{1}{4} \times 1\frac{1}{4}$

COMMENTS:-

IMPORTANT NOTE

Residual current devices (RCD and RCCB) are installed on this ride for personnel and equipment protection. They are intended to minimise the risk of electric shock and should be tested at regular intervals. Any device that does not trip immediately on test must be replaced with an identical device.

The ride must never be operated without the ground fault devices (RCD). **It is dangerous to do so!**

The ride must be connected to earth and properly grounded. Never operate the ride without proper grounding.

DYNAMIC BRAKING UNIT

EC SERIES

INSTRUCTION MANUAL

After reading this manual, keep it at hand for future reference.

SAFETY

DANGER HIGH VOLTAGE

Motor control equipment and electronic controllers are connected to hazardous line voltages. When servicing drives and electronic controllers, there might be exposed components with cases or protrusions at or above line potential. Extreme care should be taken to protect against shock.

Stand on an insulating pad and make it a habit of only using one hand when checking components. Always work with another person in case an emergency occurs. Disconnect controllers whenever possible before checking controllers or performing maintenance. Be sure equipment is properly grounded. Wear safety glasses whenever working on electronic controllers or rotating electrical equipment.

CAUTION

This unit is for use with inverters with both DC positive and negative terminals available. It cannot be used with inverters with built in braking, or with inverters where the DC link buss voltage is not available.

Read the inverter manual thoroughly to ensure compatibility, if in any doubt consult your supplier.

SPECIFICATION

The EC Series Dynamic Braking Unit can be used with both low and high voltage inverters.

When used with high voltage (400 volt class) inverters the EC Dynamic Braking Unit must have a supply voltage of 380-415 volts, line to line. The unit will then operate when the DC link voltage reaches 660 volts.

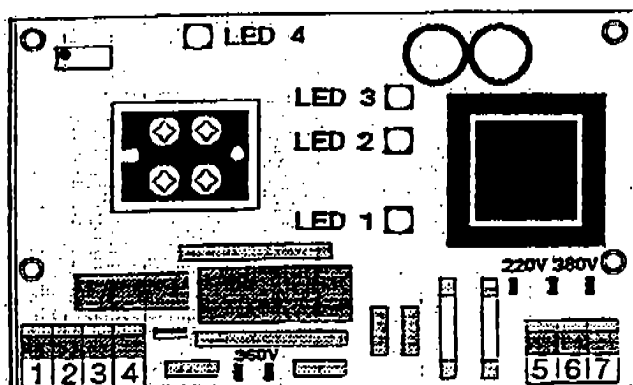
When used with low voltage (200 volt class) inverters the EC Dynamic Braking Unit must have a supply voltage of 220-240 volts, line to neutral. The unit will then operate when the DC link voltage reaches 360 volts.

Ensure the internal link selection is correctly made for the voltage being used.

TECHNICAL DATA

Mains Supply	220-240 Volt AC / 380-415 Volt AC				
Size/Type	Model	Rating KVA 660 Volt DC Link	Rating KVA 360 Volt DC Link	Maximum Current Amps	Minimum Resistance Ohms
Size 2	EC12249	5.7	3.2	8.6	80.0
	EC12250	8.6	4.9	13.0	55.0
	EC12251	11.0	6.0	16.0	45.0
	EC12252	15.0	8.3	22.0	35.0
Size 3	EC12254	23.0	13.3	35.0	20.0
	EC12256	43.0	20.0	53.0	15.0
	EC12258	46.0	26.0	70.0	10.0
Ambient	0-40 Centigrade				

LAY OUT SIZE 2



Indication

LED 1 Clear Unit Active
LED 2 Red Wrong Polarity
LED 3 Green Unit Ready
LED 4 Yellow Power Supply

Fusing

Size 30mm x 5mm - 1amp

TERMINAL DESCRIPTION SIZE 2

Terminals 1 - 3 DC Link Connection. 1 = DC negative, 2 = DC positive

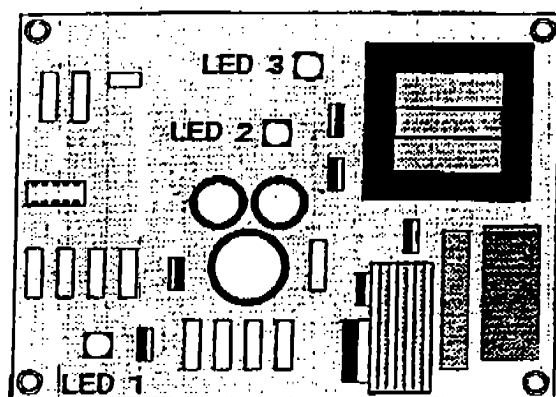
Terminals 2 - 4 Resistor Connection. In series with the braking resistor a thermal relay should be fitted to protect the resistor. It should be rated at the nominal current of the resistor.

Terminals 5 - 6 Power Supply. See specification label.

Terminal 7 Earth

Note : For single phase (line and neutral) supplies, connected to a low voltage inverter, the 360 volt link should be bridged. For three phase (line to line) supplies, connected to high voltage inverters no link is necessary.

LAY OUT SIZE 3



Indication

LED 1 Clear Unit Active
 LED 2 Green Unit Ready
 LED 3 Yellow Supply Under Voltage

Fusing

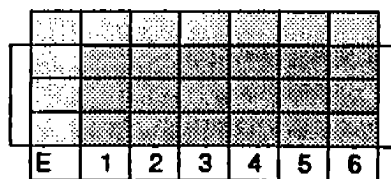
Size 32mm x 6.35mm
 2amp/415volt

TERMINAL DESCRIPTION SIZE 3

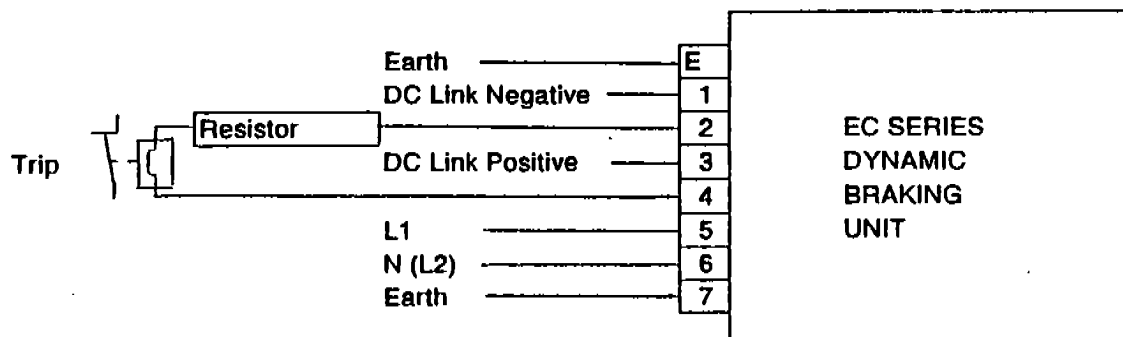
Terminals 1 - 3 DC Link Connection. 1 = DC negative, 2 = DC positive

Terminals 2 - 4 Resistor Connection. In series with the braking resistor a thermal relay should be fitted to protect the resistor. It should be rated at the nominal current of the resistor.

Terminals 5 - 6 Power Supply. See specification label.

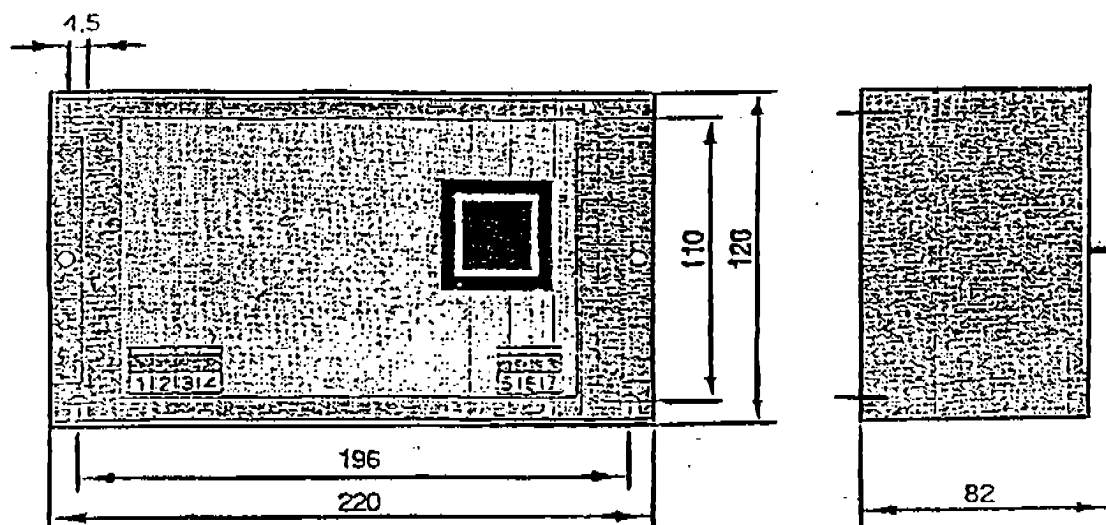


CONNECTION DIAGRAM - SCHEMATIC

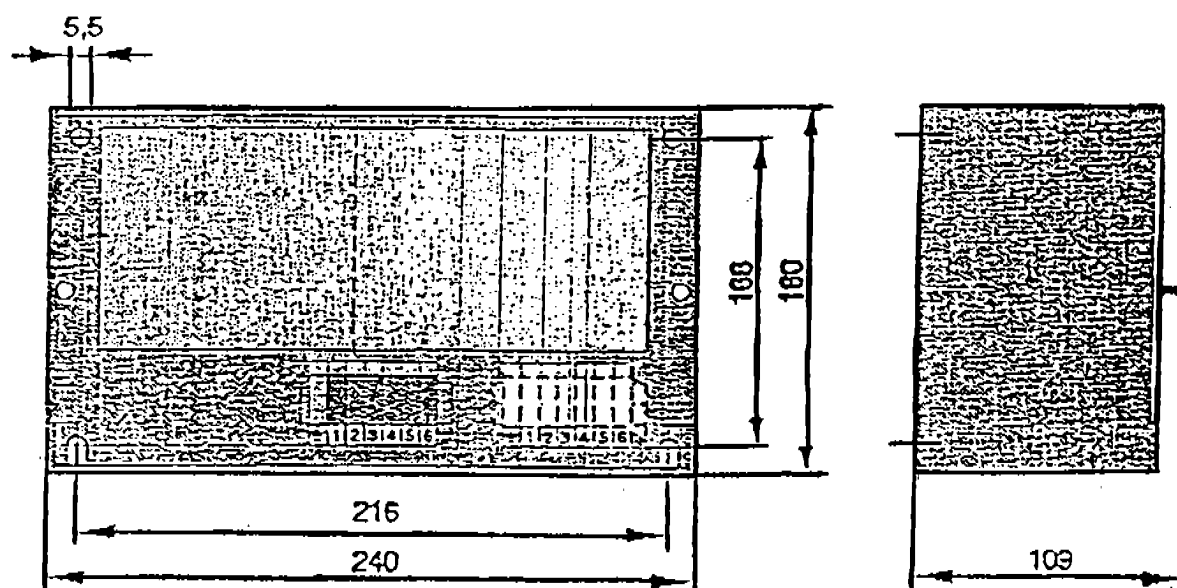


DIMENSIONS

SIZE 2



SIZE 3



ALL DIMENSIONS IN MM

SECTION 6

HYDRAULIC AND ELECTRICAL SCHEMATICS

Installation drawing: REV A:		Test procedure:		Parts List for: TRI STAR ARM LIFT MANIFOLD	
Tab. on assy. drawing		Distribution:		Assembly No.:	
Division: Vickers Havant		AEL:	Release-type:	Release-date: 13.04.94	Approved by: S INGRAM
Date last change: 13.04.94		Circuit diagram No.: CD 2427.01		D-Sheet: 1 / 1	Page: 1 / 1

N Quotation No.: 9404017-A

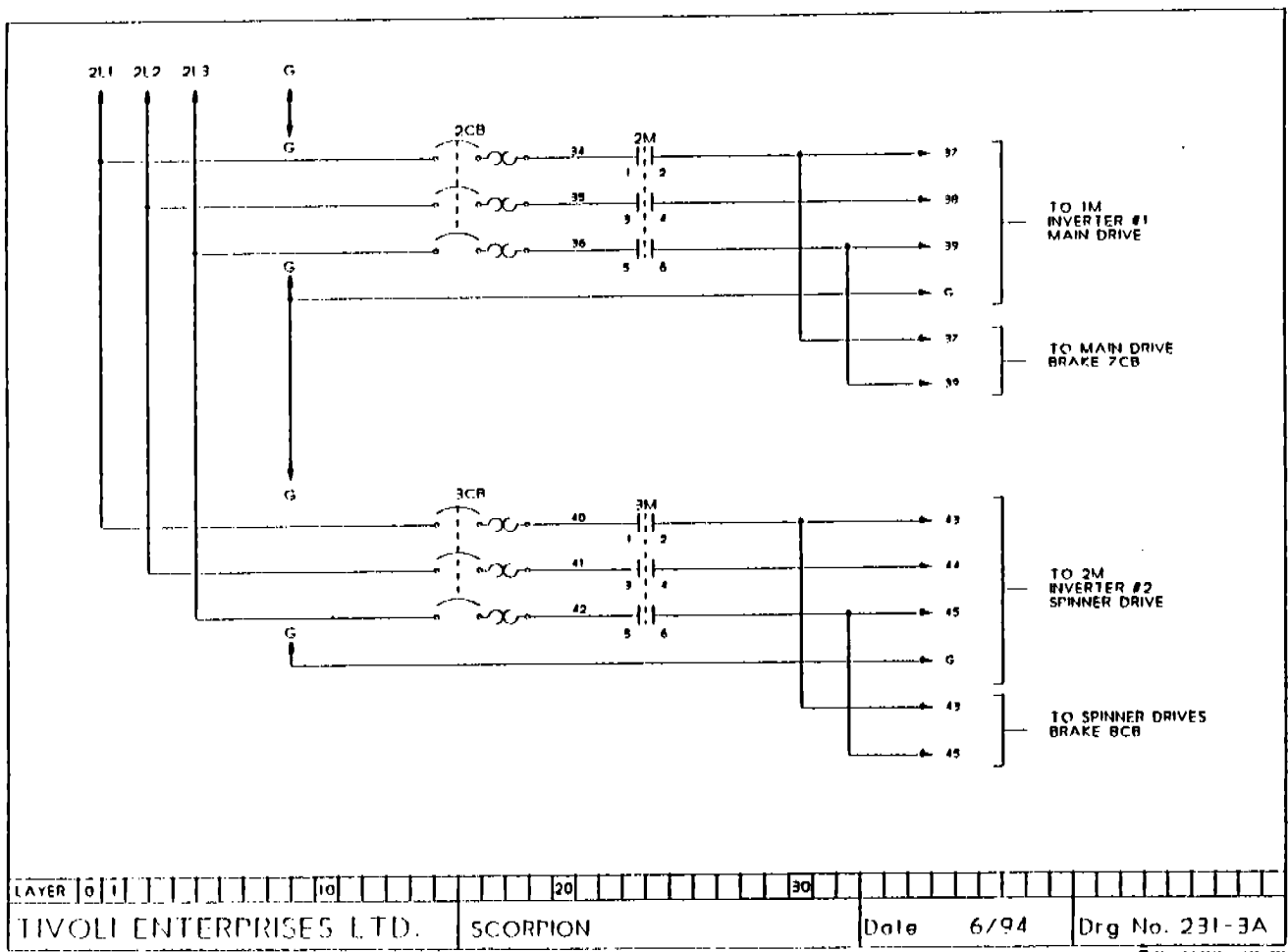
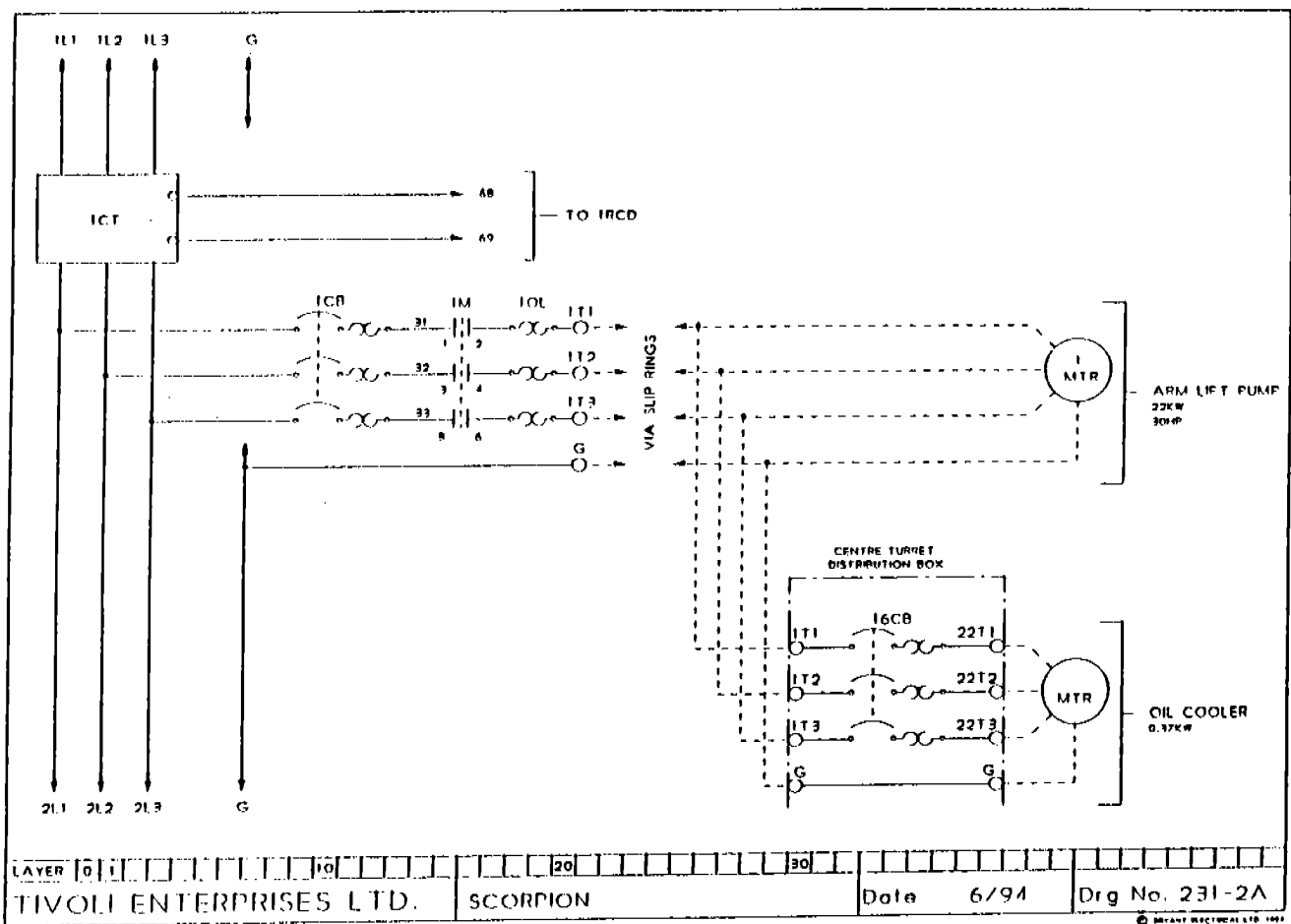
Quotation title: (PS 2427) TRI STAR ARM LIFT

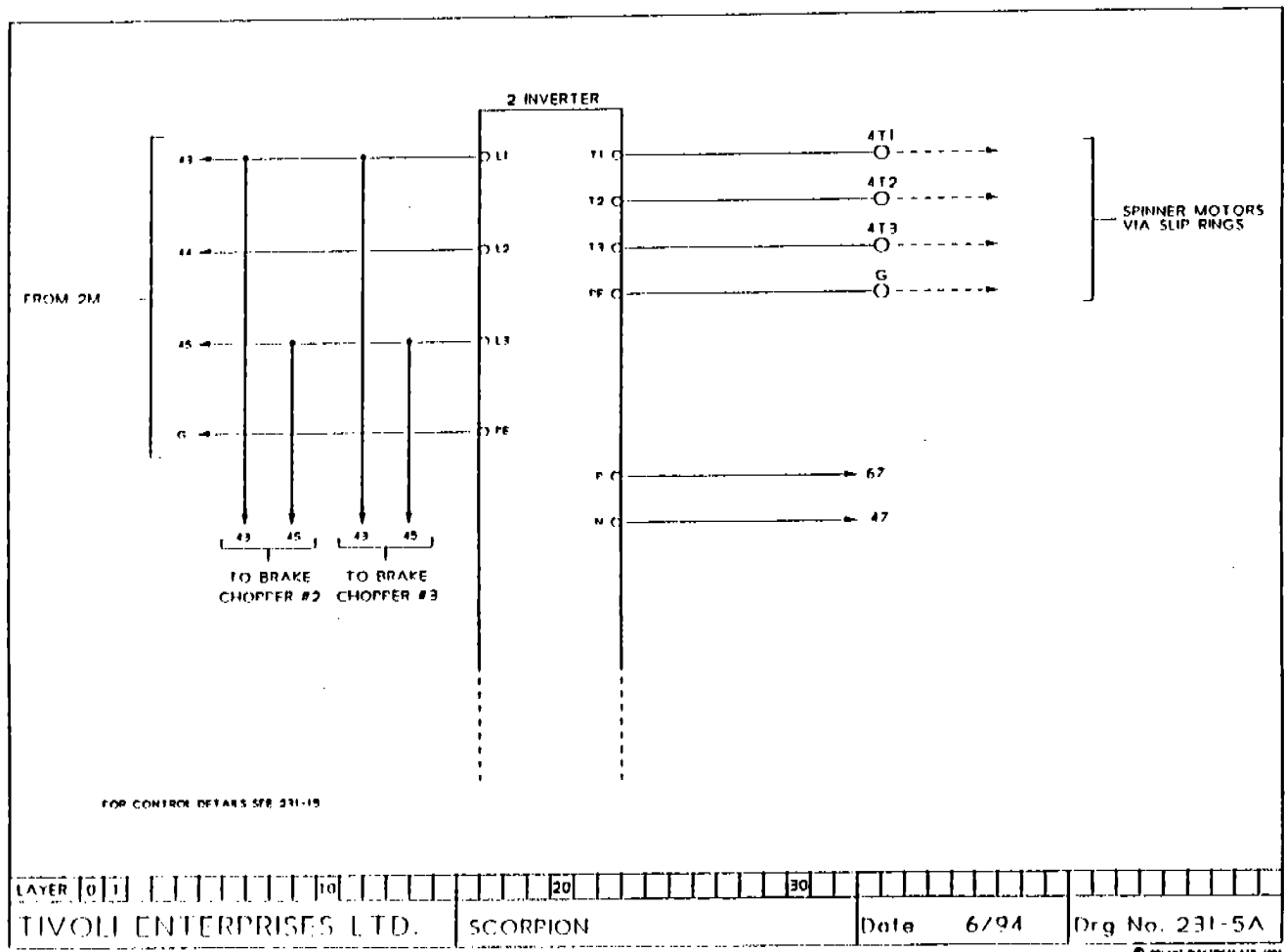
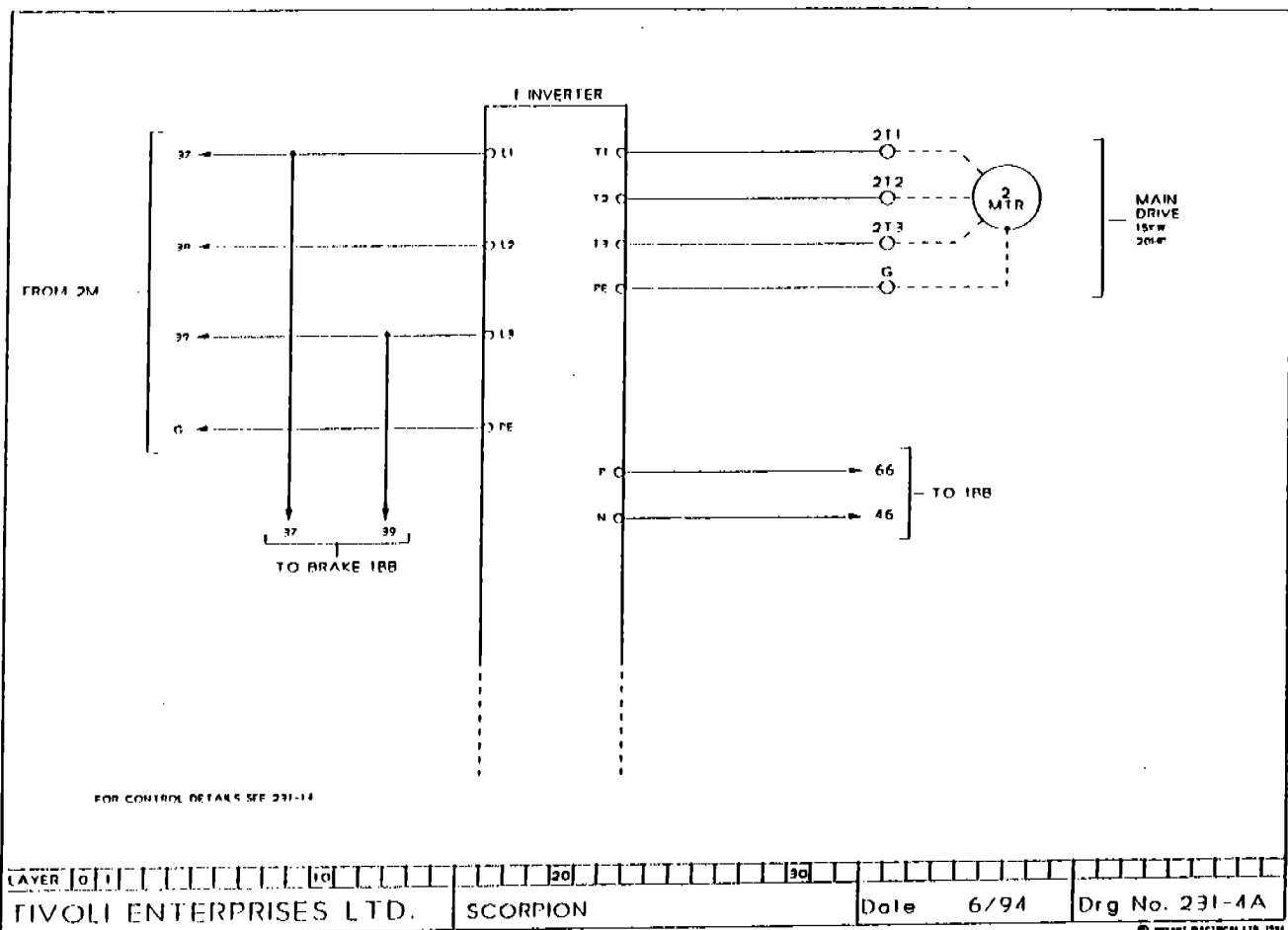
A Customer No.: 01206501

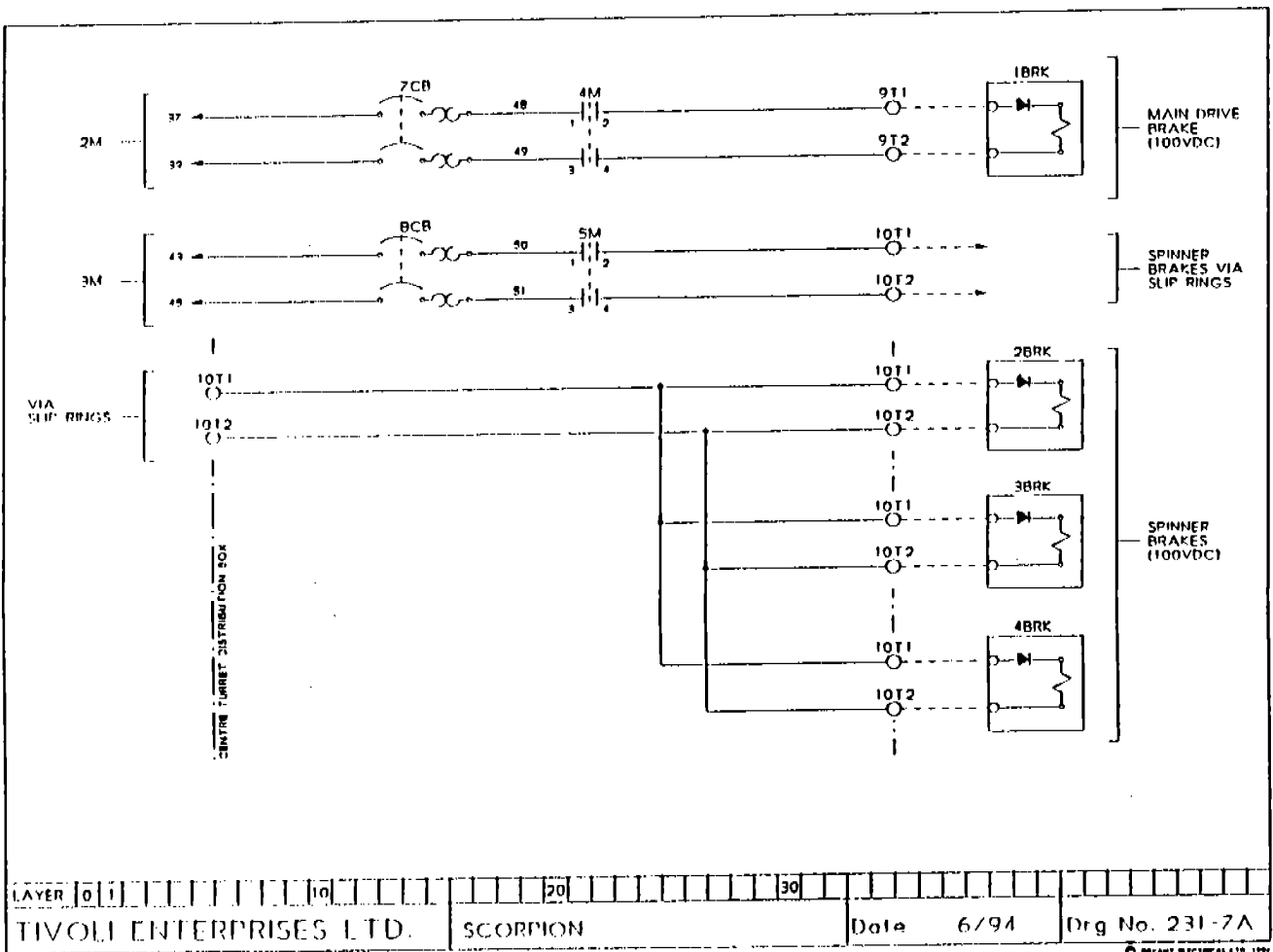
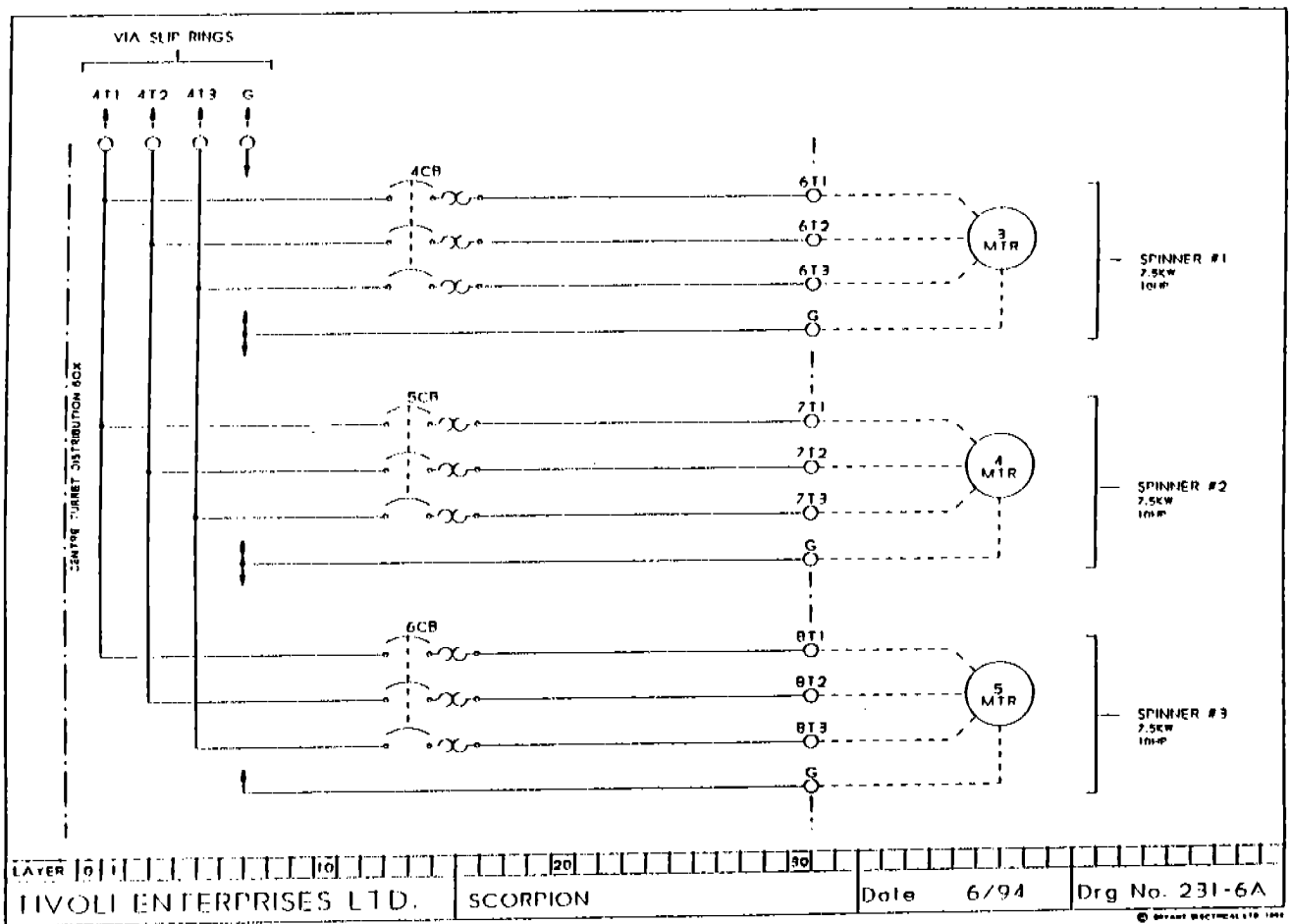
Customer name: TIVOLI ENTERPRISES LTD

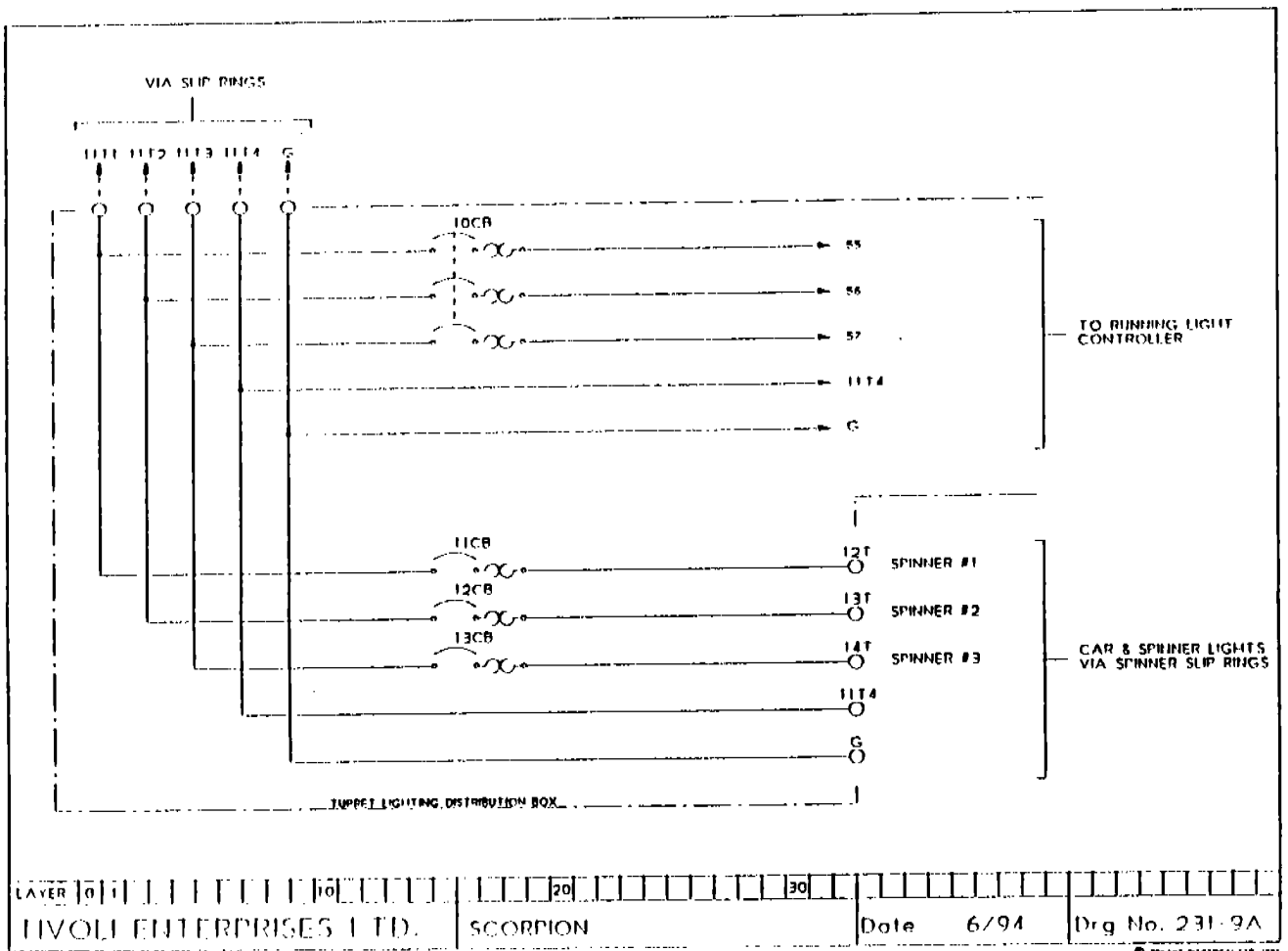
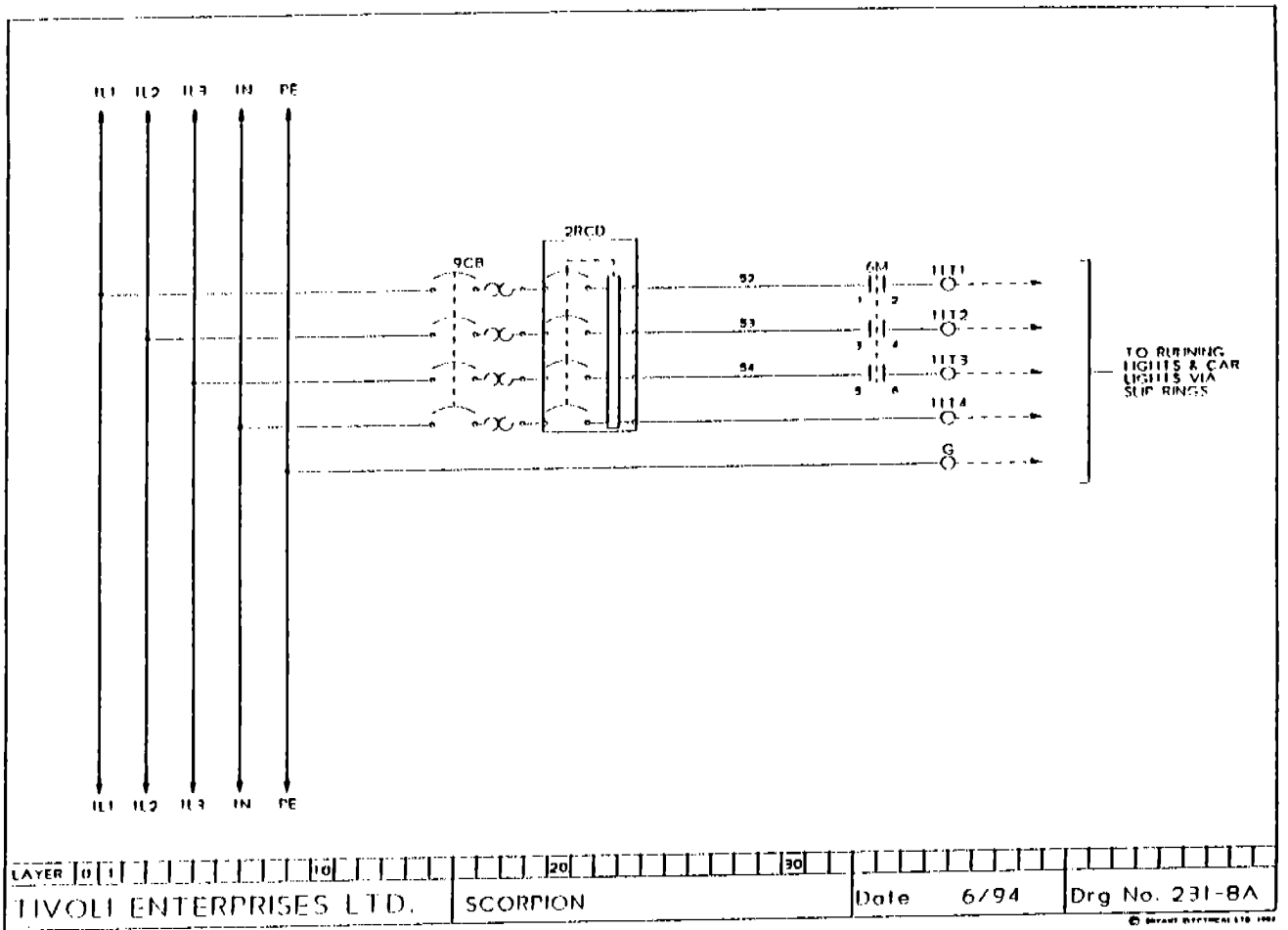
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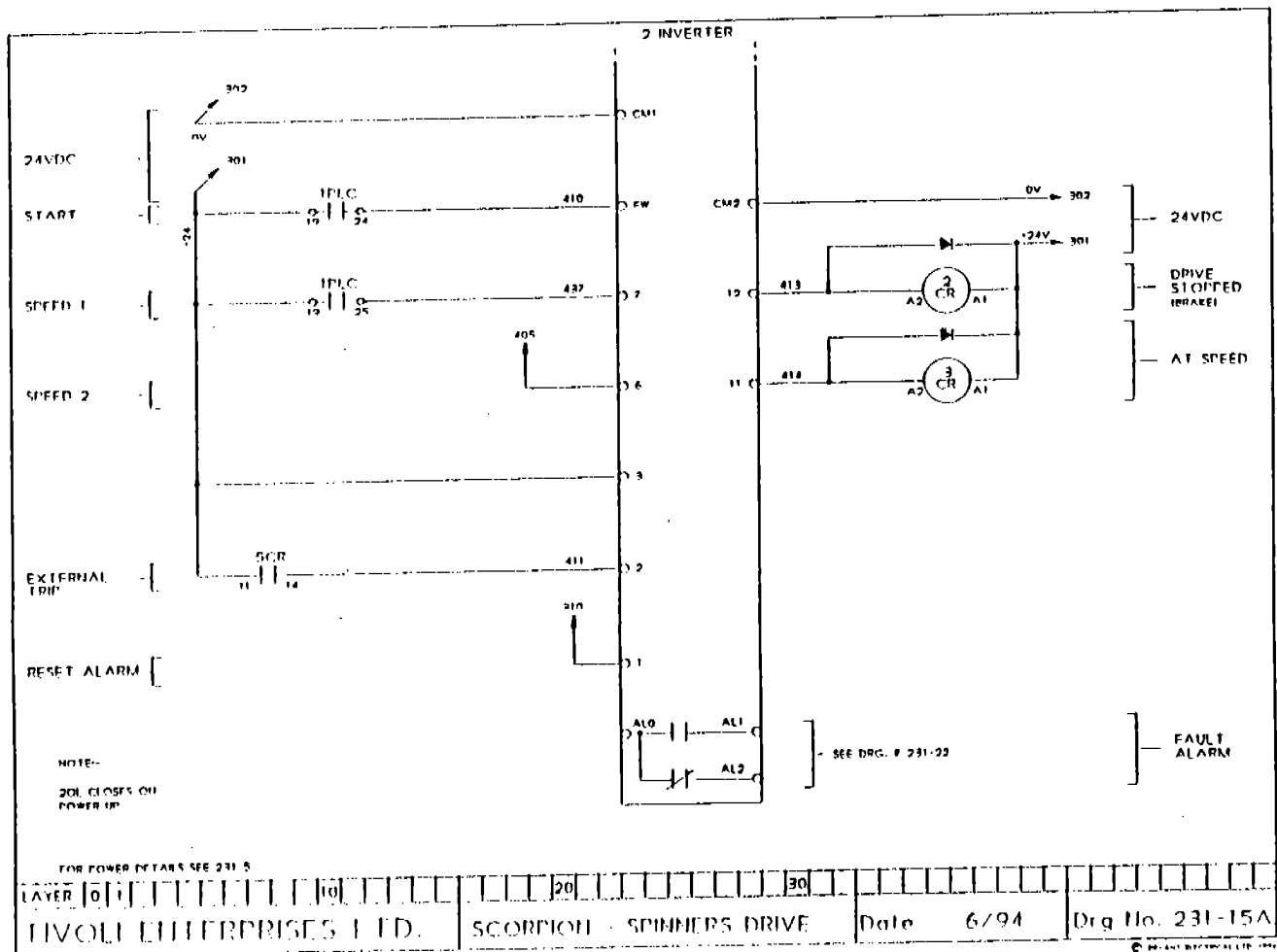
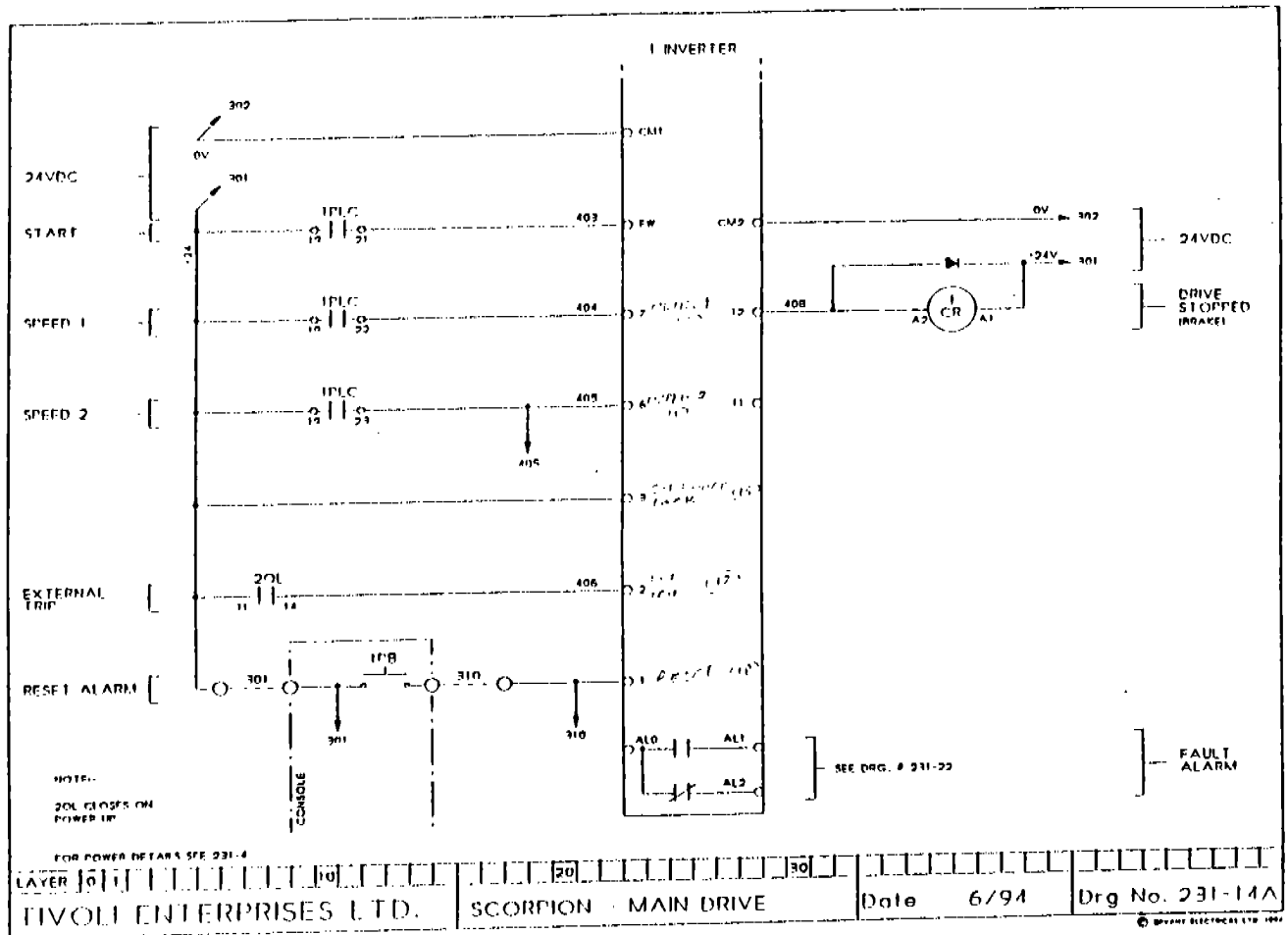
Vickers	Cust.	Qty.	Name	Ass. No.	Order code Modelcode	Supplier	MSCR
				REV A:	(ORIGINAL)	13.4.94	
0.1		1	Manifold Block	NN	DRAWING ****	Vickers	
1		1	Directional Solenoid Valve Screw-In Cartridge	565716	SV3 16 0 0 115AG	Vickers	
2		1	Directional Solenoid Valve Screw-In Cartridge	565716	SV3 16 0 0 115AG	Vickers	
3		1	Directional Solenoid Valve Screw-In Cartridge	565716	SV3 16 0 0 115AG	Vickers	
4		1	Directional Solenoid Valve Screw-In Cartridge	565716	SV3 16 0 0 115AG	Vickers	
5		1	Relief Valve Screw-In Cartridge	565568	RV3 10 S 0 36	Vickers	
6		1	Relief Valve Screw-In Cartridge	565568	RV3 10 S 0 36	Vickers	
7		1	Relief Valve Screw-In Cartridge	565568	RV3 10 S 0 36	Vickers	
8		1	Check Valve Screw-In Cartridge	565845	CV3 10 P 0 10	Vickers	
9		1	Check Valve Screw-In Cartridge	565845	CV3 10 P 0 10	Vickers	
10		1	Check Valve Screw-In Cartridge	565845	CV3 10 P 0 10	Vickers	
11		1	Check Valve Screw-In Cartridge	565845	CV3 10 P 0 10	Vickers	
12		1	Check Valve Screw-In Cartridge	565845	CV3 10 P 0 10	Vickers	
13		1	Check Valve Screw-In Cartridge	565845	CV3 10 P 0 10	Vickers	
14		1	Test Point 1/4"BSP	1606TP01	HSP-2000B	Hyd Sys Prod	
15		1	Test Point 1/4"BSP	1606TP01	HSP-2000B	Hyd Sys Prod	
16		1	Test Point 1/4"BSP	1606TP01	HSP-2000B	Hyd Sys Prod	
17		1	Flow Control Valve	708148	EFN 06 21 B	Vickers	
18		1	Flow Control Valve	708148	EFN 06 21 B	Vickers	
19		1	Flow Control Valve	708148	EFN 06 21 B	Vickers	

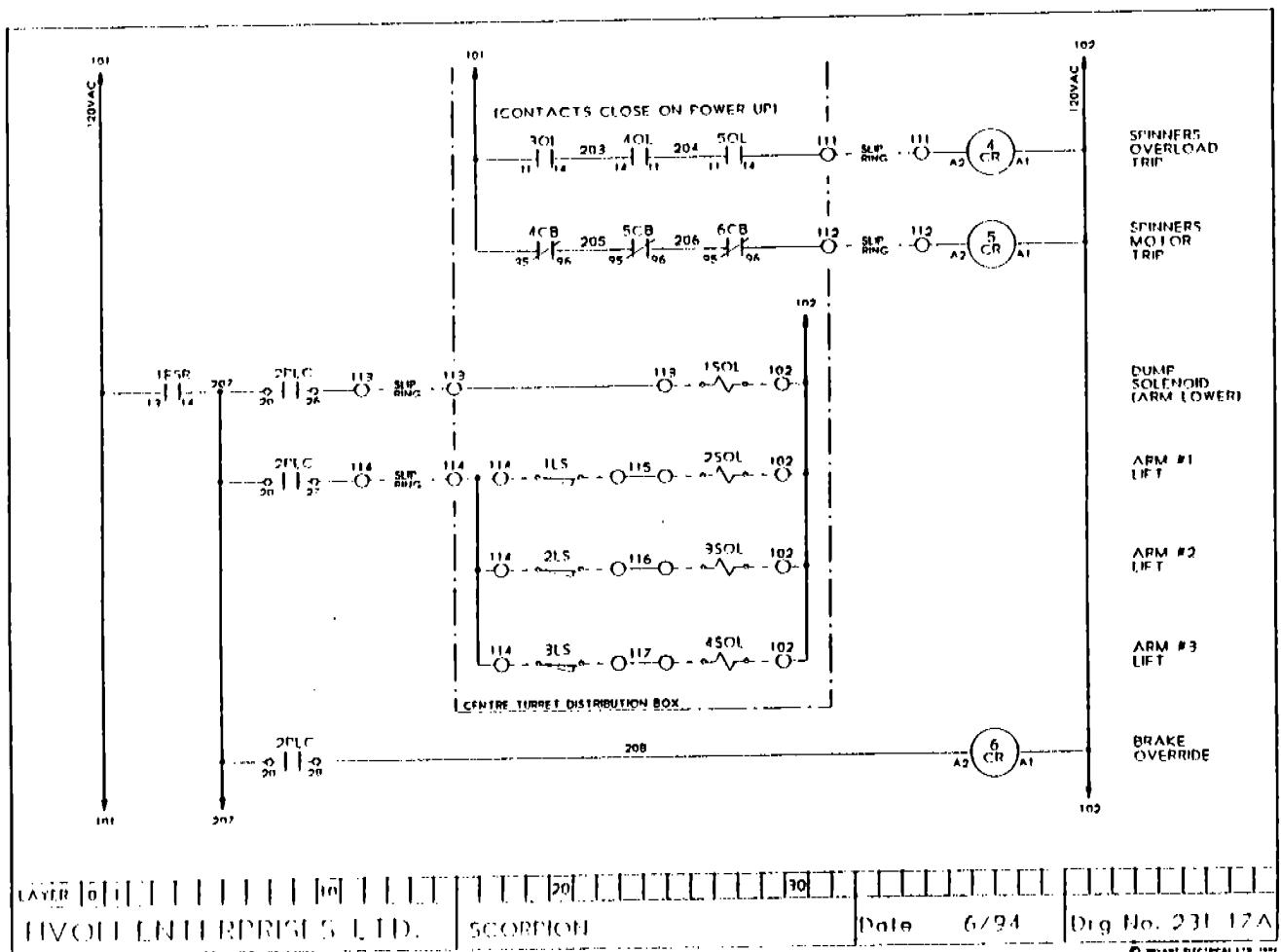
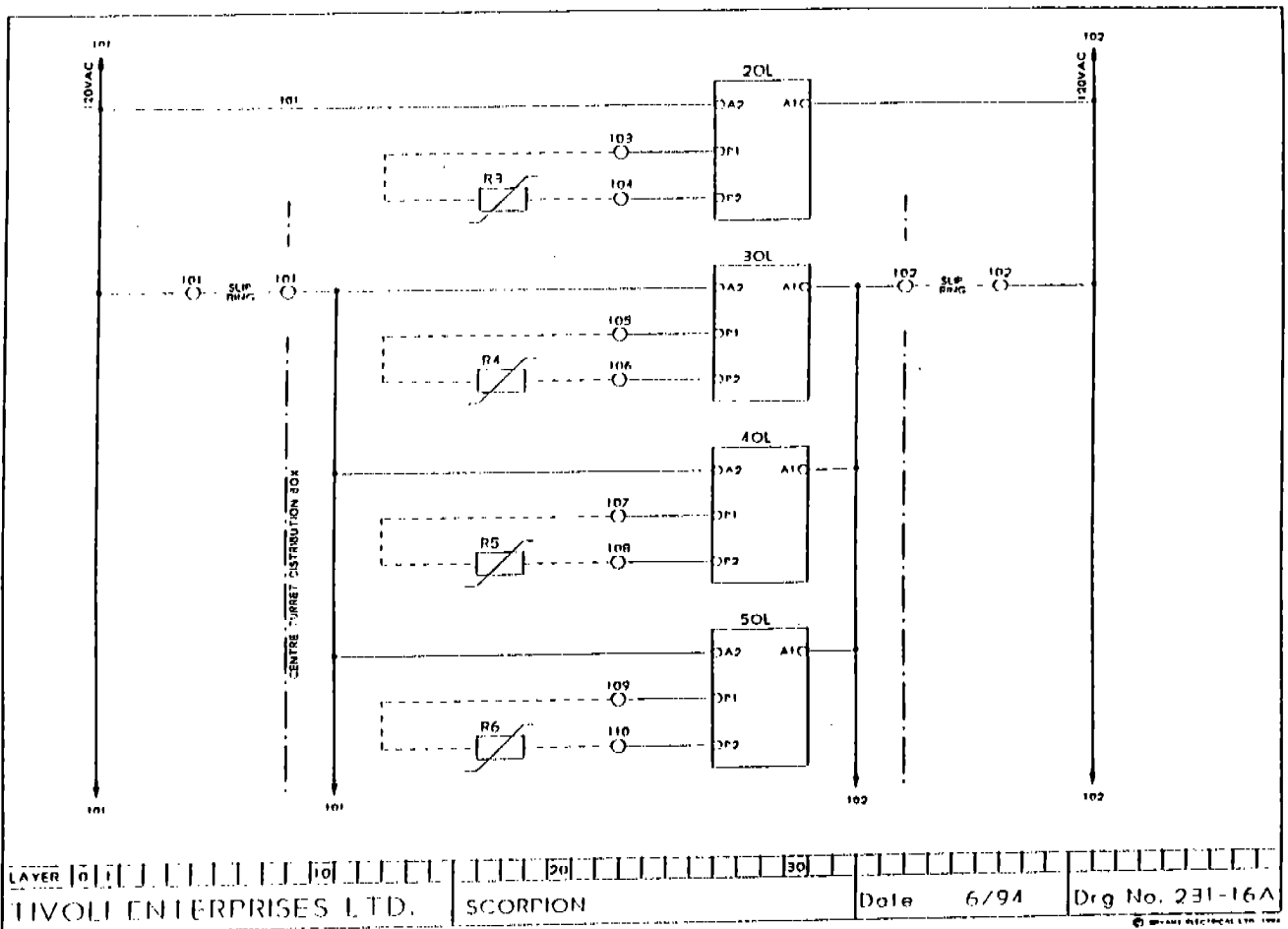


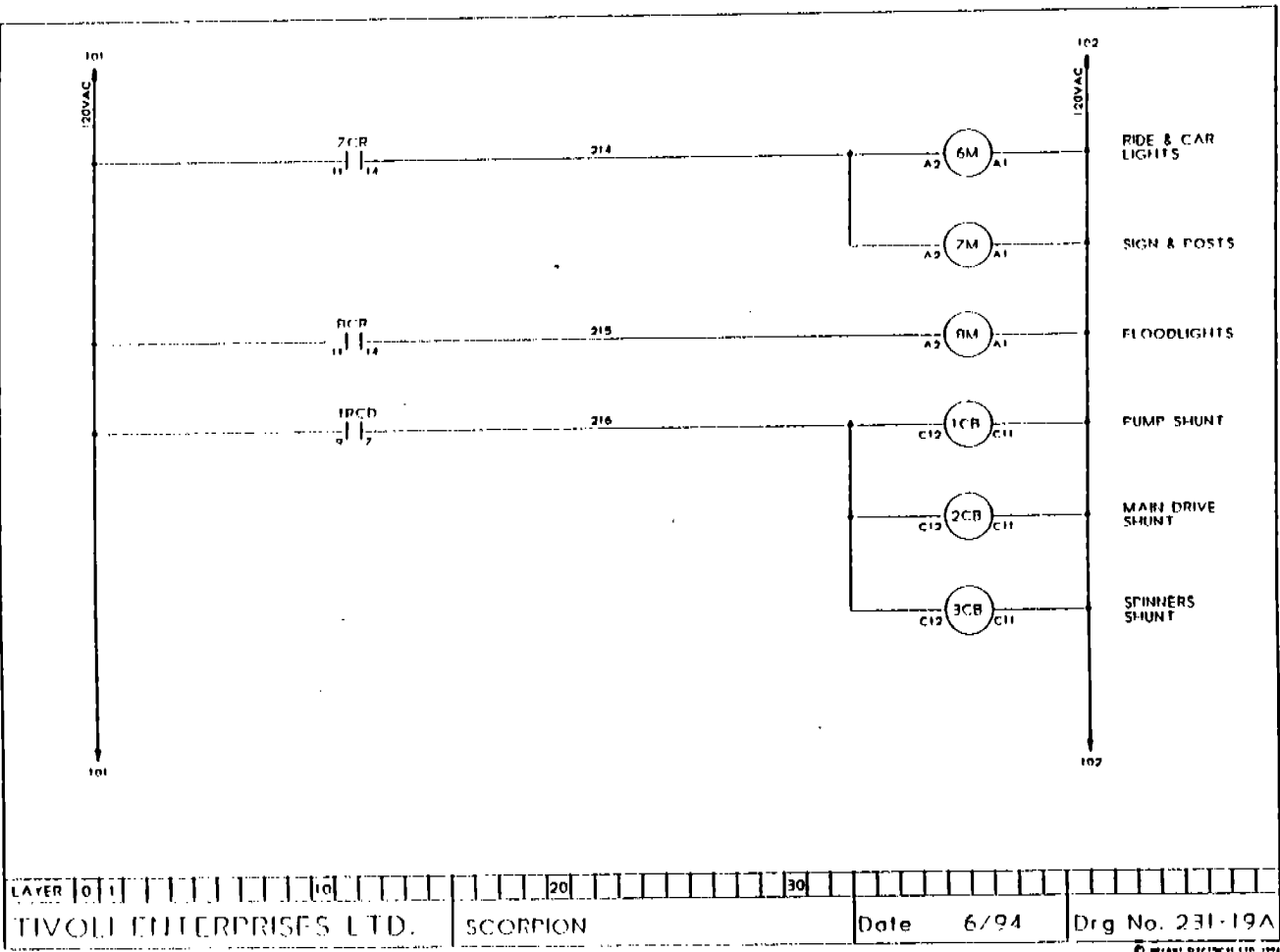
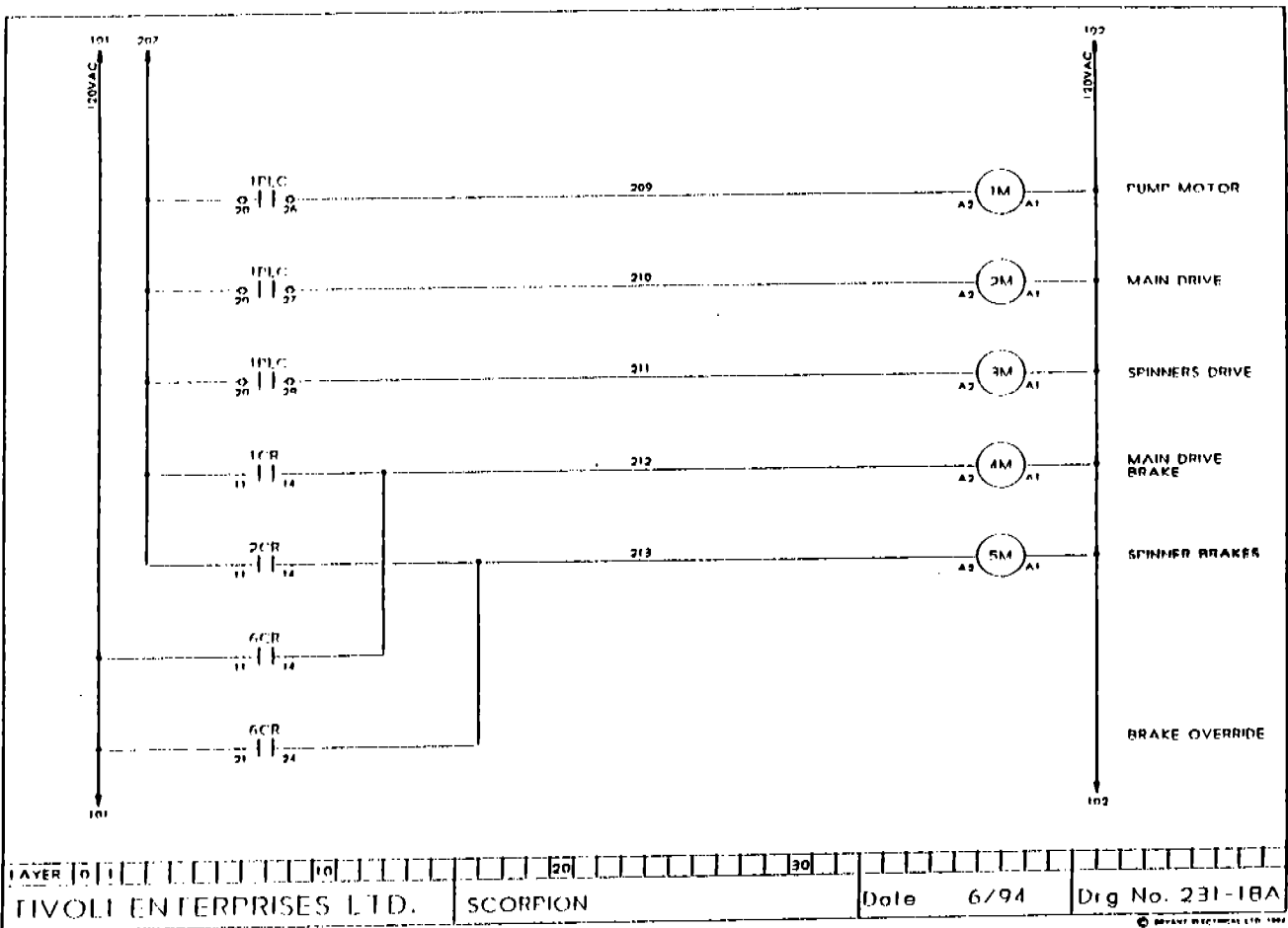


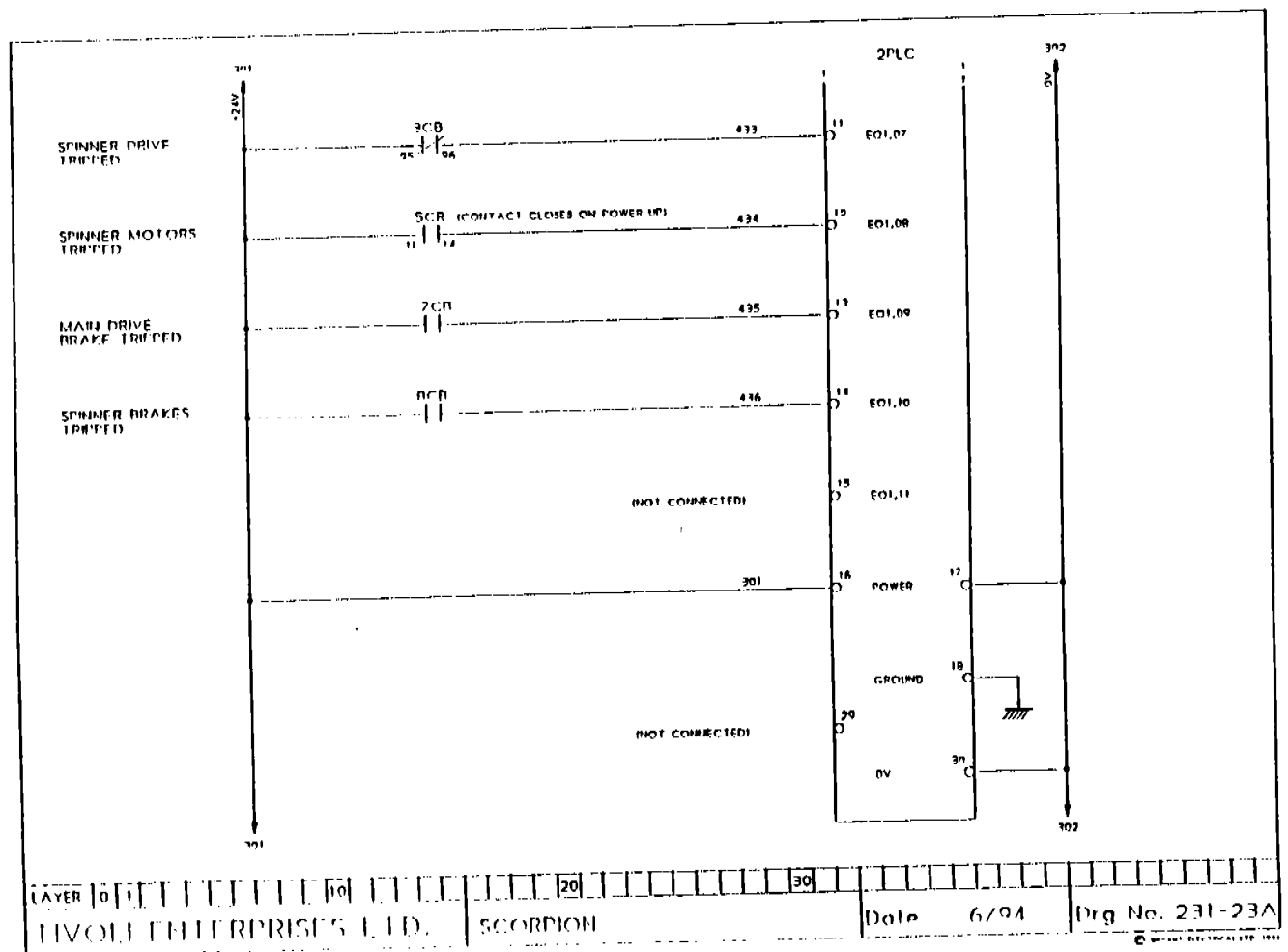
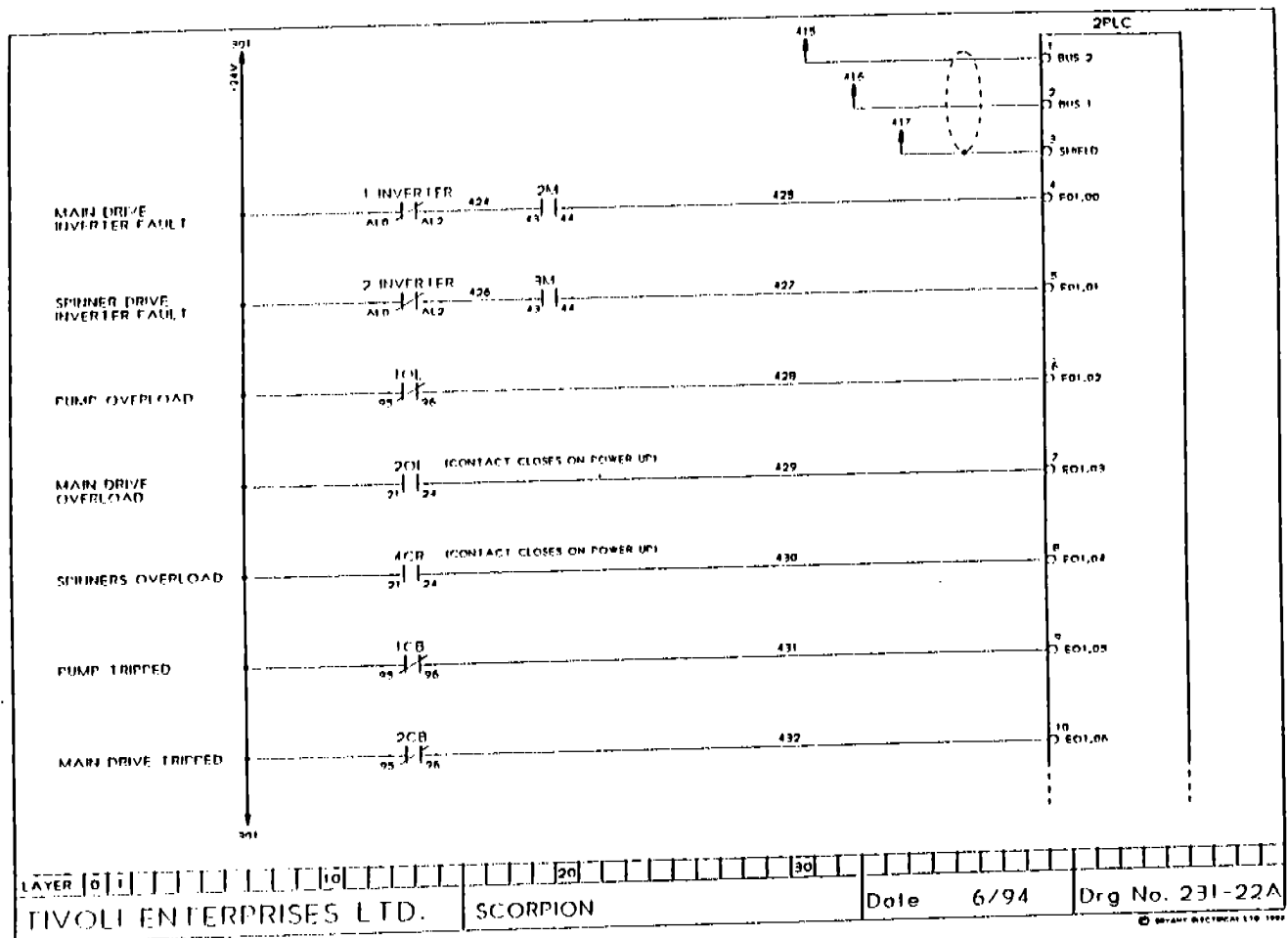


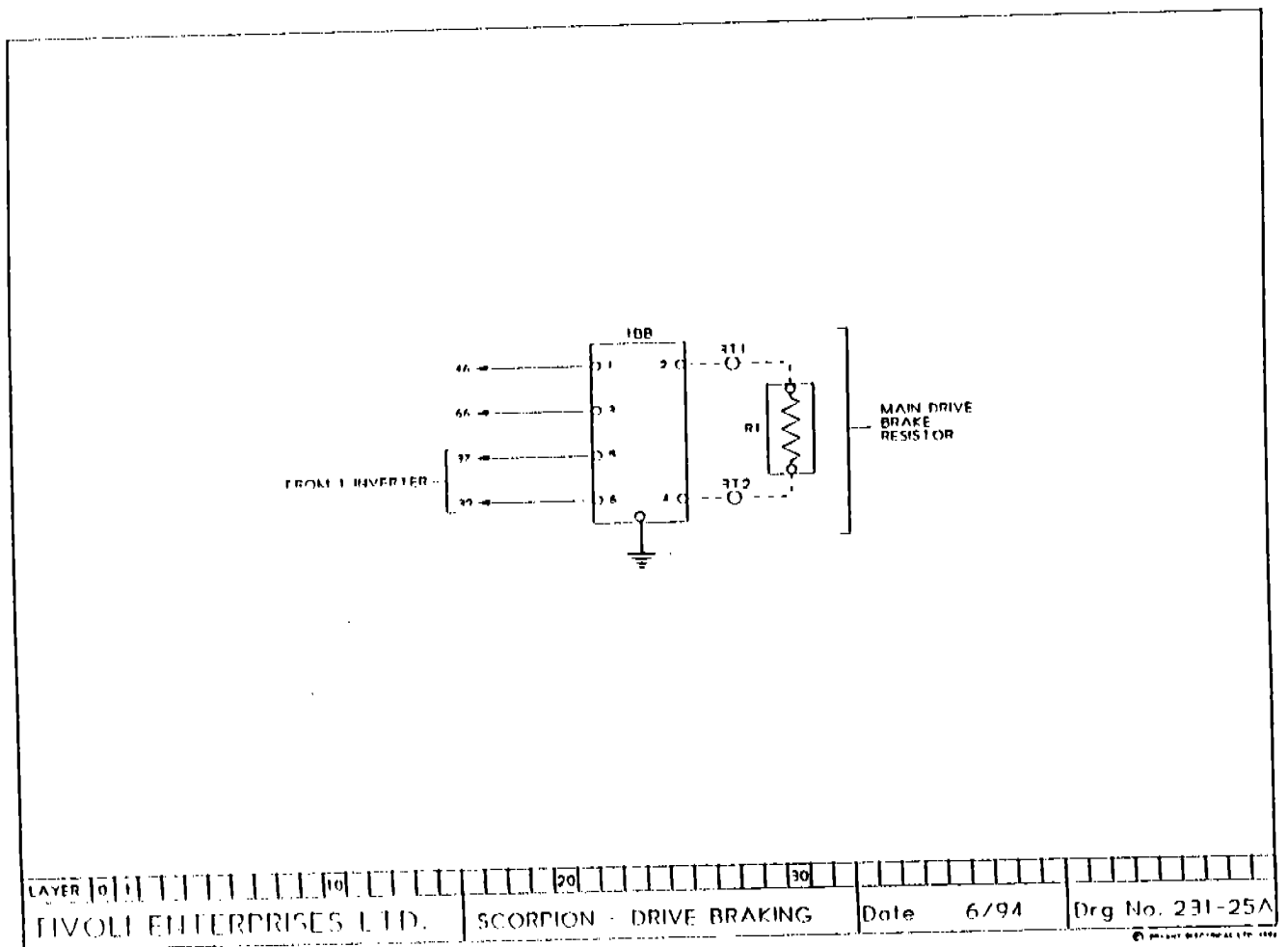
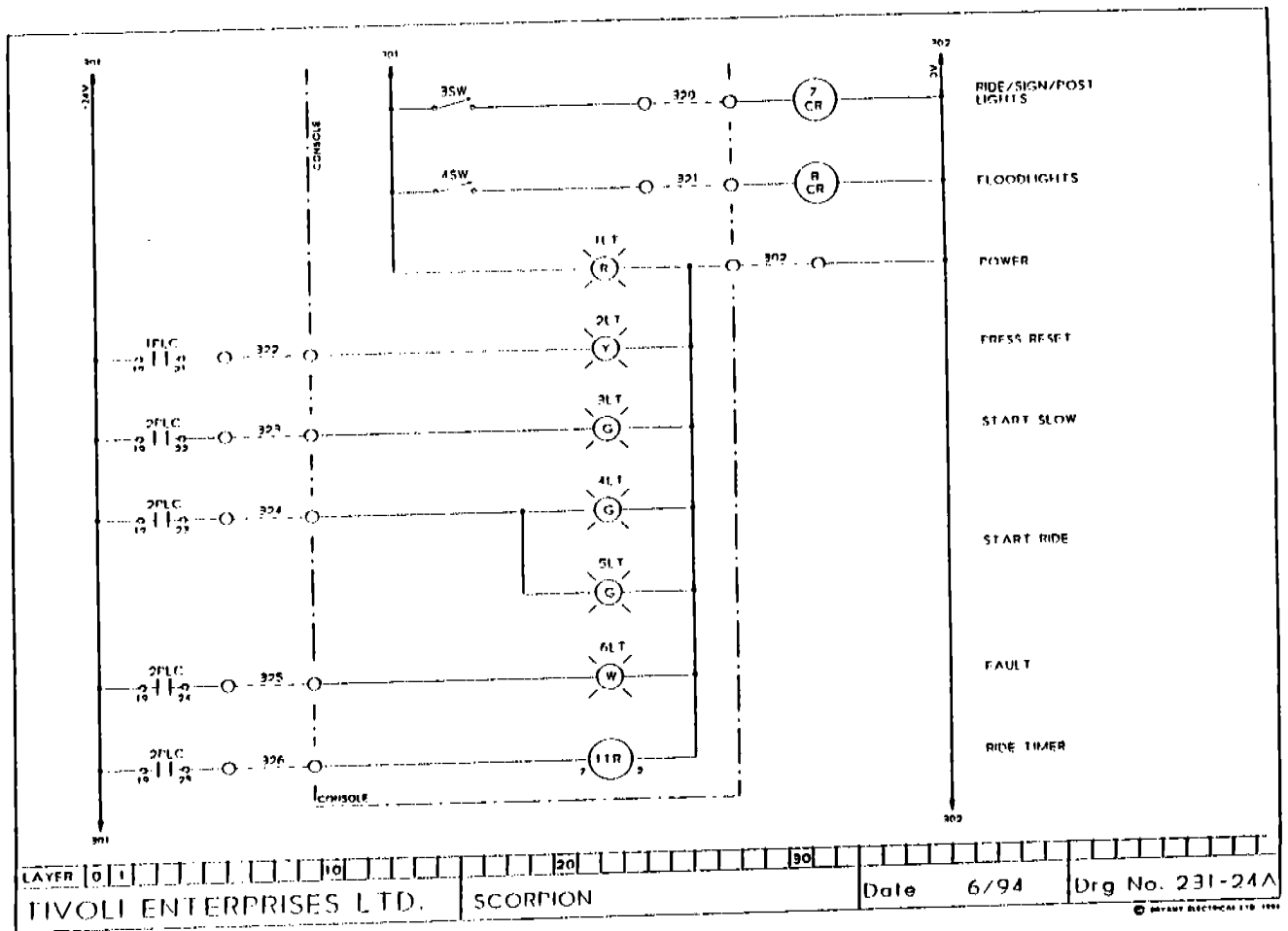


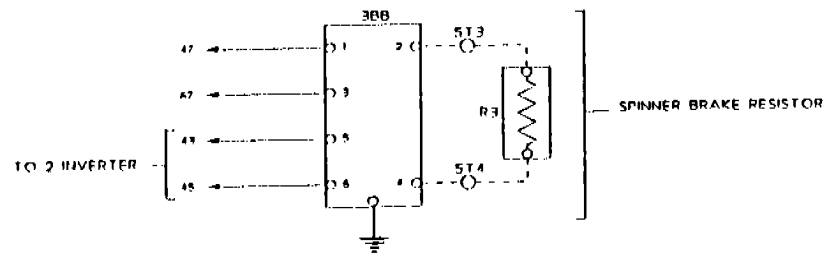


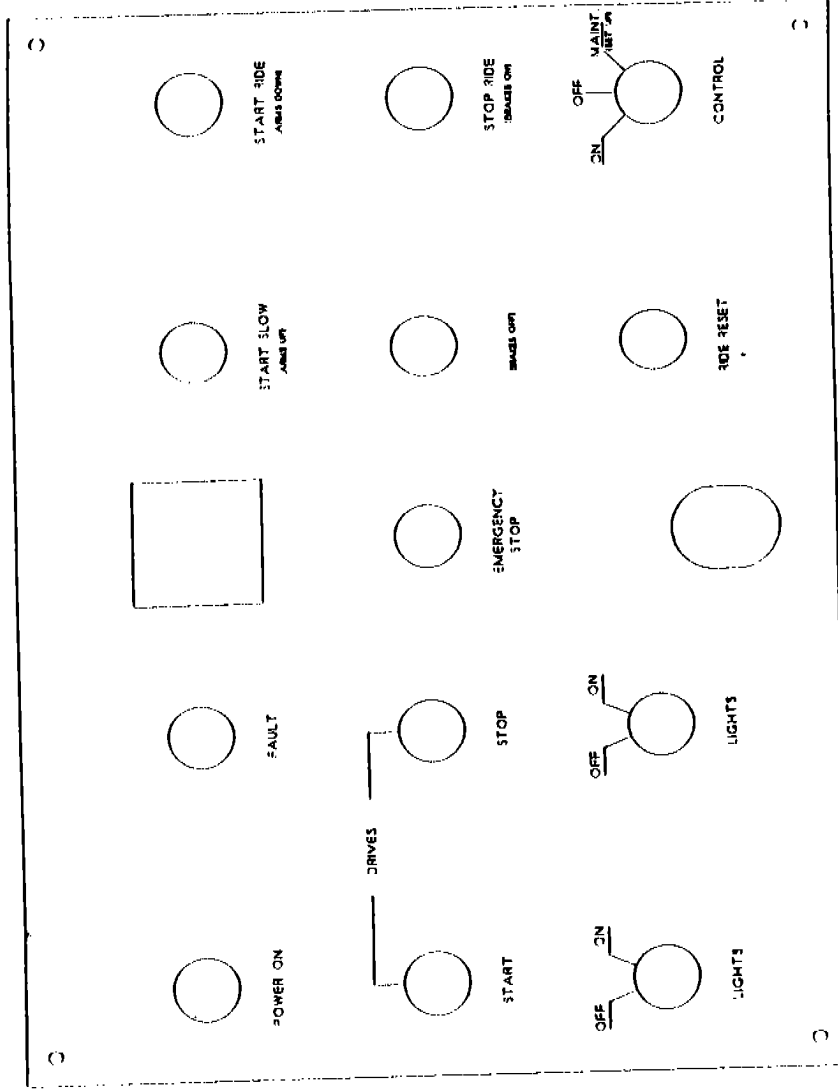












LAYER 101121 5

TIVOLI ENTERPRISES LTD.

SCORPION

CONSOLE LAMINATE

Date

6/94

Org No. 232

SECTION 7

LUBRICATION INFORMATION

Lubrication Schedule

Component	Location	Frequency	Lubricant
Main center column slewing ring	At base of center column on deck near drive pinion 4 Grease fittings.	Daily	General Purpose Lithium Grease 10 pumps each fitting while ride turns slow
Center ring and pinion gears	Through pinion Gear cover guard.	Weekly	General purpose Lithium grease Apply directly to gears while ride rotates slow until all gear teeth coated
Sweep arm pivot bushing. 3 bushings, 1 per sweep	End of pivot shaft 1 grease fitting per sweep	Daily	General purpose Lithium grease 5 pumps each fitting
Spinner slewing ring 3 bearings 1 per spinner	Outside surface of bearing 3 places each bearing	Daily	General purpose Lithium grease 5 pumps per fitting
Spinner ring and pinion gears 1 ring, 1 pinion per sweep	Inside spinner hub from underside	weekly	General purpose Open gear lubricant Apply directly to gears until lightly coated
Vehicle pivot joints 2 ball joint per car	Each end of vehicle frame at hanging point	Bi Weekly	General purpose Lithium grease Clean & wipe small amount on ball surface

Tilt out hydraulic cylinder pivot points
2 places per cylinder. 3 cylinders

Each end of hydraulic
cylinder at pivot joint

Monthly

General purpose
Lithium Grease
5 pumps per fitting

Hydraulic Resivour

On the center colume

Weekly
Annualy
Bi-Annualy

Check level
Clean tank strainer
Change oil.

Motor Gearboxes

At spinner center & ride
center

Monthly

Check level

Annualy

Change oil

SECTION 8

TROUBLESHOOTING

SECTION 9

SERVICE BULLETINS

SECTION 11

SUPPLEMENTAL INFORMATION



OPERATOR'S MANUAL FOR THE SERIES 12 HYDRAULIC & ELECTRIC WINCH

- SAFETY PRECAUTIONS AND GENERAL APPLICATION
- MOUNTING SPECIFICATIONS
- ELECTRIC ENGINEERING & PERFORMANCE DATA
- HYDRAULIC ENGINEERING & PERFORMANCE DATA
- REPLACEMENT PARTS INFORMATION

! CAUTION !

Fully read and understand this manual before installation and operation of winch. Save this manual for future reference.

**Warn Industries, Inc.
13270 S.E. Pheasant Court
Milwaukie, OR 97222**

Phone: (503) 786-4464 FAX: (503) 786-4452

SAFETY PRECAUTIONS AND GENERAL APPLICATION

! WARNING !

Careless operation can result in serious injury or property damage. Read and understand all safety and operating instructions before installing and operating winch. These instructions are installation instructions for the Warn Industrial, **SERIES 12** Hydraulic and Electric Winch.

! CAUTION !

- DO NOT EXCEED THE LINE PULL RATING SHOWN ON THE IDENTIFICATION LABEL.
- DO NOT EXCEED THE MAXIMUM RATING OF THE WIRE ROPE BEING USED.
- THE WINCHES DESCRIBED HEREIN ARE NEITHER DESIGNED NOR INTENDED FOR USE OR APPLICATION TO EQUIPMENT USED IN LIFTING OR MOVING PEOPLE.
- THESE WINCHES ARE RATED FOR INTERMITTENT DUTY OPERATION ONLY.
- OVERHEATING THE MECHANICAL BRAKE MAY RESULT IN PERMANENT DAMAGE TO, OR FAILURE OF, THE BRAKE. REPLACE ANY DAMAGED BRAKE COMPONENTS BEFORE RESUMING USE OF THE WINCH.

Mechanical Brake

Care must be taken to avoid overheating the mechanical brake. As the load is increased, the duration of brake use must be reduced to limit the brake temperature. Allow adequate time for the brake to cool between uses. The smoothness of operation of the mechanical brake will improve as it is broken in during initial use.

1. Before initial use of your winch, test for proper operation. **KEEP HANDS AWAY FROM WIRE ROPE AND HOOK WHILE TESTING WINCH.**
2. Never touch the wire rope or hook while they are in tension or under load. Even at rest, the winch may have wire rope in tension.
3. Never handle the wire rope or rigging while anyone is at the controls or while operating the winch.
4. Always stand clear of the wire rope and load during the winching operation. Keep helpers and spectators at a safe distance. If a wire rope pulls loose or breaks under load, it can lash back with tremendous force.
5. Always be certain the rigging that you intend to use is capable of withstanding the load. Never put the wire rope

around an object and hook it back to the wire rope. This will cause damage to the wire rope.

6. Never use the winch with less than five wraps of wire rope around the winch drum. With fewer wraps, the wire rope could break under loose from the drum under heavy load.
7. (On **SERIES 12** hydraulic winches only); The wire rope must always spool onto the drum as indicated by the drum rotation label on the winch. Hydraulic winches are equipped with an automatic brake and **WILL NOT FUNCTION** if the wire rope spools in the opposite direction. The wire rope spooling can accidentally be reversed by running the wire rope all the way out and re-spooling in with the control switch in the "Power Out" mode. **NOTE:** **SERIES 12** electric winches, provided with this manual or built after 2/93, have a bi-directional brake and will work with wire rope spooled on either direction.
8. Never exceed the rated capacity of the winch. Know the weight of your load.
9. Operate the winch controls smoothly, and slowly take up any slack to avoid shock loads which can momentarily far exceed the winch and wire rope rating.
10. To prepare rigging for heavy loads, unspool wire rope and tightly level wind rope onto drum. Make pulls with minimal wire rope on drum. This will minimize wire rope damage, such as mashing and kinking, caused from top layers pulling down into bottom layers when short pulls are made. The greatest pulling power is available at the First Layer on the drum, decreasing with each successive layer.
11. Always pull as straight as possible to minimize the buildup of wire rope on only one end of the drum. Always inspect and carefully rewind the wire rope after each use. Mashed, pinched, or frayed areas severely reduce the original tensile strength of the wire rope. For safety's sake, replace wire rope when damaged.
12. The life of the wire rope is directly related to the care it receives. The wire rope on a new winch, and any replacement ropes, **MUST BE STRETCHED AND RE-SPOOLED UNDER LOAD** before using the winch. Failure to do this will result in wire rope damage.
13. Always wear heavy duty leather gloves when handling wire rope. Do not let the wire rope slip through your hands.
14. **ALWAYS** release the winch control when hook is a minimum of one meter from winch. The following procedures are important to personal safety and to avoid wire rope damage caused by over tightening.
15. When spooling in wire rope, be sure to distribute the wire rope evenly and tightly onto the drum. This prevents the top layers of wire rope from being drawn into the bottom layers of the wire rope and creating a "bind". If the wire rope binds on the drum, the winch and/or wire rope may be damaged. A "BOUND" wire rope will reel out only a

short distance and then reel back in even though the remote control is held in the "Power Out" position. A "BOUND" wire rope must be corrected before using the winch. Should the wire rope become "BOUND" connect the hook to a load, then by alternately "Powering In" then "Powering Out", the wire rope will usually work itself free. In any event, **DO NOT PUT YOUR HANDS ANYWHERE NEAR THE WIRE ROPE WHEN WORKING A BIND FREE.**

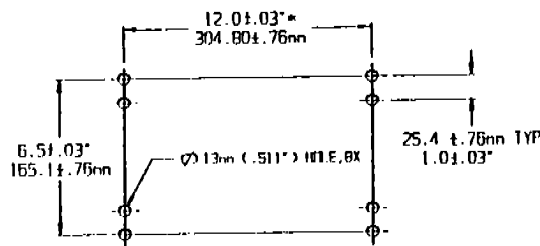
16. For additional safety on electric models, always keep the remote control lead clear of the drum, wire rope, and the rigging while the remote control is plugged in or near the winch.
17. Before using winch, inspect the remote control lead for cracks, pinched spots, frayed wire, and loose connections. A damaged, shorted lead could cause the winch to run as soon as it is plugged in.

MOUNTING SPECIFICATIONS

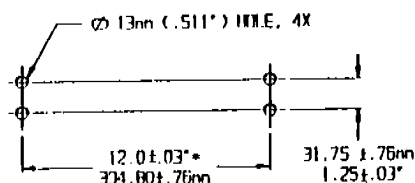
! WARNING !

Any deviation from the illustrated mounting dimensions or instructions could cause the winch to break under load. This would create an unsafe working condition that could result in serious injury or property damage.

1. The winch mounting hole pattern is of critical importance to the strength of the winch. **YOU MUST** use a mounting hole pattern and tolerances as shown in the illustration.
2. To prevent binding of the gear train, the winch must be mounted on a surface that will not flex when the winch is in use. Also, the mounting surface must be flat within $\pm .50\text{mm}$ (.020"). If necessary, use shim stock to insure even mounting.



MOUNTING OPTION "A"



MOUNTING OPTION "B"

MOUNTING HOLE PATTERN

* Dimensions shown in the illustration are for the standard SERIES 8 Winch with the 10 in. (254mm) long drum. If your winch has the short 8 in. (203mm) drum, this dimension changes to $10.0 \pm .03$ " ($254 \pm .76\text{mm}$)

3. When mounting the winch, use all eight (8) mounting holes for the mounting option (bottom for up-right mount, side for low-mount) and use M12 x 1.75, material class 8.8 or better bolts. When selecting mounting bolts, ensure that the ends of the bolts extend between 16mm (5/8") and 27mm (1-1/16") into the drum support castings. Bolts that are too long can damage the drum support, and bolts that are too short will have inadequate thread engagement. If your winch is supplied with 35mm (1-3/8") long bolts, they must only be used with 6mm (1/4") to 16mm (5/8") thick mounting plates. The washers supplied with these bolts must be installed under the bolt heads.
4. One tie bar may be moved to an alternate location for wire rope clearance. **ALL THREE (3) TIE BARS MUST BE USED.**

FASTENERS

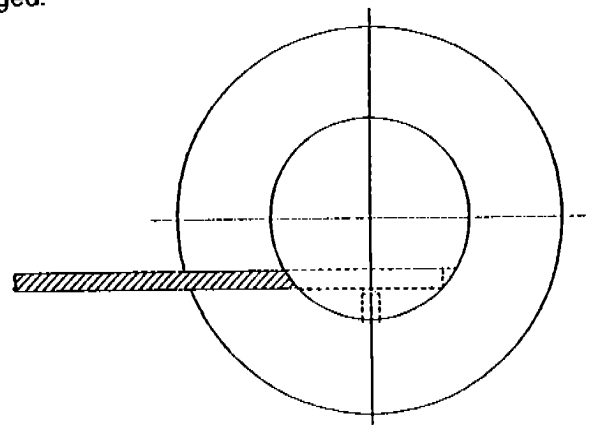
During the course of normal use, the fasteners may loosen. Periodically check the tightness of all fasteners. Replace any damaged fasteners.

! CAUTION !

The wire rope must be installed as shown in the illustration. (On SERIES 12 hydraulic winches only); The wire rope must spool onto the drum according to the drum rotation label on the winch, or the brake **WILL NOT FUNCTION.**

NOTE: SERIES 12 electric winches, provided with this manual or built after 2/93, have a bi-directional brake and will work with wire rope spooled on either direction.

Install the wire rope by pushing the end of the wire rope into the anchor hole in the drum tube. NOTE: A small piece of tape around the end of the wire rope will make installation much easier. The wire rope must extend to the other end of the hole. Torque the set screw to 12-15 lb.in. (16-20 N.m). Do not over tighten, as this may cause the set screw threads to be damaged.

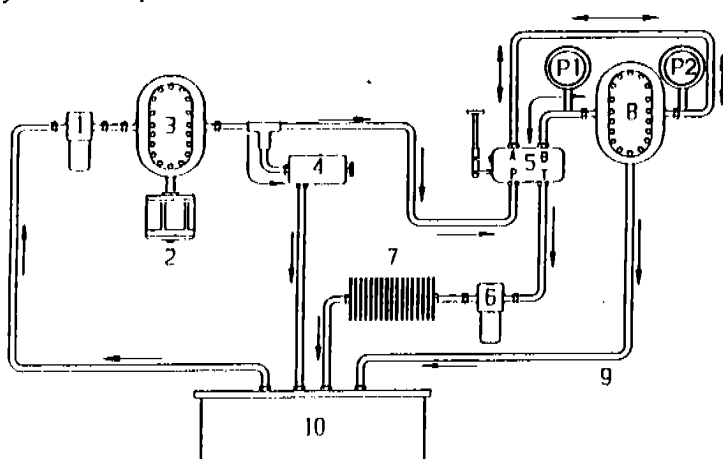


HYDRAULIC SPECIFICATIONS

! CAUTION !

- Do not exceed the maximum recommended hydraulic pressure or flow of any of the components used.
- The winch control valve must be a tandem center type valve (A & B work ports blocked) to insure proper brake operation. Failure to use proper control valve could cause brake failure resulting in serious injury or property damage.
- The winch works correctly only when hydraulic system components are correct.

NOTE: The pictorial diagram and the following descriptions are intended only as a general guide for reference use. For specific recommendations on component selection, inter-connection, layout, and use, consult a knowledgeable hydraulics representative.



HYDRAULIC FLUID

The hydraulic fluid used with the winch must be an extreme pressure, anti-wear hydraulic oil with oxidation and corrosion inhibitors. It must contain a foam suppressant, and have a viscosity rating of (700-800 cST at 38 DEG. C).

1. **STRAINER:** This removes larger particles from the hydraulic fluid.
2. **MOTOR:** This is the power source for the hydraulic system. It must be adequately rated to supply the required power. It can be a power take-off (PTO), belt drive from a gasoline or diesel engine, a large electric motor, etc.
3. **HYDRAULIC PUMP:** This converts the mechanical power of the motor into hydraulic fluid power. It must be adequately rated to supply the system with enough power for proper performance (see the performance chart for required motor "flow inputs").
4. **PRESSURE RELIEF VALVE:** This is to limit the system pressure to a safe level (one which will not exceed the maximum pressure rating of any of the components used).

The pressure rating of the winch motor is determined by (a) the maximum allowable pressure at the motor inlet port and (b) the maximum allowable pressure drop across the motor. Pressure drop is defined as the difference between the inlet pressure (P1) and the outlet pressure (P2) at the winch motor (item 8 in the diagram). Exceeding the maximum inlet pressure may damage the motor. Exceeding the maximum pressure drop may cause failure of winch components. Maximum allowable values are shown in the following table.

MOTOR TYPE	MAXIMUM PRESSURE AT THE MOTOR INLET PORT (P1)	MAXIMUM PRESSURE DROP ACROSS THE MOTOR (P1-P2)
4.5 cu.in 74 cc	2475 psi (170 bar)	2001 psi (138 bar)
5.9 cu.in. 97cc	2475 psi (170 bar)	1537 psi (106 bar)

5. **THREE POSITION VALVE:** This is a three-position tandem valve with a center-off position. In the center-off position, the pressure tank ports (labeled "P" and "T") are inter-connected, and the output ports (labeled "A" and "B") are blocked off. The blocked off ports will immediately stop the hydraulic motor rotation. This valve type is required for proper brake operation. This valve is used to control the three basic winch functions of "Power In", "Stop", and "Power out". It may be actuated either manually or electrically. Ensure that the valve is sufficiently rated for pressure and flow rate.

! CAUTION !

Do not use a standard motor valve.

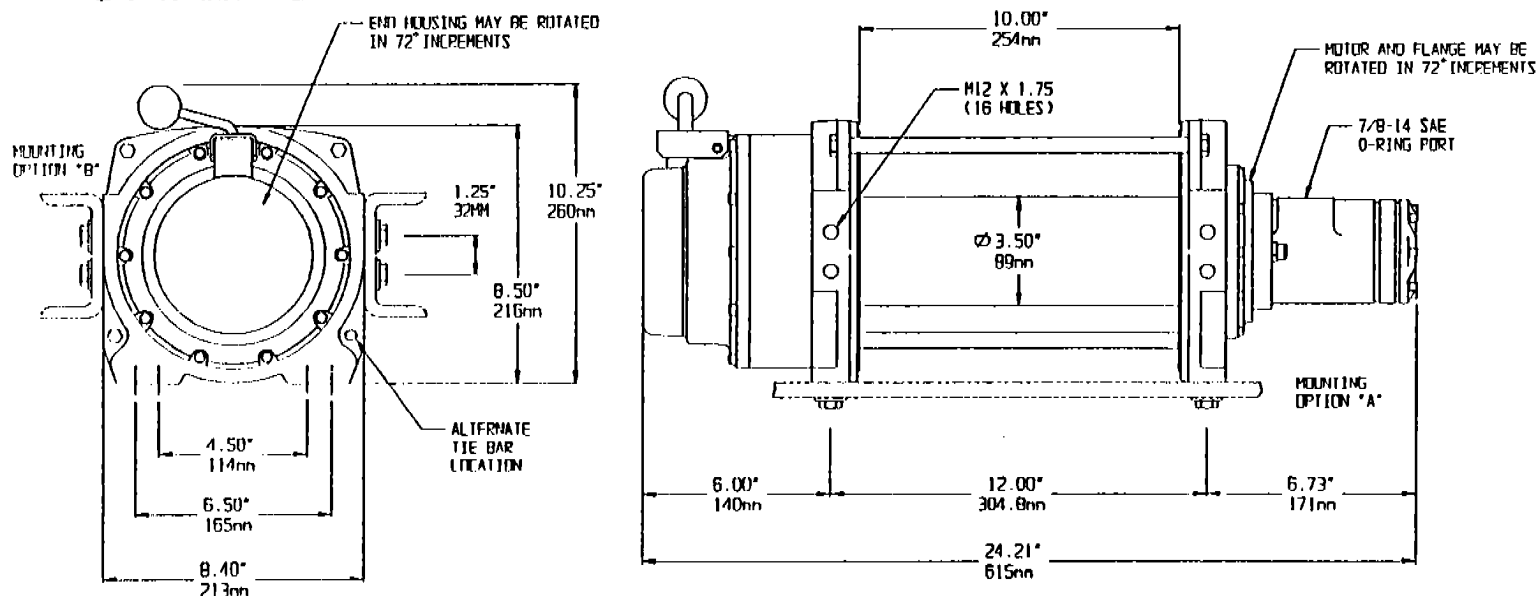
6. **FILTER:** This removes the smaller particles and insoluble contaminants from the hydraulic fluid. Ensure that it is rated for an adequate flow rate. The recommended filtration level is 10 microns nominal or finer.
7. **HEAT EXCHANGER:** This is a device to remove excess heat from the hydraulic fluid. This is an optional device that will be required only if excess heat buildup is a problem due to a small reservoir size, restricted hydraulic fluid flow, extended operating periods, etc.
8. **HYDRAULIC MOTOR:** This supplies power to the winch. The recommended operating temperature range is 100°F to 150°F (38°C to 66°C). The maximum operating temperature range is -6°F to 180°F (-21°C to 82°C). **DO NOT EXCEED THE FLOW RATING OF THE HYDRAULIC MOTOR.** (See Hydraulic Motor Data)

9. **MOTOR CASE DRAIN LINE:** A motor case drain line will be required in most cases. Warn supplied industrial motors have internal check valves, and do not require a case drain line unless the motor outlet port (the port connected through the three-position valve back to the reservoir) pressure exceeds 1.5 MPa (218psi). This will alternately be either port "A" or "B" at the three-position valve depending on the positioning of the valve at either "power in" or "power out". Check outlet port pressure in both positions.
10. **RESERVOIR:** The reservoir is the container for storing the hydraulic fluid. Its functions include storing all the required fluid, helping to moderate fluid temperature, solid contaminant, possibly heating fluid for viscosity control in cold weather, and reducing sloshing with baffles.

SERIES 12 HYDRAULIC ENGINEERING DATA

Rated Working Load (Maximum Load), first layer.....	12000 lb.	5400 kg	
Winch Breaking Strength, first layer.....	24000+ lb.	10800+ kg	
Maximum Recommended Wire Rope Diameter.....	7/16 in.	12 mm	
Drum Dimensions.....	Barrel Diameter:	3.5 in.	89 mm
	Flange Diameter:	7.75 in.	197 mm
	Distance Between Flanges:	10.0 in.	254 mm
Total Gear Reduction.....	36:1		
Static Input Torque Requirement (To start maximum load).....	1040 lb-in	117 N-m	
Dynamic Input Torque Requirement (To operate maximum load).....	924 lb-in	104 N-m	
Maximum Input Flow at Rated Load.....	15 USGPM	57 l/min	
Approximate Shipping Weight	76 lb.	34 kg	

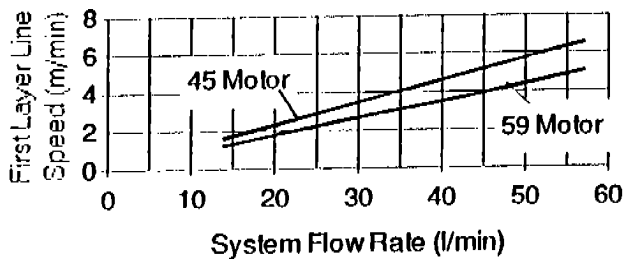
SERIES 12 HYDRAULIC DIMENSIONAL DATA



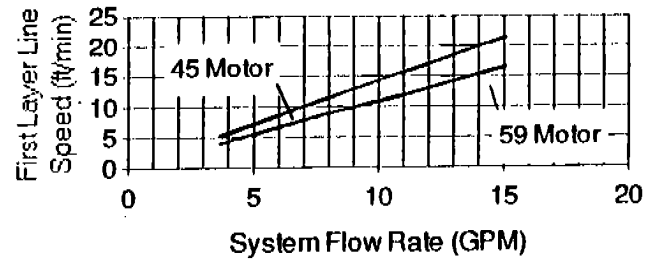
DIMENSIONS ARE FOR REFERENCE ONLY INCHES / MILLIMETERS

HYDRAULIC MOTOR DATA

PERFORMANCE FOR 11 mm DIA. ROPE



PERFORMANCE FOR 7/16 IN. DIA. ROPE



SERIES 12 HYDRAULIC PERFORMANCE DATA

WIRE ROPE SIZE		LAYER	LINE PULL		45 MOTOR		59 MOTOR		CUMULATIVE WIRE ROPE CAPACITY	
					LINE SPEED at 15 GPM (57 l/min.)		LINE SPEED at 15 GPM (57 l/min.)			
in.	mm		lb.	kg	ft/min.	m/min.	ft/min.	m/min.	ft.	meters
---	9	1	12000	5400	21	6.4	16	4.9	26	8
		2	10030	4560	25	7.5	19	5.8	56	17
		3	8680	3950	28	8.7	22	6.7	82	26
		4	7650	3480	32	9.9	25	7.6	131	40
3/8	---	1	12000	5400	21	6.4	16	4.9	24	7
		2	9960	4530	25	7.6	19	5.8	53	16
		3	8580	3900	28	8.9	22	6.8	87	27
		4	7520	3420	33	10.1	26	7.8	126	38
---	10	1	12000	5400	21	6.4	16	4.9	23	7
		2	9870	4480	25	7.7	20	6.0	52	16
		3	8470	3850	30	9.1	23	6.9	85	26
7/16	11	1	12000	5400	21	6.5	16	5.0	23	7
		2	9730	4425	26	7.9	20	6.1	46	14
		3	8250	3750	31	9.4	24	7.2	79	24
---	12	1	12000	5400	22	6.6	16	5.0	20	6
		2	10000	4360	27	8.1	20	6.2	46	14
		3	8050	3660	32	9.7	24	7.4	75	23

LINE PULL		MAXIMUM PRESSURE DROP ACROSS WINCH FOR 45 MOTOR							
		3.5 in. (89 mm) DRUM							
		Layer 1		Layer 2		Layer 3		Layer 4	
lb.	kg	psi	bar	psi	bar	psi	bar	psi	bar
0	0	102	7	102	7	102	7	102	7
2000	900	435	30	493	34	551	38	609	42
4000	1800	754	52	870	60	986	68	1102	76
6000	2700	1044	72	1247	86	1421	98	1585	110
8000	3600	1378	95	1610	111	1856	128	---	---
10000	4500	1682	116	---	---	---	---	---	---
12000	5400	2001	138	---	---	---	---	---	---

LINE PULL		MAXIMUM PRESSURE DROP ACROSS WINCH FOR 59 MOTOR							
		3.5 in. (89 mm) DRUM							
		Layer 1		Layer 2		Layer 3		Layer 4	
lb.	kg	psi	bar	psi	bar	psi	bar	psi	bar
0	0	203	14	203	14	203	14	203	14
2000	900	377	26	406	28	450	31	493	34
4000	1800	585	41	682	47	783	54	870	60
6000	2700	827	57	972	67	1102	76	1247	86
8000	3600	1073	74	1247	86	1436	99	---	---
10000	4500	1305	90	---	---	---	---	---	---
12000	5400	1537	106	---	---	---	---	---	---

Explanation of Model Number

SERIES 12 - A - 02 - 28

SERIES 12 - Designates 8,000 lb. (3,600 kg) 1st Layer Line Pull

A - Designates Drum Rotation A = Anti-Clockwise C = Clockwise

02 - Designates Drum Size 02 = 4.0" (102mm) Drum Dia. x 10.0" (254mm) Drum Length

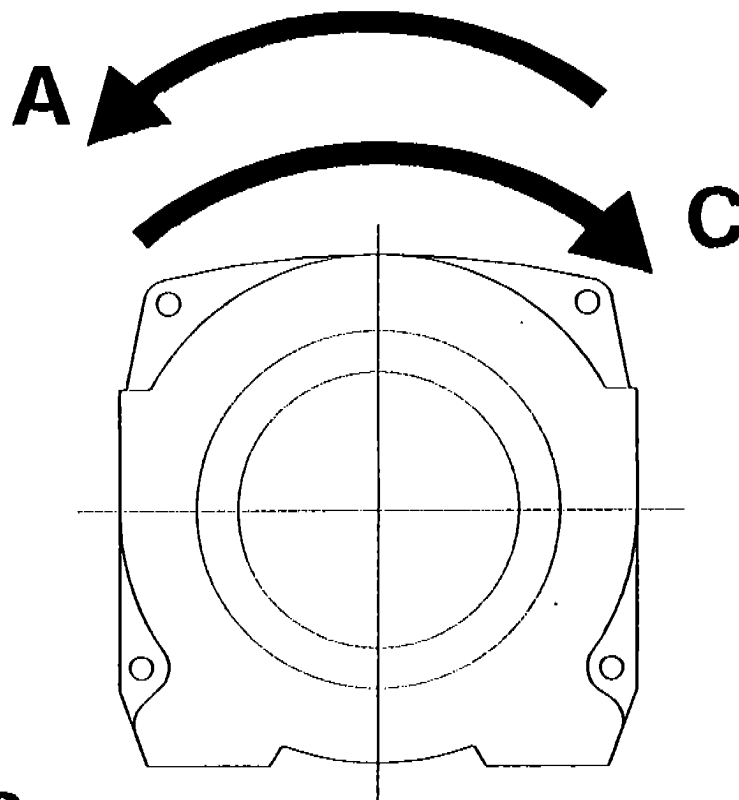
28 - Designates Motor 59 = 5.9 cu.in. (97cc) Hydraulic Motor

45 = 4.5 cu.in. (74cc) Hydraulic Motor

1D = 12 VDC Electric Motor

2D = 24 VDC Electric Motor

00 = No Motor



MOTOR

END



WARN INDUSTRIAL

SERIES 12 HYDRAULIC WINCH

REPLACEMENT PARTS LIST

ORDERING INFORMATION

WHEN ORDERING PLEASE GIVE WINCH MODEL & SERIAL NUMBER. PARTS MAY BE OBTAINED THROUGH YOUR LOCAL DEALER OR DISTRIBUTOR.

ITEM	PART NO.	QTY.	DESCRIPTION
1	22125	1	HYDRAULIC MOTOR, 4.5 CU. IN.
	24285	1	HYDRAULIC MOTOR, 5.9 CU. IN.
2	2596	2	LOCK WASHER
3	16238	2	CPSCR, 1/2-13 X 1 1/4 LONG
5	5553	10	CAPSCREW, #10-24 X 3/4" LONG
6	27857	1	MOTOR ADAPTER, HYDRAULIC
7	16027	1	MOTOR SHAFT COUPLING
8	27430	1	HEX SHAFT (INPUT)
9	13848	1	GASKET
10	16336	2	DRUM BUSHING, NYLON
11	1827	6	CAPSCREW 3/8" X 1" LONG
12	28080	1	CCW DRUM SUPPORT (MOTOR END), INCLUDES ITEMS 10 & 14
13	17707	3	TIE ROD
14	17150	2	OIL SEAL, RADIAL
15	13826	2	THRUST WASHER, NYLON
16	25961	1	RING, RETAINING
17	25960	1	SPACER, TUBE
18	22326	1	CCW BRAKE ASSEMBLY, HYDRAULIC
18	22333	1	CW BRAKE ASSEMBLY, HYDRAULIC
19	27911	1	89mm DRUM ASSEMBLY INCLUDES ITEM 20
20	27424	1	M10 SETSCREW
21	28085	1	CCW DRUM SUPPORT, (GEAR END) INCLUDES ITEMS 10, 14, AND 45
	28086	1	CW DRUM SUPPORT, (GEAR END) INCLUDES ITEMS 10, 14, AND 45
22	14964	2	GASKET
23	28102	1	HEX SHAFT (OUTPUT)
24	24564	1	CARRIER ASSEMBLY (STAGE 3)
25	28090	1	RING GEAR ASSEMBLY, SERIES 12 (STAGE 3), INCLUDES ITEMS 44 & 45
26	15581	2	RETAINING RING
27	24563	1	CARRIER ASSEMBLY (STAGE 2)
28	22350	1	3/16" DIA STEEL BALL SET (85 BALLS)
29	21878	1	SLIDING RING GEAR
30	16149	1	SUN GEAR, INPUT
31	21009	1	THRUST PLATE
32	28087	1	CCW GEAR HOUSING ASSEMBLY INCLUDES ITEMS 31 AND 43



WARN INDUSTRIAL

SERIES 12 HYDRAULIC WINCH

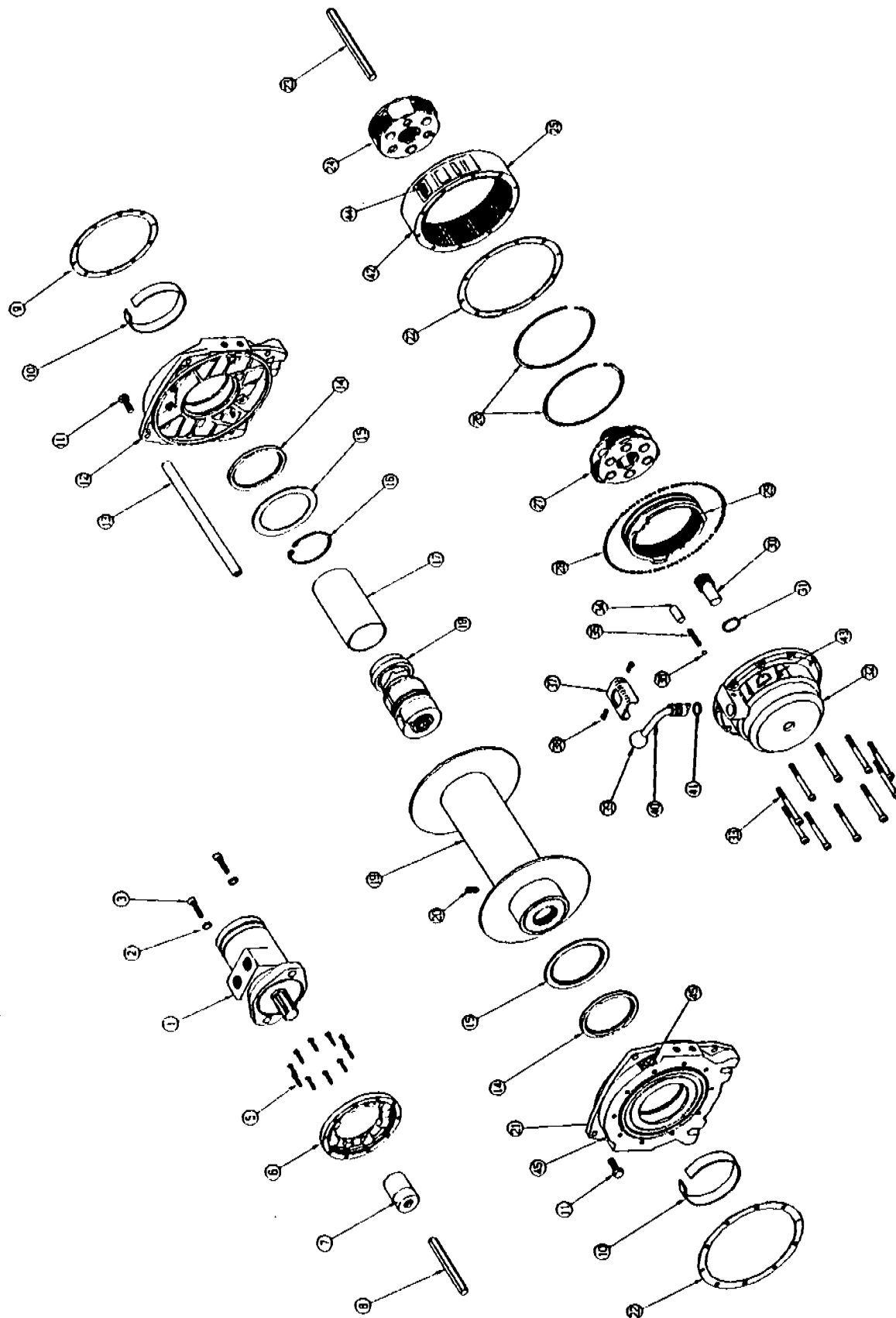
REPLACEMENT PARTS LIST

ORDERING INFORMATION

WHEN ORDERING PLEASE GIVE WINCH MODEL & SERIAL NUMBER. PARTS MAY BE OBTAINED THROUGH YOUR LOCAL DEALER OR DISTRIBUTOR.

ITEM	PART NO.	QTY.	DESCRIPTION
	28095	1	CW GEAR HOUSING ASSEMBLY INCLUDES ITEMS 31 AND 43
33	15603	10	CAPSCREW, 1/4"-20 X 3" LONG
34	15686	1	DETENT SPACER
35	1833	1	COMPRESSION SPRING
36	1834	1	1/4" DIA STEEL BALL
37	28088	1	LATCH, SAFETY, CLUTCH, INCLUDES ITEM 38
38	21382	2	CAPSCREW #10-24 X 3/8" LONG
39	15604	1	KNOB
40	28089	1	CLUTCH LEVER ASSY, INCLUDES ITEMS 39 & 41
41	15605	1	SEAL, O-RING
42	27901	1	LABEL, WARNING
43	27897	1	LABEL, CLUTCH LEVER
44	27896	1	LABEL, NAMEPLATE, SERIES 12
45	27186	2	LABEL, DRUM ROTATION

SERIES 12 HYDRAULIC WINCH REPLACEMENT PARTS



07-JUL-1994 17:15 FROM LEROY SOMER LTD

10

02277730137 P. 01

FAX TO: DICK WOOLLS
 COMPANY: TIVOLI ENTERPRISES
 FROM: PATRICK TONIN
 DATE: 07/07/94
 RE:



Leroy Somer Limited
 Leybourn Village
 Hoston Bridge Road
 West Drayton
 Middlesex UB7 8JR
 Telephone: (0825) 412678
 Fax: (0825) 420633

Dear Dick,

Further to our telephone conversation, please find below the addresses of our regional offices in the States:

U.S Electrical Motors Division / Leroy Somer
 Emerson Electric Co.
 8100 West Florissant Avenue
 St Louis, MO 63136
 Tel: (314) 553 1183 Fax: (314) 553 1156

Millford, Connecticut
 Tel: (203) 877 1762 Fax: (203) 877 2398

Chicago, Illinois
 Tel: (708) 952 3500 Fax: (708) 952 0158

Memphis, Tennessee
 Tel: (901) 794 5500 Fax: (901) 794 0741

Dallas, Texas
 Tel: (214) 644 0470 Fax: (214) 644 0254

Los Angeles, California
 Tel: (909) 594 5470 Fax: (909) 594 2389

Best regards

Patrick Tonin

Patrick Tonin

Orthobloc 2000

LUBRIFICATION

Pour fonctionnement entre -10 et +50°C, le réducteur Orthobloc est livré, en standard, lubrifié avec une huile minérale extrême pression ISO VG 220 EP*.

Options

Pour fonctionnement entre -30 et +50°C: huile synthétique Mobil SHC 629 avec ou sans AD.

Réducteur avec antidévier: jamais d'huile extrême pression (EP).

Entre -10 et +50°C, il est possible d'utiliser une huile minérale ISO VG 100 (non EP), mais dans ce cas il est recommandé de déclasser le réducteur (facteur de service 1,25 minimum).

Entretien, vidange.

- Huile minérale: vidange toutes les 5000 h.

- Huile synthétique SHC 629: ne nécessite pas de changement d'huile. Il est recommandé de vérifier périodiquement le niveau d'huile.

Capacité en huile

Les quantités d'huile indiquées (voir tableau page 7) sont approximatives: n'utiliser seulement que pour déterminer le volume d'huile à approvisionner. Pour la quantité exacte, remplir le réducteur jusqu'à son bouchon de niveau.

*Ex.: BP: Energol GR XP 220 - ELF: Réductif SP 220
ESSO: Spartan EP220 - SHELL: Omala 220.

COMMANDE DE PIECES

Pour toute commande, indiquer s'il vous plaît:

- type du réducteur;
- forme;
- position de montage;
- nature de l'arbre (G: gauche, D: droit; C: creux & X: 2 arbres (G+D));
- réduction exacte;
- numéro de fabrication;
- numéro, désignation de la pièce;
- le type, la polarité et la puissance du moteur (voir plaques signalétiques).

LUBRICATION

For operation between -10 and +50°C, Orthobloc reducer is shipped, as standard, with mineral extreme pressure oil ISO VG 220 EP*.

Options

For operation between -30 and +50°C: synthetic oil Mobil SHC 629. Reducer with backstop: never use extreme pressure (EP).

It is also possible, for operation between -10 and +50°C, to use mineral oil ISO VG 100 (not EP), but in this case, it is recommended to derate the reducer (1.25 minimum service factor).

Maintenance, oil change

- Mineral oil: drain every 5000 hours of operation.

- Synthetic oil: do not require oil change. It is nevertheless recommended to check proper oil level periodically.

Oil capacities

The oil capacities shown in table are approximative values and should be used only as reference in determining how much oil to provide. The proper oil levels can only be determined by filling the reducer to the level of the plug.

*Ex.: BP: Energol GR XP 220 - ELF: Réductif SP 220
ESSO: Spartan EP220 - SHELL: Omala 220.

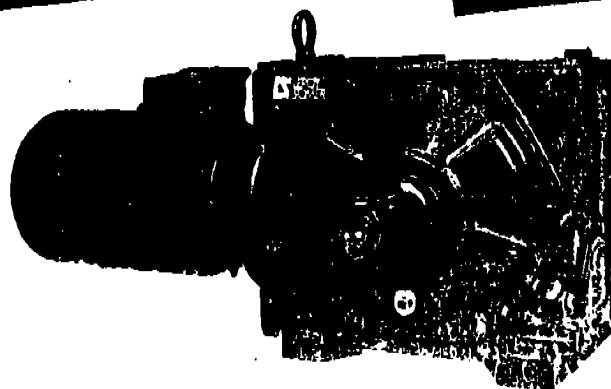
SPARES ORDERS

When ordering, please indicate:

- reducer type;
- design;
- mounting position;
- output shaft design (G: left, D: right; C: hollow & X: 2 shafts end (G+D));
- exact ratio;
- serial number;
- number and designation of spare part;
- type, polarity and power of motor (refer to nameplates).

Lors de l'assemblage
du montage "U":
lubrifier les cannelures
avec de la graisse Lithium
+ MO S2 grade 2.

For universal "U" mounting:
lubricate splines of input
shaft and coupling
with grease
(Lithium + MO S2, grade 2);
install motor on lantern.

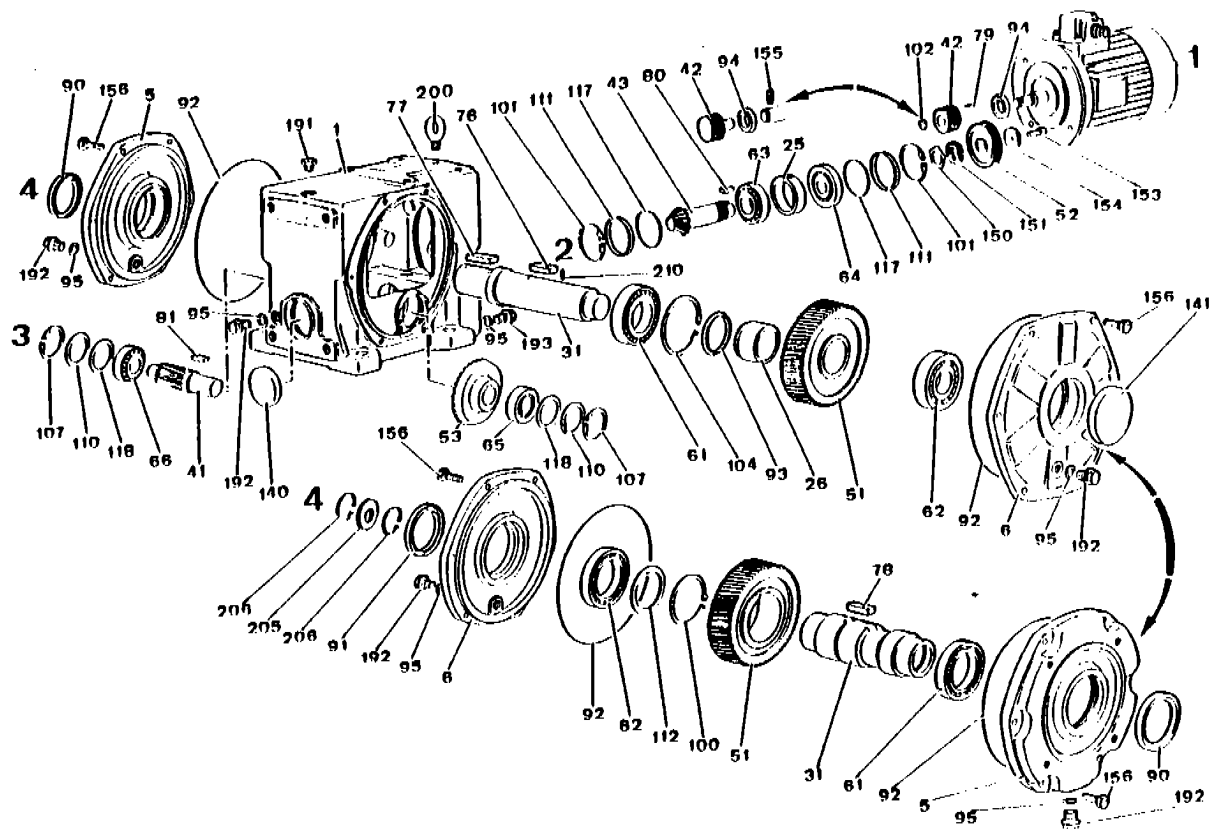


Ref. 687 - 033 / 5 - 9.91

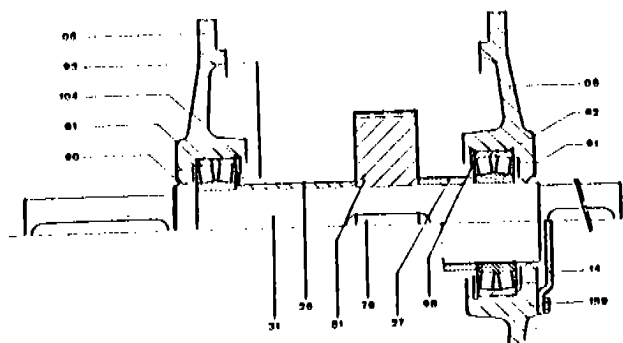
Malgré tout le soin apporté à la fabrication et au contrôle de ce matériel, Leroy Somer ne peut garantir à 100% l'absence de fuite de lubrifiant. Au cas où ces fuites pourraient avoir des conséquences graves mettant en jeu la sécurité des biens et des personnes, il appartient à l'installateur de prendre toutes les précautions nécessaires pour éviter ces conséquences.

Despite all the care taken in the manufacturing and inspection processes of our products, Leroy Somer cannot guarantee 100% against lubricant leakage. In cases where there leaks should be serious, putting at risk the safety and well being of persons, it is the users responsibility to take all necessary precautions to avoid these eventualities occurring.

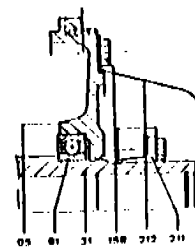
Orthobloc 2000



Version arbre lent double (gauche et droit)
Double output shaft (left and right side)



Version arbre lent creux (frette)
Hollow output shaft (nave band)



Orthobloc 2000

Nomenclature ORTHOBLOC 2000

Rep.	Désignation	Qté	Rep.	Désignation	Qté	Rep.	Désignation	Qté
001	carter	1	076 078	clavette de roue (clav. de roue creuse)	1	117	bague d'appui axe 2	2
005	palier côté sortie	1	077	clavette	1 ou 2	118	bague d'appui axe 1	2
006	palier opposé	1	079	clavette arbre moteur	1	140	bouchon cuvette axe 2	1
014	chapeau	1	080	clavette axe 2	1	141	bouchon cuvette	1
025	entreeuse axe 2	1	081	clavette axe 3	1	220 151	écrou et rondelle SKF	1
026	entreeuse / arbre C	1	090	joint d'étanchéité côté sortie	1	153	vis de roue	1
027	entreeuse / arbre D ou X	1	091	joint d'étanchéité côté opposé	1	154	rondelle de roue	1
031	arbre lent	1	092	joint torique	2	155	goupille (pignon à queue)	1
041	pignon axe 3	1	093	joint Nilos	1	156	vis de fixation paliers	12
042	pignon axe 1, arbre moteur	1	094	défecteur d'huile sur arbre moteur	1	158	vis	1
043	pignon conique axe 2	1	095	joint de bouchon	4	159	vis du chapeau 014	4
051	roue de sortie	1	098	joint Nilos	1	191	bouchon de remplissage	1
052	roue axe 2	1	100	circlips E axe 4 (version arbre creux)	1	192	bouchon de niveau	3
053	roue conique axe 3	1	101	circlips I axe 2	2	193	bouchon de vidange	1
061	roulement gauche axe 4	1	102	circlips E sur arbre moteur	1	200	manille de levage	1
062	roulement droit axe 4	1	104	circlips I axe 4	1	205	extracteur d'arbre creux	1
063	roulement avant axe 2	1	107	circlips I axe 3	2	206	circlips I d'extracteur	2
064	roulement arrière axe 2	1	110	cales de réglage axe 3	x	210	plon d'arrêt	1
065	roulement droit axe 3	1	111	cales de réglage axe 2	x	211	frette	1
066	roulement gauche axe 3	1	112	bague d'appui axe 4 (arbre creux)	1	212	chapeau	1

NOTA : aucune intervention sur le couple conique ne doit être effectuée en dehors de l'un de nos ateliers agréés LEROY SOMER.

ORTHOBLOC 2000 part list

Rep.	Désignation	Qty	Rep.	Désignation	Qty	Rep.	Désignation	Qty
001	housing	1	076 078	key, wheel (key for hollow shaft wheel)	1	117	spacer, axis 2	2
005	endshield, output side	1	077	key	1 or 2	118	spacer, axis 3	2
006	endshield, opposite side	1	079	key, motor shaft	1	140	cup plug, axis 2	1
014	cover	1	080	key, axis 2	1	141	cup plug	1
025	spacer, axis 2	1	081	key, axis 3	1	220 151	nut and washer	1
026	spacer (output shaft on left side)	1	090	seal (output side)	1	153	screw (wheel)	1
027	spacer (output shaft D or X*)	1	091	seal (opposite side)	1	154	washer, input wheel	1
031	output shaft	1	092	"O" ring seal	2	155	pin, shaft pinion	1
041	pinion, axis 3	1	093	seal	1	156	bolts, journal securing	12
042	pinion axis 1, motor shaft	1	094	oil deflector	1	158	fixing bolt	4
043	bevel pinion, axis 2	1	095	plug seal	4	159	fixing bolt, cover 014	4
051	wheel, axis 4	1	098	seal	1	191	filling plug	1
052	wheel, axis 2	1	100	retaining ring, hollow shaft (axis 4)	1	192	level plug	3
053	bevel wheel, axis 3	1	101	retaining ring axis 2	2	193	magnetic drain plug	1
061	bearing axis 4, left	1	102	retaining ring, motor shaft	1	200	lifting log	1
062	bearing axis 4, right	1	104	retaining ring, axis 4	2	205	hollow shaft extractor	1
063	bearing axis 2, front	1	107	retaining ring, axis 3	2	206	extractor retaining ring	2
064	bearing axis 2, rear	1	110	shims, axis 3	x	210	pin	1
065	bearing axis 3, right	1	111	shims, axis 2	x	211	nave band (extractor)	1
066	bearing axis 3, left	1	112	spacer, hollow shaft (axis 4)	1	212	cover	1

NOTE : No work on the bevel gear may be performed outside workshops approved by LEROY SOMER.

*D: right side, X: left & right side output shaft.

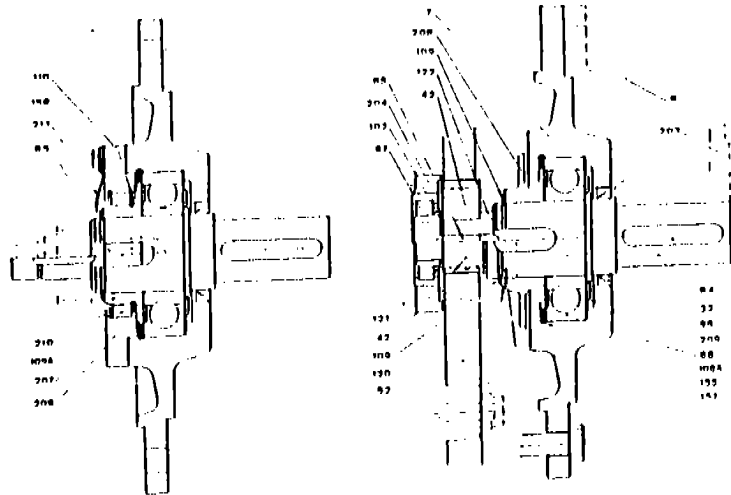
Plèces d'usage

Infil / Size	Arbre* Shaft*	061	062	063	064	065	066	090	091	092
2301	G - D	6209 RS	NJ 205 E	32305	32305	32304	32304	55x68x8 AS	55x68x8 AS	185x1
	C	6011 RS	6011 RS							
	X	6209 RS	6308 RS							
2401	G - D	22211	NJ 208 E	30306	30306	30305	32305	65x85x13 AS	65x85x13 AS	240x1
	C	6013 RS	6013 RS							
	X	22211	22211							
2501	G - D	22213	6311	32307 B	32307 B	32307	32307	75x100x10 AS	75x100x10 AS	270x1
	C	6017 RS	6017 RS							
	X	22213	22213							
2601	G - D	22215 E	22215 E	32308	32308	32308	32308	80x100x10 AS	80x100x10 AS	330x1
	C	6019	6019							
	X	22215 E	22215 E							
2701	G - D	22217 E	22217 E	32310	32310	32309 B	32309	95x125x12 AS	95x125x12 AS	380x1
	C	6022	6022							
	X	32020	32020							
2801	G - D	23120 E	23120 E	32311 B	32311 B	32312 B	32312	105x130x12 AS	105x130x12 AS	470x1
	C	6026	6026							
	X	23120 E	23120 E							

*: G - D: gauche ou droite; C: creux; X: 2 BA.

*: G - D: left or right side; C: hollow shaft; X: 2 output shafts.

Ol 27.. et 28..



Nomenclature montage arbre primaire AP

Rep.	Désignation	Qté	Rep.	Désignation	Qté
001	flange primaire AP	1	102	clip(s) E (pignon alésé)	1
012 *	arbre primaire	1	108A	clip(s) I	1
012	pignon	1	109	clip(s) E	1
052	roue	1	115A	cale d'appui	1/feu
067	roulement côté pignon	1	120	cale(s) d'appui	1
068	roulement côté arbre	1	122	cale d'appui	1
079	clavette de pignon	1	152	goupillon d'assemblage	4
084	clavette d'arbre	1	155	goupille (pignon à queue)	1
096	joint d'étanchéité	1	156	écrous	4

"AP" Input shaft mounting part list

Rep.	Désignation	Qté	Rep.	Désignation	Qté
001	AP input flange	1	102	pinion retaining ring	1
012 *	input shaft	1	108A	retaining ring	1
012	pinion	1	109	retaining ring	1
052	wheel	1	115A	ring	1/set
067	bearing (pinion side)	1	120	ring(s)	1
068	bearing (shaft side)	1	122	ring	4
079	pinion key	1	152	studs	1
084	shaft key	1	155	pinion pin	1
096	oil seal	1	156	nuts	4

CH 2303

CH 24, 25 & 2603

Kit antidétreneur AD

Rep.	Désignation	Qté
013	chapeau de roulement	1
083	clavette de bagne	1
109A	clip(s) I	1
160	vis de chapeau	1
206	bagne de roue libre	1
207	roue libre	1

*: remplir le réservoir de graisse (Lithium + Mo S₂)

"AD" backstop kit

Rep.	Désignation	Qté
013	bearing cover	1
083	race key	1
109A	retaining ring	1
160	screws	1
206	free wheel race	1
207	free wheel	1

*: fill the reservoir with grease (Lithium + Mo S₂)

CH 23, 24, 25 & 2603

Nomenclature montage universel U

Rep.	Désignation	Qté	Rep.	Désignation	Qté
007	lanterne U	1	96	joint d'étanchéité	1
027	entretoise	1	97	joint torique	1
012	arbre primaire	1	102	clip(s) E (pignon alésé)	1
012	pignon	1	108U	clip(s) I	1
052	roue	1	109	clip(s) E	1
067	roulement côté pignon	1	116U	cale d'appui	1
068	roulement côté arbre	1	117U	cale d'appui	1
079	clavette de pignon	1	120	cale(s) d'appui	1/feu

"U" universal mounting part list

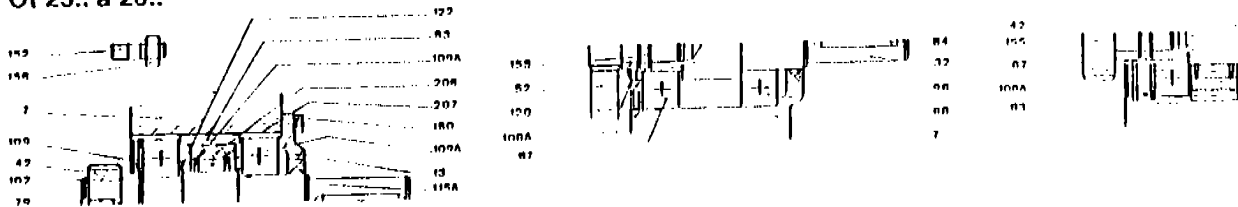
Rep.	Désignation	Qty	Rep.	Désignation	Qty
007	"U" adaptor	1	96	oil seal	1
008	spacer	1	97	"O" ring seal	1
012	input shaft	1	102	pinion retaining ring	1
012	pinion	1	108U	retaining ring	1
052	wheel	1	109	retaining ring	1
067	bearing (pinion side)	1	116U	ring	1
068	bearing (shaft side)	1	117U	ring	1
079	pinion key	1	120	ring(s)	1/set

Rep.	Désignation	Qté
121	cale d'appui	1
152	goupillon d'assemblage	4
155	goupille (pignon à queue)	1
156	écrous	4
159	vis de contre bride	1
203	manchon	1
204	bagne	1
205	contre bride	1

Rep.	Désignation	Qty
121	ring	1
152	studs	4
155	pinion pin	1
156	nuts	4
159	screws	1
203	coupling	1
204	bearing shield	1
205	counter flange	1

Orthobloc 2000

OI 23.. à 26..



Nomenclature montage arbre primaire AP & universel U

Rep.	Désignation	Qté	Rep.	Désignation	Qté
007	flange primaire AP	1	108A	circ clips I	1
008	lanterne U	1	109	circ clips E	1
012	arbre primaire	1	120	cale d'appui	1
013	pignon	1	122	entree-toise	1
052	roue	1	128	cale d'appui	1
067	roulement côté pignon	1	155	goupille (pignon à queue)	1
068	roulement côté arbre	1	157	vis d'assemblage	4
079	clavette de pignon	1	203	manchon (montage U)	1
081	clavette d'arbre	1	204	bague	1
096	joint d'étanchéité	1	208	défecteur d'huile	1
102	circ clips E de pignon	1	209	joint Niles	1

Kit antidéshneur AD

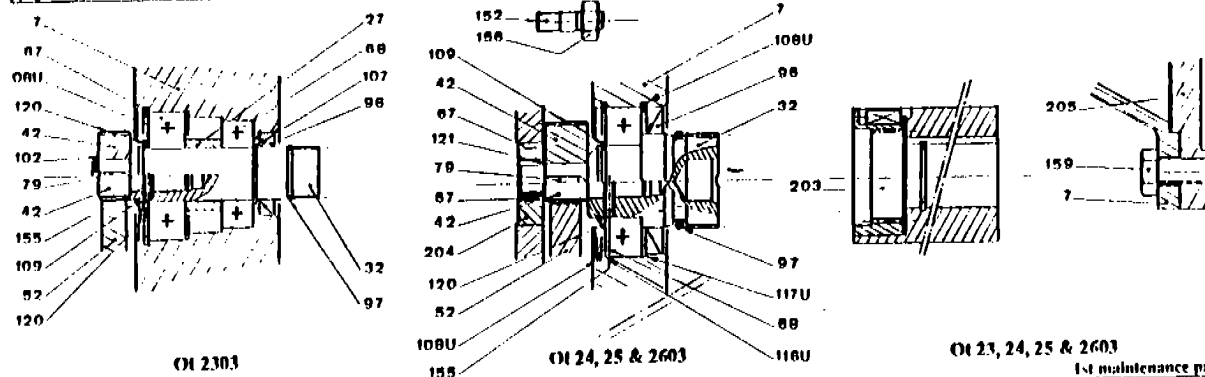
Rep.	Désignation	Qté
085	clavette de bague	1
109A	circ clips I	1
110	circ clips E	1
158	vis de bride	1
206	bride de roue libre	1
207	roue libre	1
210	bague intérieure	1
211	défecteur d'huile	1

"AI" Input shaft & "U" universal mounting part list

Rep.	Désignation	Qté	Rep.	Désignation	Qté
007	AP input flange	1	108A	retaining ring	1
008	"U" adaptor	1	109	retaining ring	1
012	input shaft	1	120	ring	1
013	pinion	1	122	spacer	1
052	wheel	1	128	ring	1
067	bearing (pinion side)	1	155	pinion pin	1
068	bearing (shaft side)	1	157	screws	4
079	pinion key	1	203	coupling ("U" mounting)	1
081	shaft key	1	204	bearing ring	1
096	oil seal	1	208	oil deflector	1
102	pinion retaining ring	1	209	Niles bearing shield	1

"AD" backstop kit

Rep.	Désignation	Qté
085	race key	1
109A	retaining ring	1
110	retaining ring	1
158	flange screws	1
206	free wheel flange	1
207	free wheel	1
210	inner race	1
211	oil deflector	1



OI 2303

OI 24, 25 & 2603

OI 23, 24, 25 & 2603

1st maintenance parts

Pièces d'usure

Taille Size OI	Réduction Ratio	Montage universel U "U" universal mounting			Montage arbre primaire AP "AI" input shaft mounting			Montage AP avec antidéshneur AD "AP" with "AD" backstop assembly				
		67	68	96	67	68	96	210	67	68	96	207
2403	12.5 à 50	6305 RS	6205	25x30x8 AS	6305 RS	6304	20x30x7 AS		6305 RS	6301	20x30x7 AS	BWX 13390A
	56 à 90	6305 RS	6205	25x40x8 AS	6206 RS	6304	20x30x7 AS		6206 RS	6301	20x30x7 AS	BWX 13390A
2103	12.5 à 63	NJ 201 E	6207 RS	45x72x8 A	6308 RS	NJ 207 E	35x62x7 A		6308 RS	NJ 207 E	35x62x7 A	BWX 13241
	71 à 125	NA 4900	6207 RS	45x72x8 A	6308 RS	NJ 207 E	35x62x7 A		6308 RS	NJ 207 E	35x62x7 A	BWX 13241
2503	12.5 à 80	NJ 201 E	6207 RS	45x72x8 A	6308 RS	NJ 207 E	35x62x7 A		6308 RS	NJ 207 E	35x62x7 A	BWX 13241
	90 à 125	NA 4900	6207 RS	45x72x8 A	6308 RS	NJ 207 E	35x62x7 A		6308 RS	NJ 207 E	35x62x7 A	BWX 13241
2603	12.5 à 90	NJ 301 E	6209 RS	55x80x8 A	6309 RS	6309	45x62x7.5/8.5 AS		6309 RS	6309	45x62x7.5/8.5 AS	BWX 131017
	100 à 125	NJ 301 E	6209 RS	55x80x8 A	6309 RS	6309	45x62x7.5/8.5 AS		6309 RS	6309	45x62x7.5/8.5 AS	BWX 131017
	12.5 à 50	NJ 206 E	6311 RS	55x72x10 AS	NJ 206 E	6311 RS	55x72x10 AS	003.001PA017	NJ 206 E	6311 RS	55x72x10 AS	BWX 131000
2703	56 à 63	NJ 305 E	6311 RS	55x72x10 AS	NJ 305 E	6311 RS	55x72x10 AS	003.001PA017	NJ 305 E	6311 RS	55x72x10 AS	BWX 131000
	71 à 125	NJ 304 E	6311 RS	55x72x10 AS	NJ 304 E	6311 RS	55x72x10 AS	003.001PA017	NJ 304 E	6311 RS	55x72x10 AS	BWX 131000
	12.5 à 45	NJ 208 E	6313 RS	65x90x10 AS	NJ 208 E	6313 RS	65x90x10 AS	003.001PA018	NJ 208 E	6313 RS	65x90x10 AS	BWX 13261A
2803	50 à 63	NJ 306 E	6313 RS	65x90x10 AS	NJ 306 E	6313 RS	65x90x10 AS	003.001PA018	NJ 306 E	6313 RS	65x90x10 AS	BWX 13261A
	71 à 90	NJ 306 E	6313 RS	65x90x10 AS	NJ 306 E	6313 RS	65x90x10 AS	003.001PA018	NJ 306 E	6313 RS	65x90x10 AS	BWX 13261A
	100	NJ 305 E	6313 RS	65x90x10 AS	NJ 305 E	6313 RS	65x90x10 AS	003.001PA018	NJ 305 E	6313 RS	65x90x10 AS	BWX 13261A

En cas de remplacement de l'AD, changer l'arbre rep. 012.

We recommend you to replace input shaft (012) in case of backstop changing.

Orthobloc 2000

MONTAGE PENDULAIRE

Nous conseillons un bras de réaction fixé au socle S1* et ayant une longueur L, telle que:

$$L \geq 2 \times A$$

et une résistance mécanique suffisante. Ce bras ne fait pas partie de notre fourniture.

*: fixation possible en S3 ou S5 (consulter notre catalogue technique).

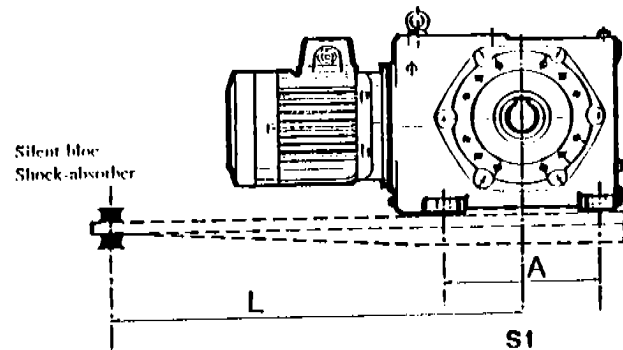
FLOATING MOUNTING

We recommend a torque arm fixed one S1* feet and such as:

$$L \geq 2 \times A$$

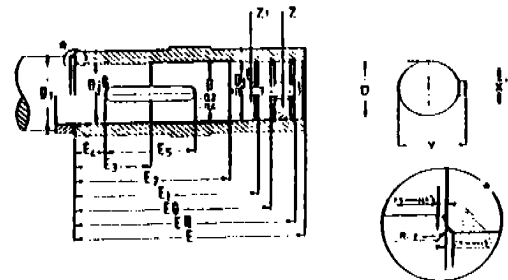
(L: torque arm length). Torque arm is not supplied by LEROY SOMMER.

*: fixing also possible in S3 or S5 side (please see our technical catalogue).



COTES ARBRE CREUX ET ARBRE CLIENT HOLLOW AND MACHINE SHAFTS DIMENSIONS

Taille Or Size	Arbre creux Hollow shaft				Arbre entrainé Driven machine shaft												
	E	EG	EL	Z	D6	D1	E1	E2	E3	E4	E5	Xh9	Y	Z1			
2303	210	183	198	M20	38	50	180	140	60	25	70	10	41	M12			
2403	252	219	239	M24	50	62	210	170	70	28	100	14	54	M16			
2503	296	257	281	M24	60	72	250	200	85	32	130	18	64	M20			
2603	310	270	293	M30	70	85	260	210	90	35	130	20	75	M20			
2703	340	300	323	M30	80	95	290	230	100	35	160	22	85	M20			
2803	430	384	410	M30	95	110	380	300	120	40	160	25	100	M24			



SYSTEME D'EXTRACTION (montage - démontage) EXTRACTION SYSTEM (mounting - removing)

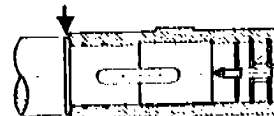
MONTAGE - MOUNTING

Joint torique
"O" ring seal



FIXATION SUR ARBRE EPAULE FIXING ON SHOULDERED SHAFT

Joint torique
"O" ring seal



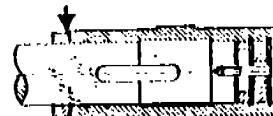
DEMONTAGE - DISMOUNTING

Joint torique
"O" ring seal

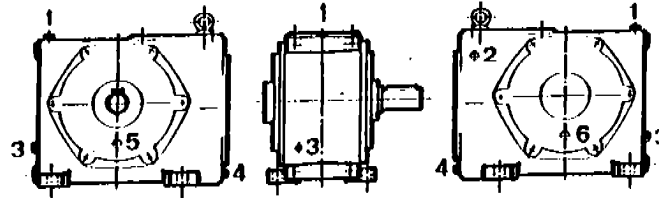


FIXATION SUR ARBRE LISSE FIXING ON SHAFT WITHOUT SHOULDER

Joint torique
"O" ring seal



Orthobloc 2000



Lubrification		Position de montage - Mounting position						Lubrification table
N° de bouchon utilisé pour:		D	P	II	T	V	W	Number of used plug for:
remplissage	1	4	4	6 - 4*	5	4	3	filling plug
évent	1	4	4	6 - 4*	5	4	3	breather plug
niveau	3	3	3	4	3	2	5	level plug
vidange	4	1	1	5	4	1	4	drain plug
Taille Or Size	Volume d'huile en litres - Oil capacities (in litres)							(bouchon) Dimensions (plug)
2103	0,9	5	5,3	5,3	5,8	3,4	M16X1,5	
2403	1,6	8,5	8,5	9,1	9,4	5,1	M16X1,5	
2503	2,8	18	18	17	19	11	M16X1,5	
2603	4	27	27	27	23* / 28	15	3/4"	
2703	6	37	35	38	36* / 40	20	3/4"	
2803	11	72	72	78	69* / 78	40	3/4"	

*: avec pompe de lubrification

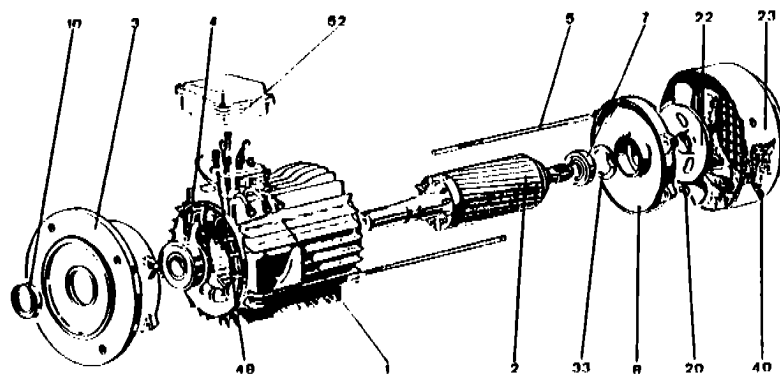
*: pour tailles 23, 24 & 25.

*: with lubricating pump

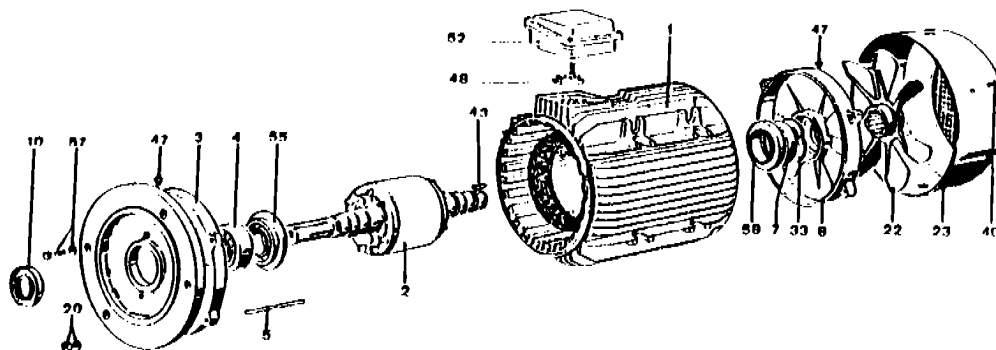
*: for sizes 23, 24 and 25.

Lubrifiants		Conditions de fonctionnement f - f running conditions				Lubrifiants
Température ambiante Ambiant temperature		-10°C < f < +50°C				+50°C < f < +70°C
Viscosité Viscosity		Standard	huiles automobiles - car lubricants			
		sans "AD"	avec "AD"	sans "AD"	avec "AD"	sans "AD"
		without "AD"	with "AD"	without "AD"	with "AD"	without "AD"
ISO	VG 68	ISO	ISO	SAE	SAE	ISO
		VG 100	VG 220	30	80/90	VG 320
BP	Enorgol GR XP (-24°C)	Enorgol 1111 100	Enorgol GR XP 220	110 SAE 30	Gear oil EP SAE 80	Enorgol GR XP 320
COF-RAN	Mécanep 68 GL	Cofraline Equitex 100	Mécanep 220	Equilux C2000 super	Coltrapied 80 W/90	Mécanep 320
ELF	Réductif SP 68 (-21°C)	Polyclis 100	Réductif SP 220	Elan SAE 30	Tranself EP 80W/90	Réductif SP 320
ESSO	Teresso EPV 32		Spartan 13P220	110X 30	110X 30/40	Spartan EP 320
MOBIL	Mobil Clear 626 (-24°C)	DIF extra heavy	Mobil Clear 630		Mobilube C 90	Mobil Clear 632
SHELL	Omala 68 (-24°C)	Tellus 100	Omala 220	Dentax 80	Spirax EP90	Omala 320
TOTAL	Carter EP 68 (-21°C)	Azolla 75 100	Carter EP 220	GTS + 15W/40	GTS + 15W/40	Carter EP 320

Orthobloc 2000



LS 71 --> LS 132



LS 160

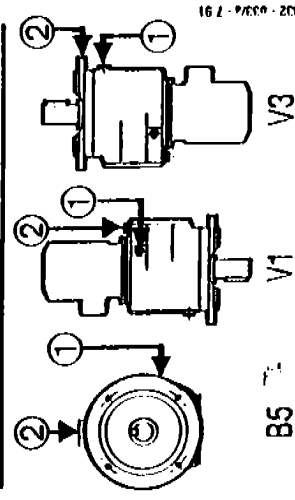
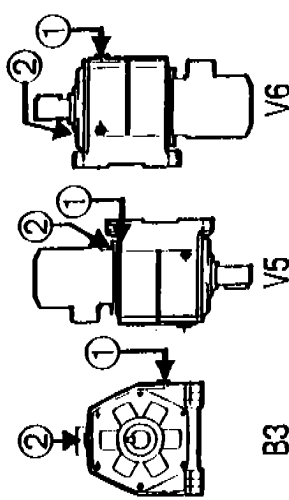
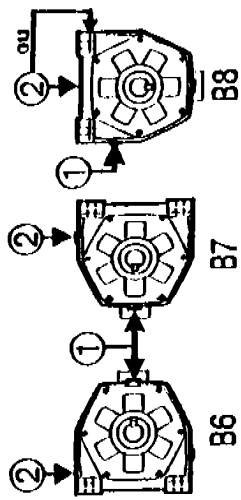
LS 180

Rep.	Désignation	Qté	Rep.	Désignation	Qté	Rep.	Désignation	Qté
1	stator bobiné	1	10	joint d'étanchéité	1	47*	graisseur	2
2	rotor	1	20	écrous et rondelles	4	48	planchette	1/2
3	flasque bride	1	22	ventilateur	1	52	boîte à bornes équipée	1
4	roulement avant	1	23	capot de ventilateur	1	55*	soupape à graisse avant	1
5	tiges de montage	4	33	rondelle fléttelly	1	57*	fixation soupape	2
7	roulement arrière	1	40	vis de fixation capot	4	58*	soupape à graisse arrière	1
8	flasque arrière	1	43*	clavette	1			

* Pour hauteur d'axe 160 et au-dessus.

Rep.	Désignation	Qty	Rep.	Désignation	Qty	Rep.	Désignation	Qty
1	wound stator	1	10	oil seal	1	47*	grease nipple	2
2	rotor	1	20	screws and washers	4	48	terminal block	1/2
3	flange	1	22	fan	1	52	terminal box	1
4	front bearing	1	23	fan cover	1	55*	grease valve (front)	1
5	tierods	4	33	wave washer	1	57*	fixing screws	2
7	bearing	1	40	fixing screws	4	58*	grease valve (back)	1
8	back endshield	1	43*	key	1			

* Only for 160 frame or higher.



16 2 - 0374 - 7 91

LIVRE AVEC HUILE

- Après installation en position
 - vérifier le niveau d'huile ①
 - retirer l'aiguille du bouchon d'évent ②

DELIVERED WITH OIL

- Before first running
 - check the oil level in running position ①
 - remove the breather nail ②

LIEFERUNG MIT ÖL

- Vor Inbetriebnahme
 - Öl niveau kontrollieren ①
 - stift der Entlüftungsschraube entfernen ②

FORNITO CON OLIO

- Dopo la collocazione in posizione
 - verificare il livello dell'olio ①
 - togliere la spina dal foro di sfogo del tappo dell'olio ②

ENTREGADO CON ACEITE

- Después de instalación en posición
 - controlar el nivel del aceite ①
 - sacar la aguja de la tapa respiradera ②

Les moteurs frein FCO, FCL et FCM sont des ensembles monoblocs constitués d'un moteur asynchrone et d'un système de freinage à commande de repos (frein de sécurité).

Installation

Pour l'installation des moteurs frein suivre les recommandations du § MISE EN SERVICE de la notice générale.
S'assurer que le frein est en position serrée.

Alimentation (Voir schémas de branchement)

Les moteurs frein à alimentation incorporée se branchent comme des moteurs standards. Il sont équipés d'une bobine à courant continu 100 V. L'alimentation du frein est faite directement à partir du stator du moteur (220 - 380, 230 - 460, 240 - 415 ou 254 - 440 V) à travers une cellule redresseuse montée dans la boîte à bornes.

Pour les moteurs de tensions différentes, à démarrage sous tension réduite ou fonctionnant sous tension ou fréquence variable, il est nécessaire de prévoir une alimentation séparée du frein. Dans ce cas, raccorder le pont redresseur à une tension alternative de 220 V.

Pour obtenir un temps de réponse raccourci du frein au serrage (obligatoire en levage), il est nécessaire de couper l'alimentation continue du frein en même temps que celle du moteur; généralement on utilise un contact auxiliaire du contacteur de démarrage du moteur.

Desserrage manuel

En série, les freins sont équipés d'un écrou "Nylstop" (rep. 25) qui par vissage permet de desserrer le frein.

Pour les freins équipés de levier, pousser sur celui-ci.

Pour les freins équipés de desserrage manuel à retour automatique (DMRA), tourner le levier de 45° jusqu'à la butée.

▲ Après toute manœuvre de desserrage, s'assurer que le frein est en position serrée une fois les opérations de maintenance effectuées.

FCO, FCL and FCM brake motors are compact units comprising of an asynchronous motor and a brake operating when supply is off (fail safe brake).

Starting up

For installation, follow STARTING UP procedure detailed in general manual. Make sure that the brake is in braking position.

Power supply (Consult connection diagrams)

Brake motors with built in power supply are connected as standard motors. They are equipped with 100 VDC brake coils. The brake coil is supplied directly from the stator of the motor (220 - 380, 230 - 460, 240 - 415 or 254 - 440 V) through rectifier cells mounted in the junction box.

For motors with different voltages, started on the reduced voltage conditions or operating under variable voltage or frequency, it is necessary to have a separate supply for the brake coil. In that case, rectifier cells must be connected to 220 V AC supply.

To achieve a shortened response time (compulsory for hoist application), it is necessary to cut off the DC voltage of the brake coil at the same time as the AC voltage of the motor; an auxiliary switch at the motor starter is generally used.

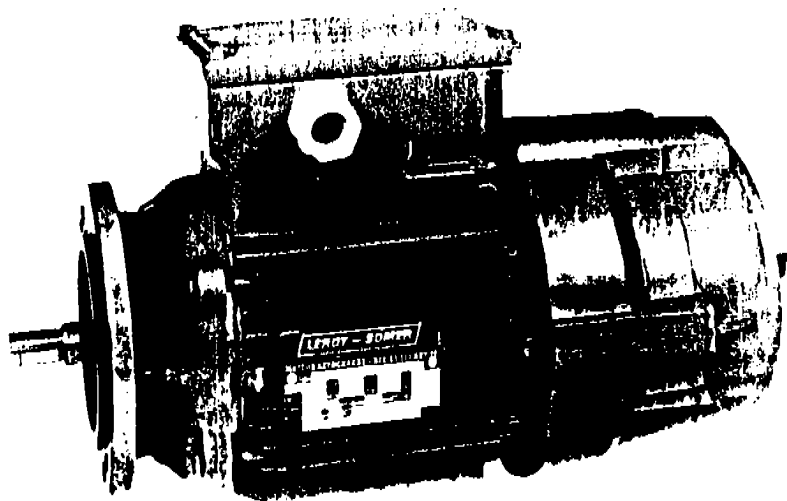
Manual release

Brakes are equipped as standard with "Nylstop" release locknut. To release the brake, tighten (CW) the locknut.

For brakes equipped with manual release lever, push on lever.

For brakes equipped with automatic reset manual release device (DMRA), turn lever up 45° (up to stop pin).

▲ After any maintenance, make sure that the brake is in braking position before starting up.



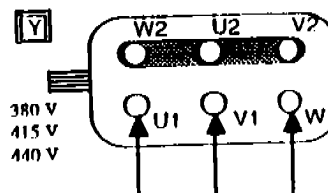
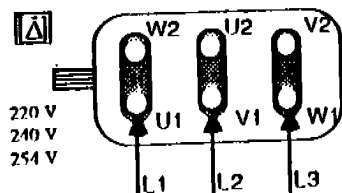
SCHEMAS DE BRANCHEMENT MOTEURS TRIPHASES

CONNECTION DIAGRAMS THREE PHASE MOTORS

Moteur 1 vitesse

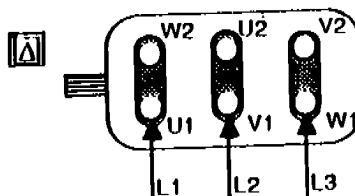
1 speed motors

2 tensions
plaqués 220-380V,
240 - 415 V ou
254 - 440 V



2 voltages
name plated 220-380V,
240 - 415 V or
254 - 440 V

plaqués 380 - 660 V
ou 415 - 720 V
Connexions pour 380 ou
415 V

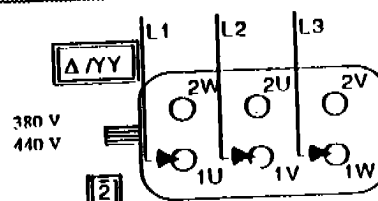
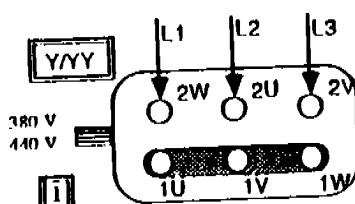


name plated 380 - 660 v
or 415 - 720 V
Connections for 380
or 415 V

Moteur 2 vitesses

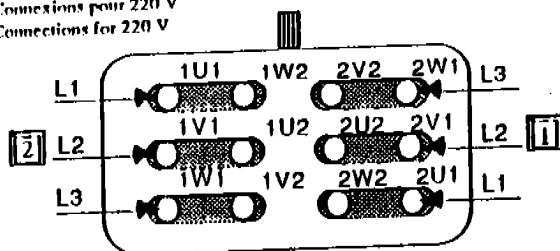
2 speed motors

Moteurs 1 bobinage
1 tension

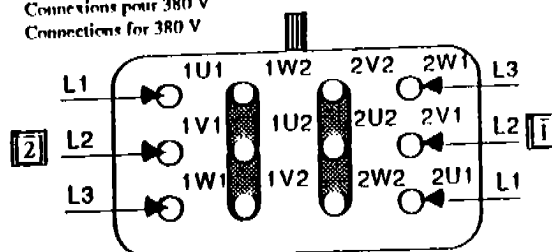


Motors 1 winding
1 voltage

Moteurs 2 bobinages
2 tensions
Connexions pour 220 V
Connections for 220 V



Connexions pour 380 V
Connections for 380 V



Motors 2 windings
2 voltages

Les bornes 1U1 et 2U1 du moteur sont connectées en usine. La ligne L1 peut être connectée indifféremment à l'une ou à l'autre de ces bornes permettant l'utilisation d'un câble 5 conducteurs. Pour inverser le sens de rotation, il faut impérativement inverser L1 et L2.

Motor terminals 1U1 and 2U1 are connected in the factory. L1 power lead may be connected to either one of these terminals, thus allowing to use a five lead cable. To reverse direction of rotation, interchange L1 and L2 only.

Important: il est indispensable de prévoir un freinage sur résistances hypersynchrones au passage grande / petite vitesse pour amortir les à-coups préjudiciables aux mécanismes entraînés. Dans le cas de résistance installée sur une phase seulement, il est impératif de le faire sur la borne 1V1.

Important: when switching from high speed to low speed, it is necessary to insert hypersynchronous resistors in the low speed circuit in order to dampen shock loading that may damage the driven mechanisms. In the case of single phase resistor, it is to be connected to terminal 1V1.

Légende

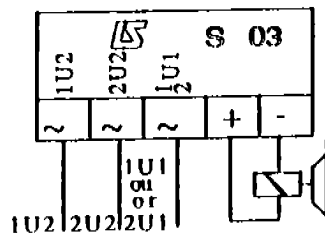
Key

1 Grande vitesse
2 Petite vitesse
Arbre moteur

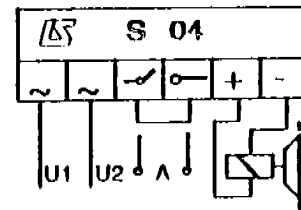
1 High speed
2 Low speed
Motor shaft

LEROY
SOMER

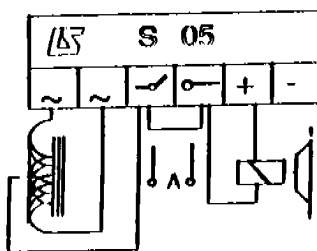
Pont redresseur S 03 - S03 rectifier cells
Moteurs 2 vitesses, 2 bobinages - 2 speed, 2 winding motors



Pont redresseur S 04 - S04 rectifier cells
Moteurs 1 vitesse - 1 speed motors

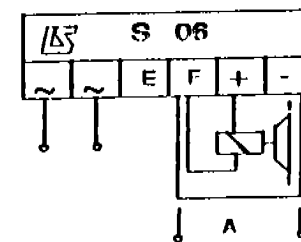


Pont redresseur S 05 - S05 rectifier cells



Alimentation 2 x 24 V ~
2 x 24 V ~ supply

Pont redresseur S 06 - S06 rectifier cells

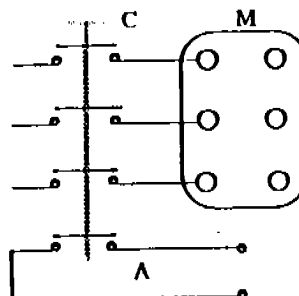


Alimentation 110 ou 24 V ~
110 ou 24 V ~ supply

Branchement pour temps de réponse raccourci:

Enlever le strap et connecter au bornes A du contact auxiliaire. Ce câblage est obligatoire en levage. Le pont redresseur S 03 ne peut être utilisé dans ce cas: le remplacer par un pont S 04 avec alimentation séparée.

A: contact auxiliaire
C: contacteur moteur frein
M: planchette moteur frein



Connection for shortened response time:

Remove the strap and connect to the terminal A of auxiliary switch. This connection, mandatory for hoisting, cannot be used with S 03 rectifier cells: use instead S 04 cells with separate power supply.

A: auxiliary switch
C: brake motor starter
M: brake motor terminal block

▲ Attention: avant toute opération sur le frein il est indispensable de déconnecter le moteur frein.

Réglage de l'entrefer

Le réglage de l'entrefer devient nécessaire dès que le desserrage ne se fait plus normalement.

- Dévisser la vis de positionnement 24 et la dégager des trous de l'armature 11. Dévisser cette dernière à fond en agissant sur l'extérieur cranté à l'aide d'un tournevis; elle vient s'appuyer sur l'électro-aimant 9.
- Revisser l'armature 11 en appuyant sur la vis 24: au 3^{ème} trou rencontré (4^{ème} pour le FCM), visser la vis 24 et la bloquer.

Réglage du moment de freinage

La plage de réglage va de 70 à 100% environ de la valeur plaquée. Pour avoir le moment de freinage désiré, régler la cote A selon la procédure suivante sans démontage du frein.

- S'assurer au préalable que l'entrefer est correct (voir procédure ci-dessus).
- Mesurer la cote B en introduisant par une des ouïes de l'électro-aimant 9 un règle jusqu'en butée sur le diamètre extérieur de la couronne 12 (voir schéma).
- Sur l'abaque correspondant au type du frein, élever la perpendiculaire (1) à l'axe M_f pour la valeur du moment de freinage choisi jusqu'à la courbe correspondant à la cote B mesurée, et de cette intersection tracer l'horizontale (2) qui coupe l'axe A à la valeur de réglage du bouton 26 (voir exemple).
- Débloquer le contre-écrou 29; régler à la cote A, en le tournant, le bouton 26 (pas de 100 soit un déplacement de 1 mm par tour).
- Le réglage terminé, bloquer le contre-écrou 29.

Démontage

- Couper l'alimentation. - Ouvrir la boîte à bornes, repérer les fils et leur position (alimentation du moteur et du frein, sondes ...).
- Débrancher les fils d'alimentation. - Démontez le moteur frein avec des outils appropriés (arrache-moyeu, arrache-roulement, maillets en cuir ou plastique, clés et tournevis calibres, pinces à circlips...).
- Enlever l'écrou de blocage 25.
- Dévisser le contre-écrou 29 et le bouton de réglage 26.
- Dévisser les 3 vis de fixation 31 de l'électro-aimant 9, enlever ce dernier en prenant soin de ne pas endommager les fils d'alimentation.
- Oter l'ensemble armature 11 et couronne garnie 12, dévisser l'armature pour la séparer de la couronne.
- Nettoyer les pièces:
 - à la soufflette uniquement pour les parties électriques (ni solvants ni produits humides);
 - au white spirit ou similaire pour les parties mécaniques;
 - au grattoir pour les emboîtements;
 - dégraisser si besoin le(s) disque(s) frein et garniture(s).
- Changer les joints et vérifier l'état des roulements.
- Déconnecter le pont redresseur et vérifier l'isolement du stator (>100 mégohms).
- Repérer toutes les pièces défectueuses pour commande de pièces de rechange.

Remontage

- Les roulements ouverts seront regraissés avant montage (utiliser une graisse appropriée aux conditions de fonctionnement).
- Lubrifier légèrement les arbres et cages de roulement.
- Garnir de graisse les lèvres des joints d'étanchéité qui seront remontés avec précaution (utiliser des douilles de protection de rainure de clavette).
- Les emboîtements devant assurer une étanchéité seront enduits d'une mince couche de pâte à joint.
- Visser l'armature 11 sur la couronne garnie 12, face plate à l'extérieur.
- Enlever la vis de positionnement 24 de l'électro-aimant.
- Mettre en position l'ensemble couronne/armature et la butée du ressort 21 dans l'électro-aimant.
- Mettre en place le ressort de pression 28, le contre-écrou 29 et le bouton 26 sur la tige de déblocage 27; visser de quelques tours le bouton 26 sur l'électro-aimant.
- Assembler sur le flasque frein 8 et fixer par les 3 vis 31 et rondelles 32 en les serrant alternativement jusqu'au serrage.
- Régler l'entrefer et le moment de freinage (voir procédures).
- Revisser l'écrou de blocage 25 sur la tige 27.

▲ Warning: always disconnect motor before working on the brake.

Air-gap adjustment

When the air-gap becomes too large (release is too slow or does not occur at all), it is necessary to check the air gap.

- Unscrew (CCW) screw 24 and remove it from hole in armature 11. Unscrew armature 11 completely using notches around it. Armature then lies against brake coil housing 9.
- Screw (CW) armature 11 while pressing on screw 24: when the 3rd hole is reached (4th for FCM), tighten screw 24.

Braking torque adjustment

Adjustment ranges from about 20 to 100% of braking torque indicated on brake name plate. Braking torque is easily adjusted without disassembling the brake by adjusting the A dimension according to the following procedure.

- Make sure the air gap is properly adjusted (see above procedure).
- Measure dimension B between the outer part of the lined brake ring 12 and the external diameter of the brake coil housing 9 by introducing a ruler in a vent opening of the brake coil housing 9 (see drawing).
- On the chart corresponding to the brake type, draw a line (1) perpendicular to the M_f axis from required braking torque value. This line crosses the curves corresponding to different values of B. From the intersection point between line (1) and the proper B curve, draw a line (2) perpendicular to the A axis (see example). Read on the A axis the proper value for A dimension between the brake coil housing and the torque adjustment knob 26 (see drawing).
- Loosen locknut 29; adjust A by turning knob 26 (knob thread has a 100 pitch (1 mm per turn)).
- Tighten locknut 29 after adjustment.

Disassembly

- Remove terminal box cover; locate wires (motor, brake supply, thermal protections ...).
- Disconnect supply wires.
- Disconnect brake motor from the machine.
- Disassemble brake motors with appropriate tools (bearing extractor, plastic mallet, spanners ...).
- Remove nylostop release nut 25.
- Unscrew locknut 29 and torque adjustment knob 26.
- Unscrew the 3 fixing screws 31 holding the brake coil housing 9 and remove it taking care not to damage brake coil wires.
- Remove brake ring 12 together with the armature 11; unscrew armature to separate it from brake ring.
- Clean all parts thoroughly:
 - blower only for electrical parts (never use solvent or humid products);
 - use white spirit or similar for mechanical parts;
 - use scraper for fittings;
 - if necessary degrease lining(s) and brake disc(s) with solvent.
- Replace oil seals and check bearings.
- Disconnect rectifier cells and check isolation resistance (> 100 megohms).
- Locate all faulty parts for re-ordering.

Reassembly

- Open bearings should be regreased before assembling (use grease according to running conditions).
- Lightly lubricate shaft and bearing race.
- Coat oil seal(s) with grease, and carefully remount (use protection sleeve over keyway).
- If necessary, coat fittings with a thin layer of sealant.
- Screw armature 11 part way onto brake ring 12. Flat side of armature must be facing outward.
- Remove locating screw 24 from brake coil housing.
- Position brake ring 12, armature 11 and spring thrust washer 21 into brake coil housing.
- Place compression spring 28, lock nut 29 and torque adjustment knob 26 over release rod 27 and tighten a few turns the knob 26 into the brake coil housing.
- Position brake assembly onto brake housing 8 and screw in the 3 fixing screws 31 and washers 32, tighten them alternately.
- Adjust air gap and braking torque (see adjustment procedures).
- Screw nylostop release locknut 25 onto release rod 27.

- Reconnecter le pont redresseur, les sondes éventuellement, puis le moteur en s'assurant que l'ordre des fils est correct; refermer la boîte à bornes.
 - Vérifier le bon fonctionnement de l'ensemble et s'assurer le cas échéant que le levier de desserrage est correctement placé avant accouplement à la machine.

- Connect the two brake coil wires, thermal protection if needed then the motor, checking that the wiring is correct.
 - Before re-mounting on the machine, check brake motor is operating properly and make sure, if fitted, that manual release lever is in correct position.

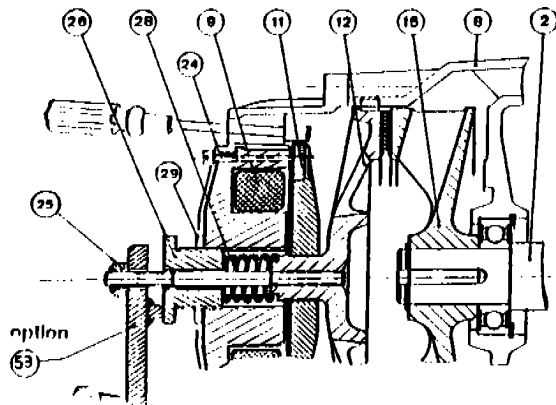


fig. 1

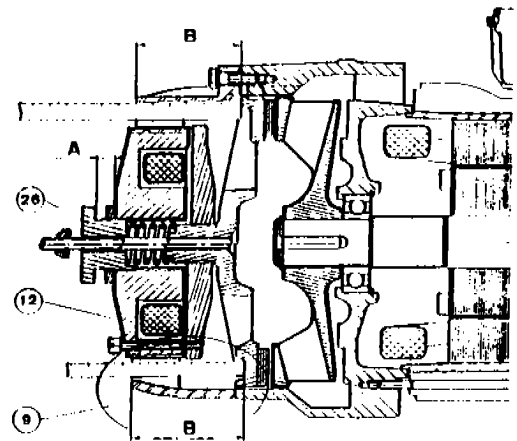


fig. 2

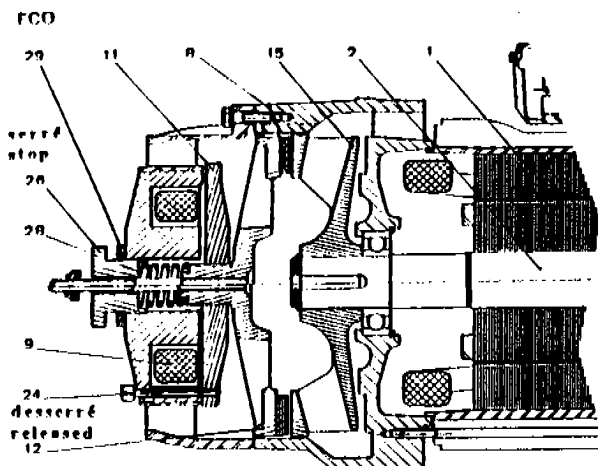


fig. 3

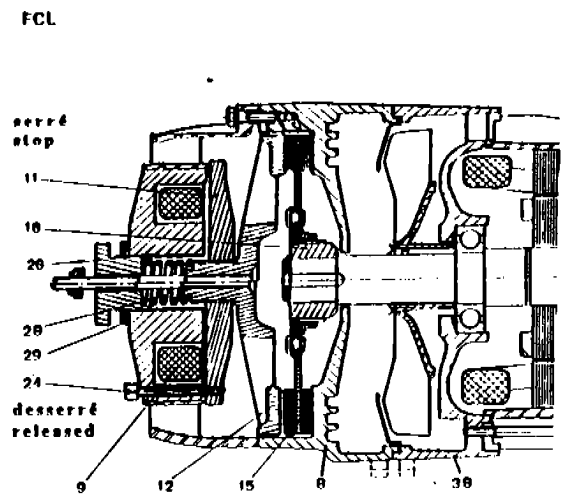


fig. 4

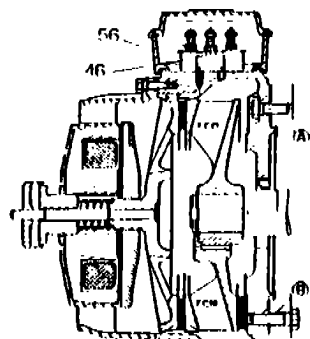


fig. 5

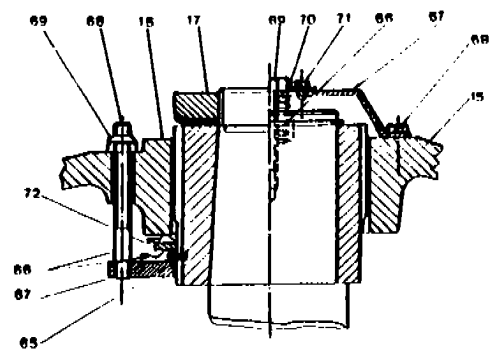


fig. 6

Guide de dépannage

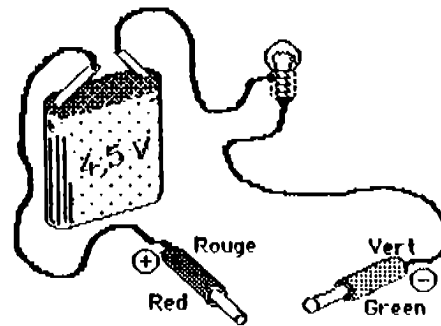
Le frein ne desserre pas	Vérifier les branchements électriques Régler l'entrefer (se reporter au § réglages) Vérifier que le bouton de réglage 26 n'est pas trop serré; s'il l'est, régler le moment de freinage selon la procédure. - La tension est de 80 à 110 V continu - S'assurer que le testeur est bien sur continu. - Débrancher les fils bleu et rouge du pont redresseur et vérifier à l'ohmmètre que la bobine n'est pas coupée ou à la masse. Mesurer la tension entre les fils bleu et rouge d'alimentation de la bobine - Démontez le frein et nettoyez toutes les pièces soigneusement. - Si la garniture colle au disque commander un disque traité au molybdène pour ambiance très humide. - La tension est de 110 ou 220 V alternatif - Remplacer le pont redresseur. - La tension est de 0 V - Vérifier que toutes les bornes sont convenablement serrées et qu'aucun fil n'est coupé. - Débrancher les fils bleu et rouge; vérifier à l'ohmmètre que la bobine frein n'est pas en court-circuit ou à la masse. - Changer le pont redresseur.
Le frein desserre mais la garniture frotte constamment	Régler l'entrefer. Démontez le frein et nettoyez toutes les pièces soigneusement, spécialement les rainures du flasque frein 8 et les crans de la couronne 12. Si le frein est du type FCM et fonctionne en position verticale, vérifier qu'il est équipé du dispositif de retenue du disque. Sinon contacter Leroy Somer.
Temps de réponse au serrage trop long	Réaliser le branchement pour temps de réponse raccourci. Voir schéma.
Moment de freinage insuffisant	Vérifier le réglage de l'entrefer et du moment de freinage. - Si la garniture est usée, remplacer la couronne garnie 12 (FCO), le disque frein 15 (FCL), la couronne garnie 12 et la garniture amovible 13 (FCM). Démontez le frein - Si la garniture est grasse, la nettoyer avec un solvant, passer la surface séchée au papier de verre fin. Éviter de mettre les doigts sur la garniture et le disque. - Nettoyer toutes les pièces soigneusement, spécialement les rainures d) flasque frein 8 et les crans de la couronne 12.
Desserrage du frein trop lent	Temps de réponse normal entre 0,05 et 0,3 s (selon type). Si le temps de réponse est plus long, régler l'entrefer.

Brake trouble shooting chart

Brake does not release	Check that connections are correct. Adjust air gap (refer to air gap adjustment section) Check that braking torque adjustment knob is not too tight; if it is, unscrew it one turn - Voltage reading 80 to 110 V DC - Make sure you are reading DC. - Disconnect blue and red wires from rectifier cells and check with an ohmmeter if brake coil is not cut off or earthed. Operation voltage of brake coil between blue and red wires - Disassemble brake and clean all parts thoroughly. - If brake lining adheres to brake disc, order molybdenum coated brake disc (special for very humid ambient). - Voltage reading 110 or 220 V AC - Replace rectifier cells. - Voltage reading 0 V - Check that all electrical connections are tightly secured and that no wire is cut. - Disconnect blue and red wires from rectifier cells and check with an ohmmeter if brake coil is not short circuited or earthed. - Replace rectifier cells.
Brake releases but rubs constantly	Adjust air gap. Disassemble brake and clean all parts thoroughly especially grooves in brake housing 8 and notches on lined brake ring 12. If brake is FCM type and works in vertical position, check that brake is equipped with special attachment for vertical position. If not refer to Leroy Somer.
Brake too slow at engagement	Check connection for instantaneous response time..
Brake torque too low	Check air gap and braking torque adjustment. - If brake pad is worn out, replace complete lined brake ring 12 (FCO), brake fan disc 15 (FCL), lined brake ring 12 and movable lining 13 (FCM). Disassemble brake - If brake pad is greasy, clean it with solvent and when dry, with fine abrasive paper. Avoid putting fingers on pad and brake disc surface. - Clean all parts thoroughly especially grooves in brake housing 8 and notches on brake ring 12.
Brake too slow to release	Response time between .05 and .3 sec (depending of brake size). If response time is longer, adjust air gap.

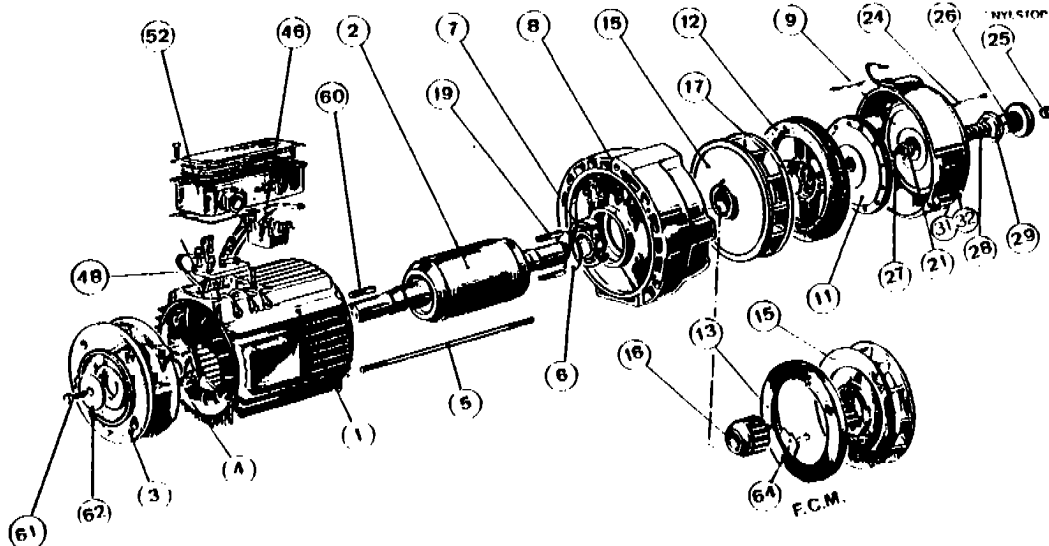
Vérification du pont redresseur

Réaliser une sonnette selon le croquis ci-contre avec une pile de 4,5 V, un peu de fil, une ampoule et 2 fiches bananes. Débrancher le pont, présenter la fiche rouge au + et la fiche verte au - : l'ampoule doit s'allumer. En inversant les deux fils, rouge au - et vert au +, l'ampoule doit rester éteinte.



Checking rectifier cells

Create a connection as in the opposite diagram with a 4.5 V battery, a small amount of wire, a bulb and 2 test probes. Disconnect the rectifier cells, touch the red probe to positive and the green to negative: the bulb should light up. By reversing the 2 wires, i.e. red to negative and green to positive, the bulb should not light.

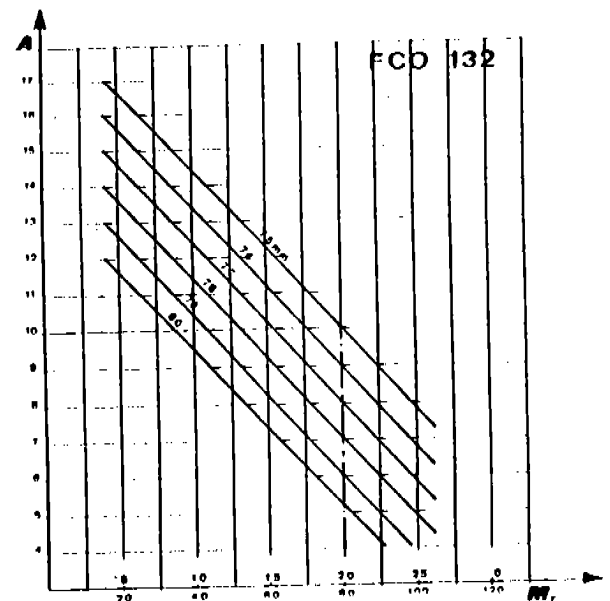
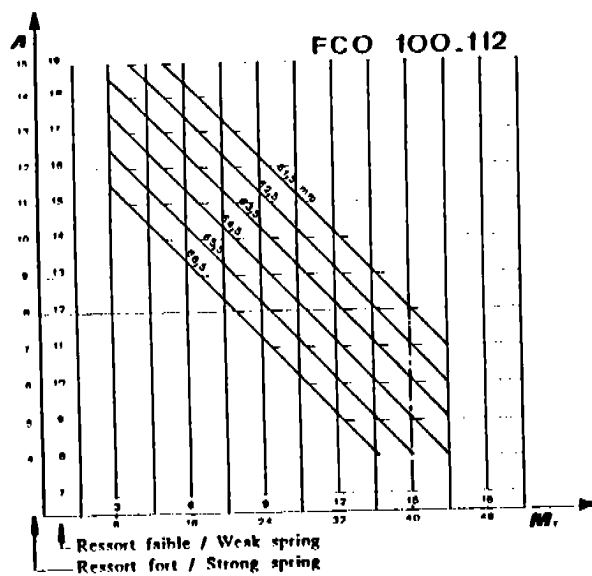
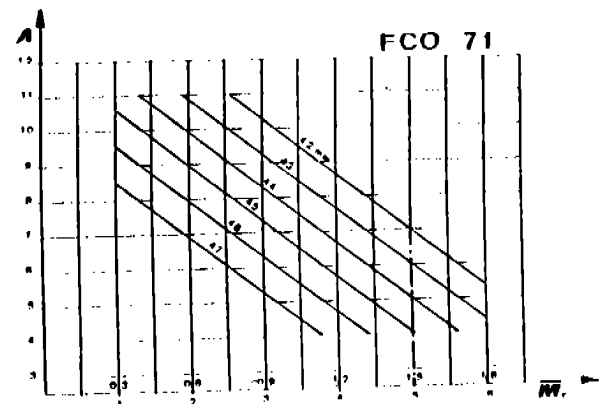
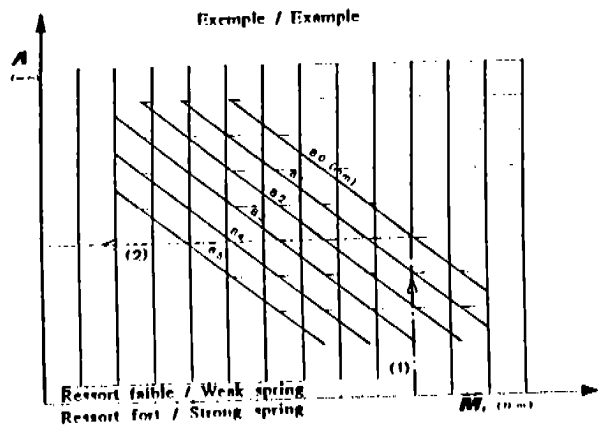


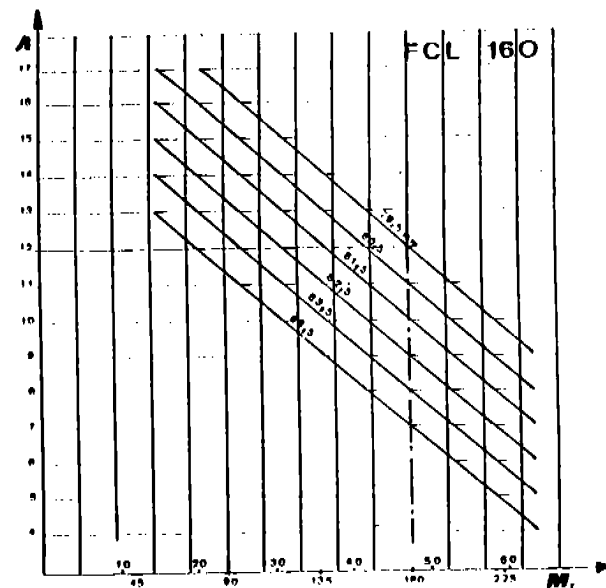
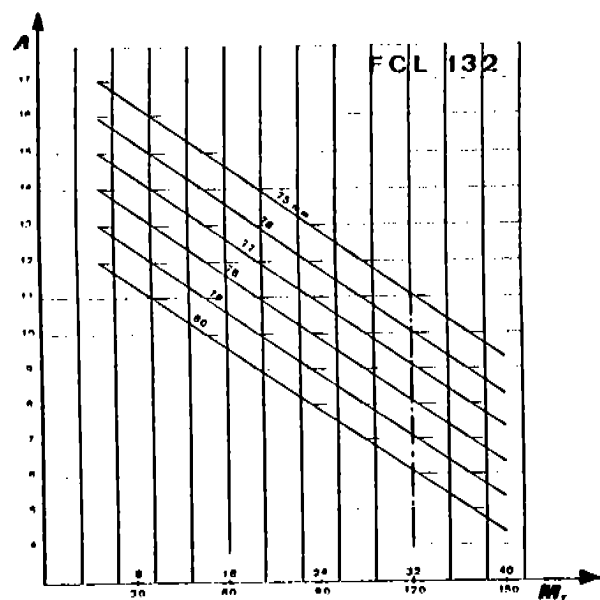
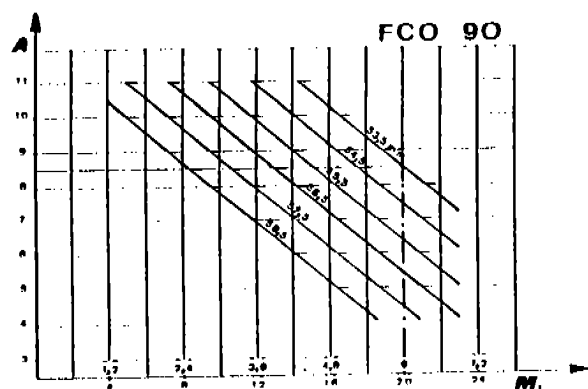
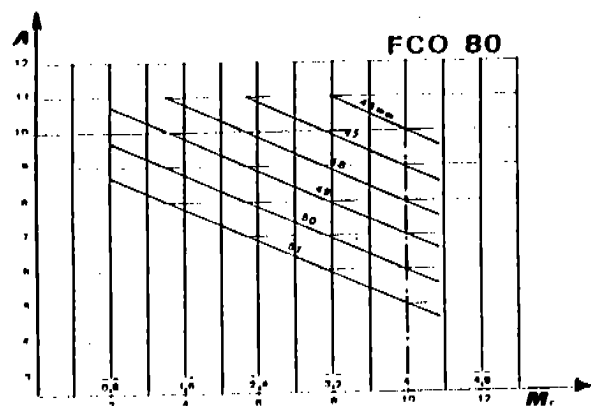
Nomenclature FCO-FCL-FCM

Rep.	Désignation	Qté	Rep.	Désignation	Qté	Rep.	Désignation	Qté
1	carter et stator bobiné	1	16	moyen cannelé (FCM)	1	46	blois cellules (redresseur)	1
2	arbre rotor	1	17	circlips extérieur	1	48	planchette à bornes moteur	1
3	flasque avant	1	19	clavettes	2	52	boîte à bornes moteur	1
4	roulement côté arbre	1	21	bûte du ressort	1	56	boîte à bornes frein	1
5	tiges d'assemblage	4	24	vis de positionnement	1	60	clavette de bout d'arbre	1
6	circlips intérieur	1	25	écrou de desserrage	1	61	vis de bout d'arbre	1
7	roulement côté frein	1	26	bouton de réglage du moment (MF)	1	62	roullette de bout d'arbre	1
8	flasque frein	1	27	tige de desserrage	1	63	vis de fixation de tête de retenue	4
9	électro-aimant	1	28	ressort de pression	1	64	tête de retenue de la garniture	1
10	joint (option)	1	29	contre-écrou	1	65	circlips marche VI	1
11	armature	1	30	roullette intermédiaire	2	66	système pour marche verticale ou inclinée	1
12	couronne	1	31	vis de fixation de l'électro-aimant	3			
13	garniture amovible (FCM)	1	32	roullettes frein	3			
15	disque frein	1	38	FCL: flasque intermédiaire	1			

FCO-FCL-FCM part list

Rep.	Désignation	Qty	Rep.	Désignation	Qty	Rep.	Désignation	Qty
1	housing and wound stator	1	16	splined hub (FCM)	1	46	rectifier cells	1
2	rotor and shaft	1	17	snap ring	1	48	terminal board	1
3	drive end shield	1	19	brake disc keys	2	52	motor terminal box frame	1
4	drive end bearing	1	21	spring thrust-washer	1	56	brake terminal box frame	1
5	assembly rods	4	24	locating screw	1	60	shaft end key	1
6	snap ring	1	25	Nylstop release locknut	1	61	shaft end screw	1
7	non drive end bearing	1	26	torque adjustment knob	1	62	shaft end washer	1
8	brake housing	1	27	release rod	1	63	lining fixing screw	4
9	brake coil housing	1	28	compression spring	1	64	lining fixing parts	1
10	seal (option)	1	29	locknut	1	65	snap ring for VI position	1
11	armature	1	30	spacer	2	66	parts for vertical or inclined mounting position	1
12	brake ring	1	31	coil housing fixing screws	3			
13	movable lining (FCM)	1	32	lock washers	3			
15	brake fan disc	1	38	FCL: fan housing	1			





Caractéristiques électro-aimants (à 20°C)

Brake coil characteristics (at 20°C)

Tension continue DC Voltage			Taille / Size					
	*		71	80	90	100/112	132 - S4	≥132
100 V	I	A	0,27	0,36	0,55	0,59	1,3	0,8
	R	Ω	373	277	183	171	78	122
	P	W	27	36	55	59	128	82
100 V - BA*	I	A	0,5	0,5	0,7	0,9		1,1
	R	Ω	182	197	142	108		89
	P	W	55	51	70	93		112
20 V	I	A	1,2	1,8	2,8	2,2		3,1
	R	Ω	17	11	7,2	9		6
	P	W	24	36	56	44		66
20 V - BA*	I	A	1,8	2,2	3,3	4		5
	R	Ω	11	9	6	5		4
	P	W	36	44	67	80		100
20 V - S4	I	A			3,3	2,9		6,4
	R	Ω			6	7		3,14
	P	W			67	57		127

*I: intensité.

R: résistance.

P: puissance.

BA/arbre sortant côté frein.

*I: current.

R: resistance.

P: power.

BA: output shaft on brake side.

Pièces d'usure

Les pièces de première maintenance à prévoir pour l'entretien courant des freins sont les repères 4, 7, 12 (FCO & FCM), 13 (FCM) et 15 (FCL) ainsi que le joint repère 10 dans le cas où le moteur en est équipé.

1st maintenance parts

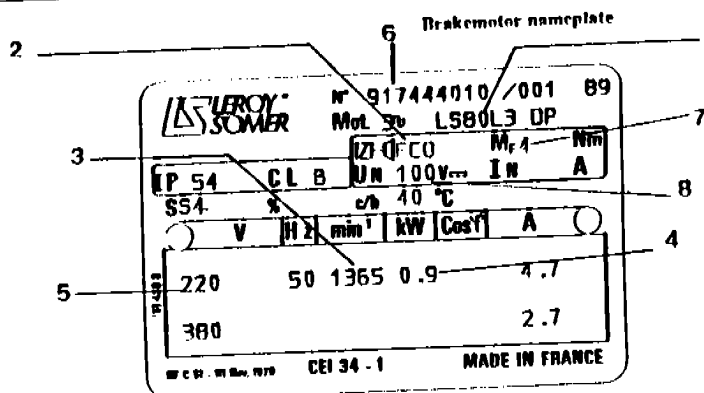
For first maintenance it is recommended to keep in stock the following spare parts: items 4, 7, 12 (FCO & FCM), 13 (FCM) and 15 (FCL) and 10 if the motor is equipped with oil seal.

Tableau des roulements et joints

Rep.	Taille / Size						
	71	80	90	100-112	132	160	180
4	6202 2RS	6204 2RS	6205 2RS	6206 2RS	6308 2RS	6309 Z C3	6310 Z C3
7	6202 2RS	6204 2RS	6205 2RS	6206 2RS	6308 2RS	6310 Z C3	6310 Z C3
10	15x26x7	20x38x8	25x40x8	30x48x8	40x55x8	45x60x8	50x65x8

Bearings and seals part number

Plaque moteur frein



COMMANDE DE PIÈCES

Renseignements indispensables
Relayer sur les plaques signalétiques:

1. Type moteur, hauteur d'axe.
 2. Type frein.
 3. Vitesse de rotation (min⁻¹).
 4. Puissance (kW).
 5. Tension (V).
 6. N° et année de fabrication.
 7. Moment de freinage.
 8. Tension du frein.
- Fixation et position: pour bride indiquer le ØF et le type de bride (B5 trous lisses ou B14 trous taraudés).
- N° et désignation des pièces (voir nomenclature).
- Particularités éventuelles.
- Pour l'électro-aimant 9 indiquer le nombre gravé sur la pièce.

HOW TO ORDER SPARE PARTS

To order please give all following details indicated on nameplates:

1. Motor type and frame.
 2. Brake type.
 3. Speed rotation (min⁻¹).
 4. Power (kW).
 5. Voltage (V).
 6. Manufacture number and year.
 7. Braking torque.
 8. Brake voltage.
- Fixing and position: for flange mount, give dimensions and type of flange (B5 or B14).
- N° and designation of spare parts (see part list).
- If necessary other specifications.
- For brake coil housing 9 quote number engraved on it.

LEROY-SOMER

Compabloc 2000

LUBRIFICATION

Pour fonctionnement entre -10 et +50 °C, le réducteur Compabloc Ch 2000 est livré, en standard, lubrifié avec une huile minérale extrême pression ISO VG 220 EP.

Options.

Pour fonctionnement entre -30 et +50 °C: huile synthétique Mobil SHC 629 avec ou sans AD.

Réducteur avec antidétreur: jamais d'huile extrême pression (EP).

Entre -10 et +50 °C, il est possible d'utiliser une huile minérale ISO VG 100 (non EP), mais dans ce cas il est recommandé de déclasser le réducteur (facteur de service 1,25 minimum).

Entretien, vidange.

- Huile minérale: vidange toutes les 5000 h.
- Huile synthétique SHC 629: pour une température de fonctionnement allant jusqu'à 70 °C, vidange toutes les 25000 heures. Il est recommandé de vérifier périodiquement le niveau d'huile.

Capacité en huile

Les quantités d'huile indiquées (voir tableau) sont approximatives: n'utiliser seulement que pour déterminer le volume d'huile à approvisionner. Pour la quantité exacte, remplir le réducteur jusqu'à son bouchon de niveau.

*Ex.: BP: Energol GR XP 220 - ELF: Nédurclif 220 - ESSO: Spartan EP220 - SHELL: Omala 220.

COMMANDE DE PIECES

Pour toute commande, indiquer s'il vous plaît:

- type du réducteur;
- forme (S, BS, RD ...);
- position de montage;
- réduction exacte;
- numéro de fabrication;
- numéro, désignation de la pièce;
- le type, la polarité et la puissance du moteur (voir plaques signalétiques).

LUBRICATION

For operation between -10 and +50 °C, Compabloc reducer is shipped, as standard, with mineral extreme pressure oil ISO VG 220 EP.

Options.

For operation between -30 and +50 °C: synthetic oil Mobil SHC 629.

Reducer with backstop: never use extreme pressure (EP).

It is also possible, for operation between -10 and +50 °C, to use mineral oil ISO VG 100 (not EP), but in this case, it is recommended to derate the reducer (1.25 minimum service factor).

Maintenance oil change.

- Mineral oil: drain every 5000 hours of operation.
- Synthetic oil: for T < 70 °C, drain every 25000 hours of operation. It is nevertheless recommended to check proper oil level periodically.

Oil capacities

The oil capacities shown in table are approximative values and should be used only as reference in determining how much oil to provide. The proper oil levels can only be determined by filling the reducer to the level of the plug.

*Ex.: BP: Energol GR XP 220 - ELF: Nédurclif 220 - ESSO: Spartan EP220 - SHELL: Omala 220.

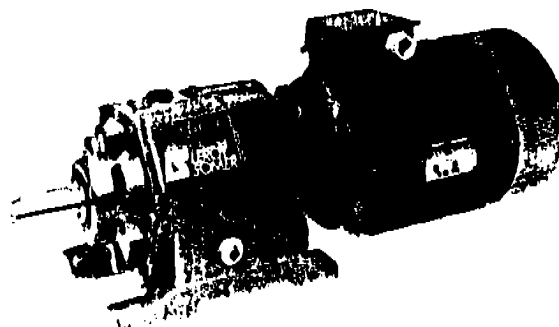
HOW TO ORDER

When ordering, please indicate:

- reducer type;
- design (S, BS, RD ...)
- mounting position;
- ratio exactly
- serial number;
- number and designation of spare part;
- type, polarity and power of motor (refer to nameplates).

Lors de l'assemblage
du montage "U":
lubrifier les cannelures
avec de la graisse Lithium
+ MO S2 grade 2

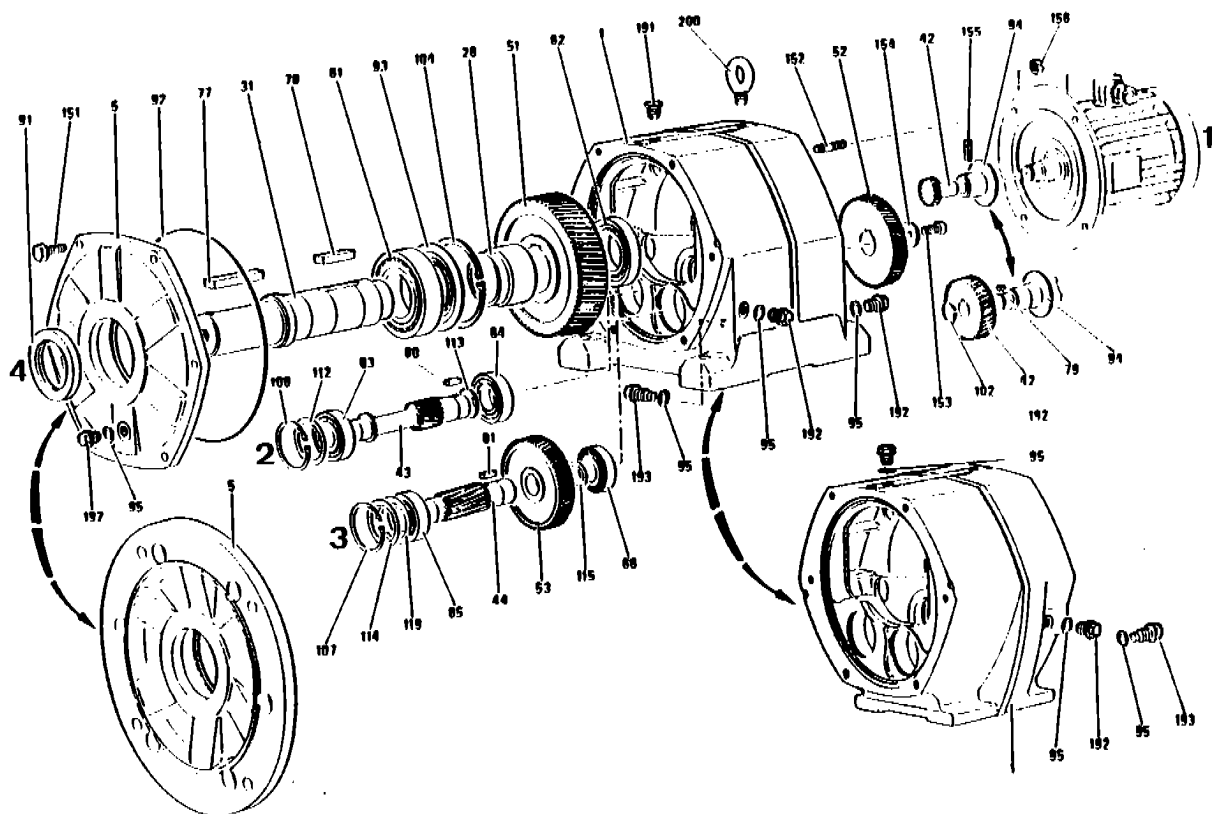
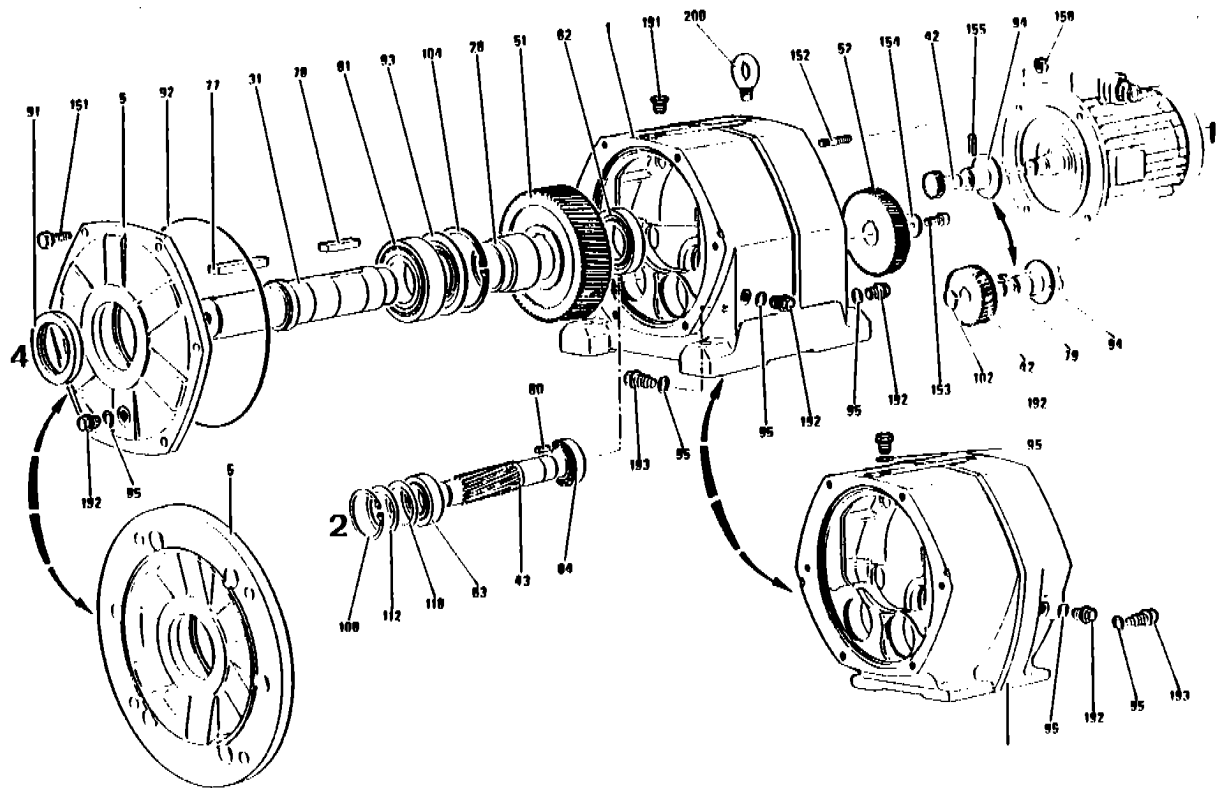
For universal "U" mounting:
lubricate splines of input
shaft and coupling with grease
(Lithium + MO S2, grade 2);
Install motor on lantern



Malgré tout le soin apporté à la fabrication et au contrôle de ce matériel, Leroy-Somer ne peut garantir à vie l'absence de fuite de lubrifiant. Au cas où de légères fuites pourraient avoir des conséquences graves mettant en jeu la sécurité des biens et des personnes, il appartient à l'installateur et à l'utilisateur de prendre toutes les précautions nécessaires pour éviter ces conséquences.

Despite all the care taken in the manufacturing and inspection processes of our products, Leroy-Somer cannot guarantee 100% against lubricant leakage. In cases where these leaks could be serious, putting at risk the safety and well being of people, it is the responsibility of the fitters to take all necessary precautions to avoid these eventualities occurring.

Compabloc 2000 2 & 3 Cb 25, 24, 23, 22, 21



Compabloc 2000 2 & 3

Cb 25, 24, 23, 22, 21

Nomenclature Cb 25-- à 21--

Rep.	Désignation	Qté	Rep.	Désignation	Qté	Rep.	Désignation	Qté
1	carter	1	66	roulement arrière axe 3	1	112	rondelle d'appui AV axe 2	1
5	flaque palier	1	77	clavette d'arbre lent	1	113	rondelle d'appui AR axe 2	1
26	entretoise	1	78	clavette de roue axe 4	1	114	rondelle d'appui AV axe 3	1
31	arbre lent	1	79	clavette de pignon axe 1	1	115	rondelle d'appui AR axe 3	1
42	pignon d'entrée axe 1	1	80	clavette de roue axe 2	1	118 /	rondelles de calage axe 2 / 3 jeu	
43	pignon arbré axe 2	1	81	clavette de roue axe 3	1	151	vis du flasque palier	6
44	pignon arbré axe 3	1	91	joint d'élançhété axe 4	1	152	goujons d'assemblage	4
51	roue axe 4	1	92	joint torique	1	153	vis de roue axe 2	1
52	roue axe 2	1	93	joint Nilos	1	154	rondelle de roue axe 2	1
53	roue axe 3	1	94	défecteur d'huile axe 1	1	155	goupille (pignon à queue)	1
61	roulement avant axe 4	1	95	joints de bouchon	3	156	écrous d'assemblage	4
62	roulement arrière axe 4	1	102	cliclips E de pignon axe 1	1	191	bouchon de remplissage ave 1	
63	roulement avant axe 2	1	104	cliclips I axe 4	1	192	bouchons de niveau	2
64	roulement arrière axe 2	1	106	cliclips I axe 2	1	193	bouchon magnétique de vidai 1	
65	roulement avant axe 3	1	107	cliclips I axe 3	1	200	anneau de levage	1

Cb 25-- to 21-- part list

Rep.	Designation	Qty	Rep.	Designation	Qty	Rep.	Designation	Qty
1	housing	1	66	bearing axis 3, back	1	112	front ring axis 2	1
5	endshield	1	77	output shaft key	1	113	back ring axis 2	1
26	spacer	1	78	wheel key axis 4	1	114	front ring axis3	1
31	output shaft	1	79	pinion key axis 1	1	115	back ring axis 3	1
42	input pinion, axis 1	1	80	wheel key axis 2	1	118 /	space washer axis 2 / 3	set
43	pinion shaft axis 2	1	81	wheel key axis 3	1	151	endshield screws	6
44	pinion shaft axis 3	1	91	oil seal axis 4	1	152	studs	4
51	wheel axis 4	1	92	O ring seal	1	153	screw	1
52	wheel axis 2	1	93	Nilos bearing shield	1	154	washer	1
53	wheel axis 3	1	94	oil deflector axis 1	1	155	pinion pin	1
61	output bearing axis 4, front	1	95	plug seal	3	156	nuts	4
62	output bearing axis 4, back	1	102	pinlon retaining ring	1	191	breather plug	1
63	bearing axis 2, front	1	104	retaining ring axis 4	1	192	level plugs	2
64	bearing axis 2, back	1	106	retaining ring axis 2	1	193	magnetic drain plug	1
65	bearing axis 3, front	1	107	retaining ring axis 3	1	200	lifting lug	1

Cb 25-- à 21-- - Pièces d'usure

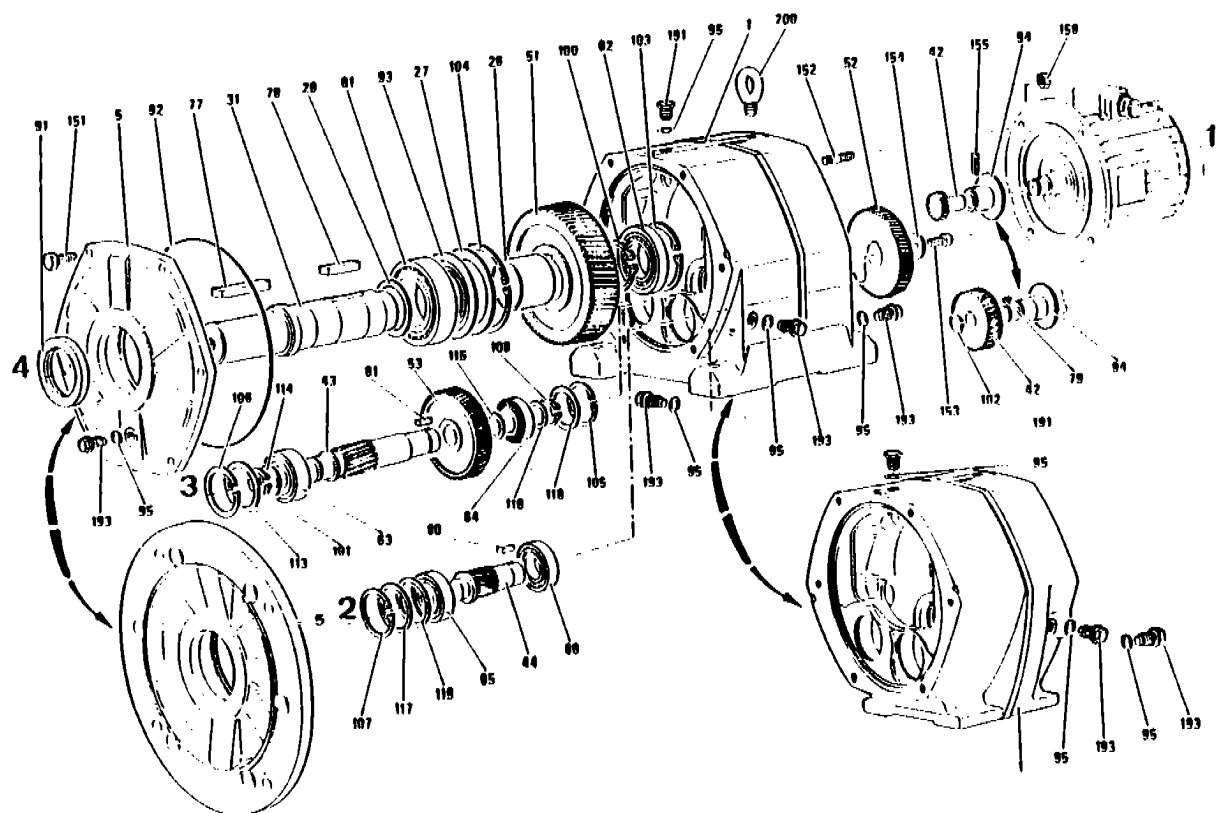
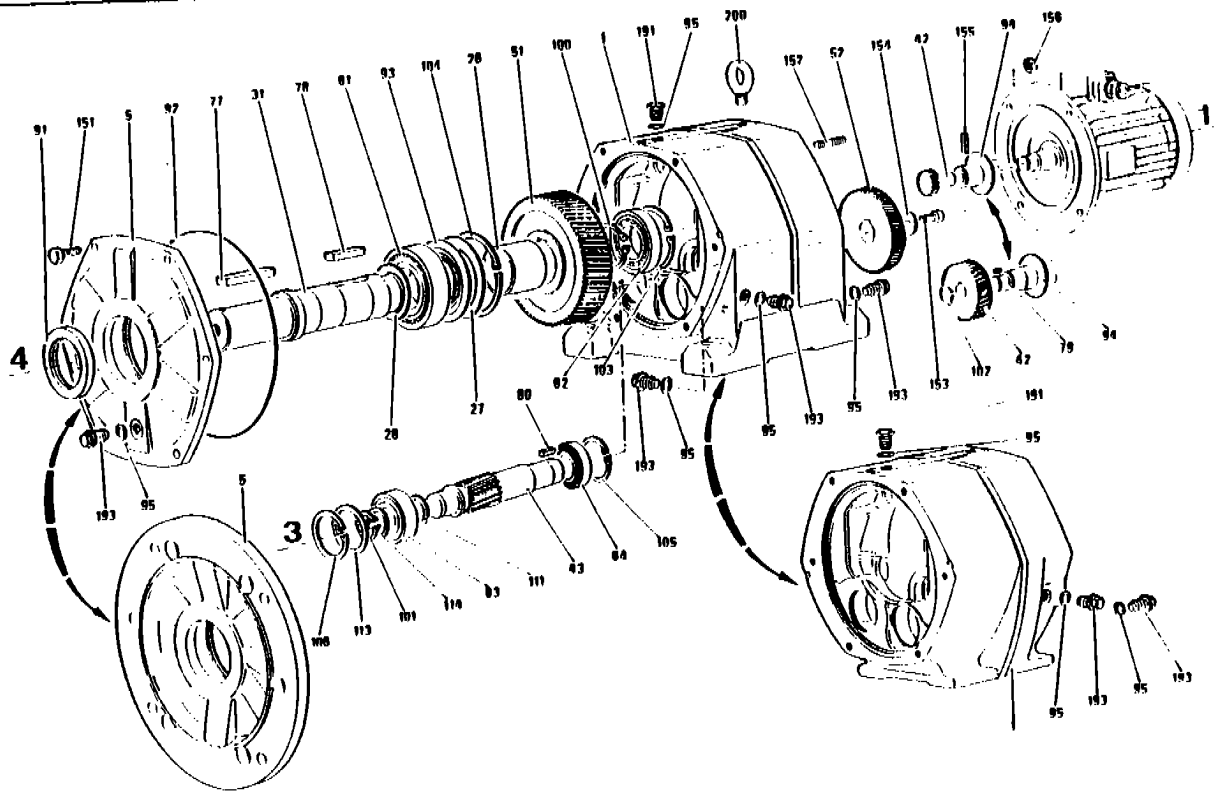
Cb 25-- to 21-- - 1st maintenance parts

Type	Rep.						
Cb	61	62	63	64	65	66	91
2503	22213	NJ 211	6306	6207	30207	30207	75x100x10 BASL
2502	22213	NJ 211	33207	33207			75x100x10 BASL
2403	22211	NJ 208	6206	6206	30305	30305	65x85x13 BASL
2402	22211	NJ 208	30305	30206			65x85x13 BASL
2303	6309 RS	NJ 205	6304	6205	6304	NJ 205	55x68x8/10 BASL
2302	6309 RS	NJ 205	NJ 205	NJ 205			55x68x8/10 BASL
2203	6207 RS	NJ 203	6203	6203	6203	6203	40x58x9 BASL
2202	6207 RS	NJ 203	NJ 203	6203			40x58x9 BASL
2103	6206 RS	NJ 202	6300	6202	6300	6202	35x52x10 BASL
2102	6206 RS	NJ 202	6202	6202			35x52x10 BASL

Cb 2002: sans entretien.

Cb 2002: maintenance free.

Compabloc 2000 2 & 3 Cb 29, 28, 27, 26



Compabloc 2000 2 & 3

Cb 29, 28, 27, 26

Nomenclature Cb 29-- à 26--

Rep.	Désignation	Qté	Rep.	Désignation	Qté	Rep.	Désignation	Qté
1	carter	1	77	clavette d'arbre lent	1	108	circlips E axe 3	1
5	flasque palier	1	78	clavette de roue axe 4	1	113	rondelle d'appui axe 3	1
26	entretoise axe 4	1	79	clavette de pignon axe 1	1	114	rondelle d'appui axe 3	1
27	rondelle d'appui axe 4	1	80	clavette de roue (52)	1	115	rondelle d'appui axe 3	1
28	rondelle d'appui axe 4	1	81	clavette de roue axe 3	1	116	rondelle d'appui axe 3	1
31	arbre lent	1	91	joint d'étanchéité axe 4	1	117	rondelle d'appui axe 2	1
42	pignon d'entrée axe 1	1	92	joint torique	1	118	rondelle d'appui axe 3	1
43	pignon arbré axe 3	1	93	joint Nilos	1	119	rondelle d'appui axe 2	1
44	pignon arbré axe 2	1	94	défecteur d'huile axe 1	1	151	vis du flasque palier	6
51	roue axe 4	1	95	joints de bouchon	5	152	goujons d'assemblage	4
52	roue axe 2	1	100	circlips E axe 4	1	153	vis de roue axe 2	1/3
53	roue axe 3	1	101	circlips E axe 3	1	154	rondelle de roue axe 2	1
61	roulement avant axe 4	1	102	circlips E de pignon axe 1	1	155	goupille (pignon à queue)	1
62	roulement arrière axe 4	1	103	circlips I axe 4	1	156	écrous d'assemblage	4
63	roulement avant axe 3	1	104	circlips I axe 4	1	191	bouchon de remplissage avec I	1
64	roulement arrière axe 3	1	105	circlips I axe 3	1	193	bouchons de niveau-vidange	4
65	roulement avant axe 2	1	106	circlips I axe 3	1	200	anneau de levage	1
66	roulement arrière axe 2	1	107	circlips I axe 2	1			

Cb 29-- to 26-- part list

Rep.	Designation	Qty	Rep.	Designation	Qty	Rep.	Designation	Qty
1	housing	1	77	output shaft key	1	108	retaining ring axis 3	1
5	endshield	1	78	wheel key axis 4	1	113	ring axis 3	1
26	spacer axis 4	1	79	pinion key axis 1	1	114	ring axis 3	1
27	ring axis 4	1	80	(52) wheel key	1	115	ring axis 3	1
28	ring axis 4	1	81	wheel key axis 3	1	116	ring axis 3	1
31	output shaft	1	91	oil seal axis 4	1	117	ring axis 2	1
42	pinion axis 1	1	92	"O" ring seal	1	118	ring axis 3	1
43	pinion shaft axis 3	1	93	Nilos bearing shield	1	119	ring axis 2	1
44	pinion shaft axis 2	1	94	oil deflector axis 1	1	151	endshield screws	6
51	wheel axis 4	1	95	plug seals	5	152	studs	4
52	wheel axis 2	1	100	retaining ring axis 4	1	153	screw	1/3
53	wheel axis 3	1	101	retaining ring axis 3	1	154	washer	1
61	bearing axis 4, front	1	102	pinion retaining ring, axis 1	1	155	pinion pin	1
62	bearing axis 4, back	1	103	retaining ring axis 4	1	156	nuts	4
63	bearing axis 3, front	1	104	retaining ring axis 4	1	191	breather plug	1
64	bearing axis 3, back	1	105	retaining ring axis 3	1	193	level-drain plug	4
65	bearing axis 2, front	1	106	retaining ring axis 3	1	200	lifting lug	1
66	bearing axis 2, back	1	107	retaining ring axis 2	1			

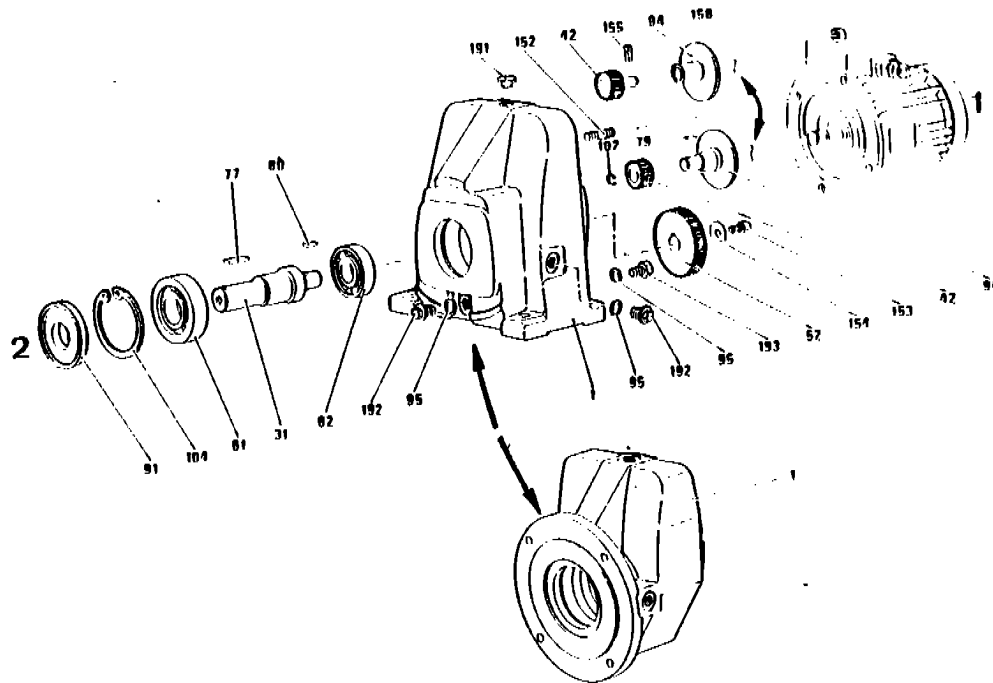
Cb 29-- à 26-- - Pièces d'usure

Type	Rep.						
Cb	61	62	63	64	65	66	91
2903	23124 E	22217 E	22314 E	2216 NJ	32212	33212	130x160x15 BASL
2803	23120 E	NJ 2215 E C3	22312 E	NJ 2213 E C3	30211	30211	105x130x12 BASL
2802	23120 E	NJ 2215 E C3	22312 E	22213 E			105x130x12 BASL
2703	22217 E	NJ 2212 E C3	22310 E	NJ 2210 E C3	32207	30207	95x125x12 BASL
2702	22217 E	NJ 2212 E C3	22310 E	22210 E			95x125x12 BASL
2603	22215 E	NJ 2211 E C3	22308 E	2208 C	30207	30207	80x100x10 BASL
2602	22215 E	NJ 2211 E C3	22308 E	NJ 22208 C			80x100x10 BASL

Cb 29-- to 26-- - 1st maintenance parts

Compabloc 2000 - 1

Cb 2501 - - - - 2101



Nomenclature Cb 2501 à 2101

Rep.	Désignation	Qté
1	carter	1
31	arbre lent	1
42	pignon d'entrée axe 1	1
52	rotte axe 2	1
61	roulement avant	1
62	roulement arrière	1
77	clavette d'arbre lent	1
79	clavette de pignon	1

Rep.	Désignation	Qté
80	clavette de roue	1
91	joint d'étanchéité	1
94	déflexeur d'huile	1
95	joints de bouchon	4
102	circlips E de pignon	1
104	circlips I axe 2	1
152	goujons d'assemblage	4
153	vis de roue	1

Rep.	Désignation	Qté
154	rondelle de roue	1
155	goupille (pignon à queue)	1
156	écrous d'assemblage	4
191	bouchon de remplissage avec	1
192	bouchons de niveau	3
193	bouchon magnétique de vidai	1

Cb 2501 to 2101 part list

Rep.	Designation	Qty
1	housing	1
31	output shaft	1
42	input pinion	1
52	wheel axis 2	1
61	bearing, front	1
62	bearing, back	1
77	output shaft key	1
79	pinion key	1

Rep.	Designation	Qty
80	wheel key	1
91	oil seal	1
94	oil deflector	1
95	plug seals	4
102	retaining ring	1
104	retaining ring	1
152	studs	4
153	screw	1

Rep.	Designation	Qty
154	washer	1
155	pinion pin	1
156	nuts	4
191	breather plug	1
192	level plugs	3
193	magnetic drain plug	1

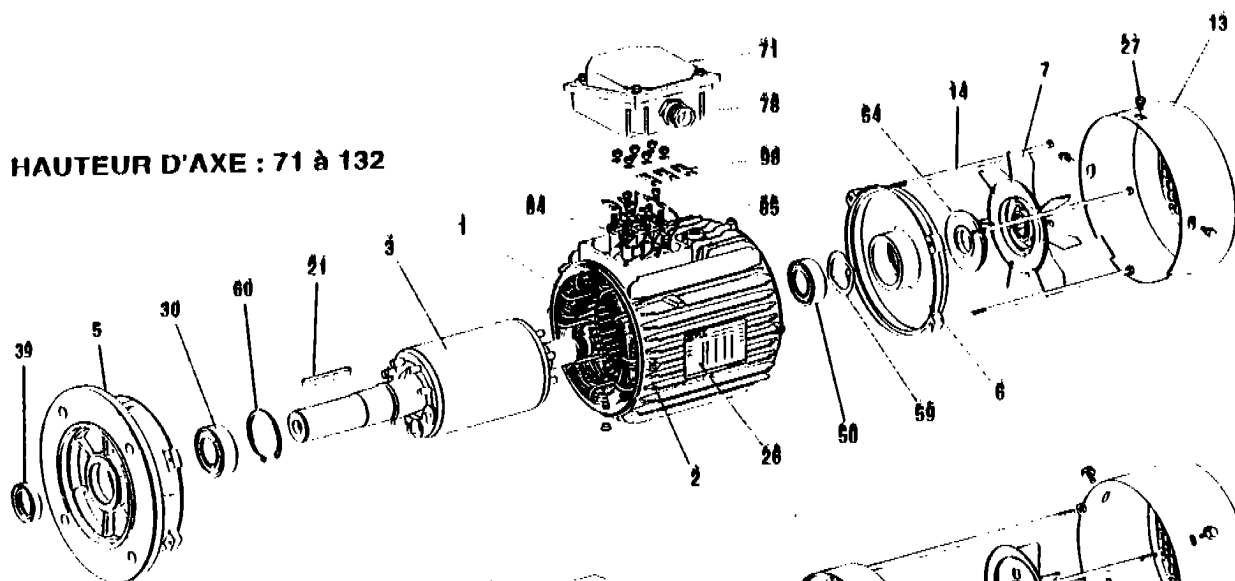
Cb 2501 à 2101 - Pièces d'usure

Type	Rep.				Cb 2501 to 2101 - 1st maintenance parts	
Cb	61 (S)	62 (S)	61 (BS)	62 (BS)	91 (S)	91 (BS)
2501	6310 RS	6309	30210	30209	50x110x12	60x90x10/12
2401	6309 RS	6308	6309 RS	6308	45x100x8	45x100x8
2301	6308 RS	6307	6308 RS	6307	40x90x8	40x90x8
2201	6206 RS	6305	6206 RS	6305	30x62x7 B1SL	30x62x7 B1SL
2101	6205 RS	6304	6205 RS	6304	25x52x7 BASL	25x52x7 BASL

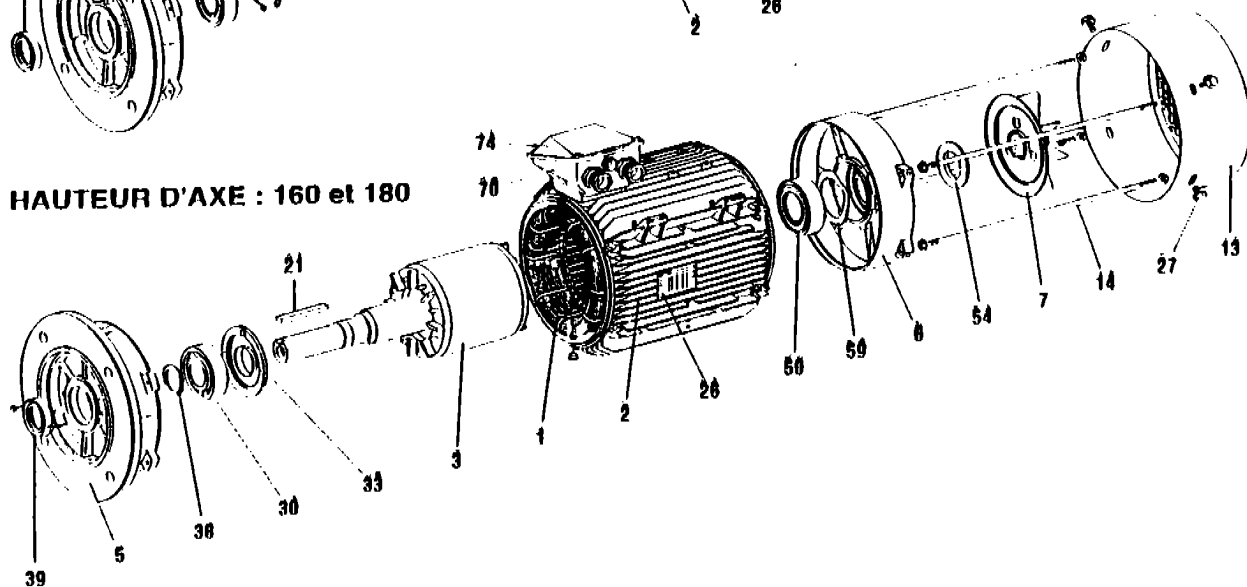
Compabloc 2000

Moteur intégré

HAUTEUR D'AXE : 71 à 132



HAUTEUR D'AXE : 160 et 180



Rep. N°	Désignation Description	Qté Qty	Rep. N°	Désignation Description	Qté Qty
1	Stator bobiné / Wound stator	1	38	Circclips de roulement côté accouplement / Drive end bearing circlip	1
2	Carter / Housing	1	39	Joint côté accouplement / Drive end bearing	1
3	Rotor / Rotor	1	60	Roulement arrière / Non-drive end bearing	1
5	Flasque côté accouplement / Drive end shield	1	64	Joint arrière / Non-drive end seal	1
6	Flasque arrière / Non drive end	1	69	Rondelle de précharge / Preloading (Wavy) washer	1
7	Ventilateur / Fan	1	80	Segment d'arrêt (circclips) / Circlip	1
13	Capot de ventilation / Fan cover	1	70	Corps de boîte à bornes / Terminal box	1
14	Tiges de montage / Tie rods	4	71	Boîte à bornes métallique / Metal terminal box	1
21	Clavette de bout d'arbre / Shaft extension key	1	74	Couvercle de boîte à bornes / Terminal box lid	1
26	Plaque signalétique / Identification plate	1	78	Presse-étoupe / Cable gland	1-2
27	Vis de fixation du capot / Fan cover screw	4	84	Planchette à bornes / Terminal block	1
30	Roulement côté accouplement / Drive end bearing	1	85	Vis de planchette / Set screw	2
33	Chapeau inférieur côté accouplement / Bearing retaining plate	1	98	Barettes de connexions / Connecting bars	3

Compabloc 2000

Moteur intégré

Quantité d'huile (en litres)

Cb 2000

2 à 6 étages de réduction (réducteur de sortie pour 4 à 6 étages)

Type	Positions de montage							
	B3	B5	B6	B7	B8	V1	V3	V5
Cb 20--	17,6		65,0	65,0	115,0			119/40*
Cb 26--	15,0	14,6	45,0	42,5	70,0	57/23*	53,0	74/23*
Cb 27--	8,3	8,0	22,3	22,0	35,3	30/13*	25,8	35/13*
Cb 26--	6,2	6,0	16,0	14,5	24,5	20/9,3*	20,0	24/9,3*
Cb 25--	3,5	4,2	8,4	7,6	12,4	12,5	13,5	13,2
Cb 24--	2,2	2,5	4,6	4,3	6,8	7,6	7,4	7,9
Cb 23--	1,4	1,6	3,0	2,5	3,6	4,4	4,4	4,2
Cb 22--	0,4	0,5	1,1	1,1	1,9	1,9	1,9	2,0
Cb 21--	0,4	0,4	0,9	0,7	0,9	1,1	1,2	1,3
Cb 20--	0,2	0,4	0,4	0,4	0,6	0,4	0,7	0,5

* remplissage avec pompe à huile.

Cb 2000

4 à 6 étages de réduction (réducteur d'entrée)

Type	Positions de montage	
	V1	V3
Cb 29--	2,5	7,6
Cb 28--	2,5	7,6
Cb 27--	1,6	4,4
Cb 26--	1,6	4,4
Cb 25--	0,5	1,9
Cb 24--	0,4	1,1
Cb 23--	0,4	1,1
Cb 22--	0,4	1,1

Types Cb	20-21-22	23-24-25	26-27-28-29
Ø bouchons	G1/8"	M16x1,5	G3/4"

Cb 2000

1 étage de réduction

Taille	Positions de montage				
	B3	B6	B7	B8	V5
2501	1,1	3,3	3,3	4,9	4,4
2401	0,6	1,5	1,5	2,5	2,1
2301	0,9	1,4	1,4	1,9	2,1
2201	0,3	0,6	0,6	0,6	0,7
2101	0,2	0,4	0,4	0,6	0,5

Les quantités d'huile données dans les tableaux ci-dessus sont des valeurs arrondies.

Cb 2000

1 étage de réduction

Taille	Positions de montage				
	B5	B52	B53	B54	V1
2501	1,0	2,2	3,4	2,2	2,5
2401	1,0	1,6	2,5	1,6	2,3
2301	0,8	1,1	1,6	1,1	1,6
2201	0,2	0,3	0,5	0,3	0,5
2101	0,2	0,2	0,4	0,2	0,3

N° des bouchons suivant position du réducteur

Cb : 23 - 22 - 21 - 20

Position	R/E	N	V
2 & 3 étages			
B3	1	2	5
B6	5	1	2
B7	2	1	5
B8	5	2	1
V5	5	5	1 (3)
V6	1 (3)	2	5

Cb : 25 - 24

Position	R/E	N	V
2 & 3 étages			
B3	1	2	5
B6	5	1	2
B7	2	1	5
B8	5	2	1
V5	4	5	3
V6	3	2	4

Cb : 29 - 28 - 27 - 26

Position	R/E	N	V
2 & 3 étages			
B3	1	2	5
B6	5	1	2
B7	2	1	5
B8	5	2	1
V5	6	5	3
V6	3	2	6

Cb : B5

Position	R/E	N	V
2 & 3 étages			
B5	1	2	4 (6)
V1	4 (6)	2	1
V3	1	1	4 (6)

4 --- (6): Cb21-22-23

Cb : 25 -- 21

Position	R/E	N	V
1 étage			
B3	1	2-3	5
B6	3	4-1	2
B7	2	4-1	3
B8	4-5	2-3	1
V5	5	1	4
V6	4	2-3	5
B5	1	2-3	4
V1	4	1	2-3
V3	2-3	2-3	4
B52	3	1	2
B53	4	2	1
B54	2	1	3

1 --- (3) Cb 23

R/E: remplissage / évent

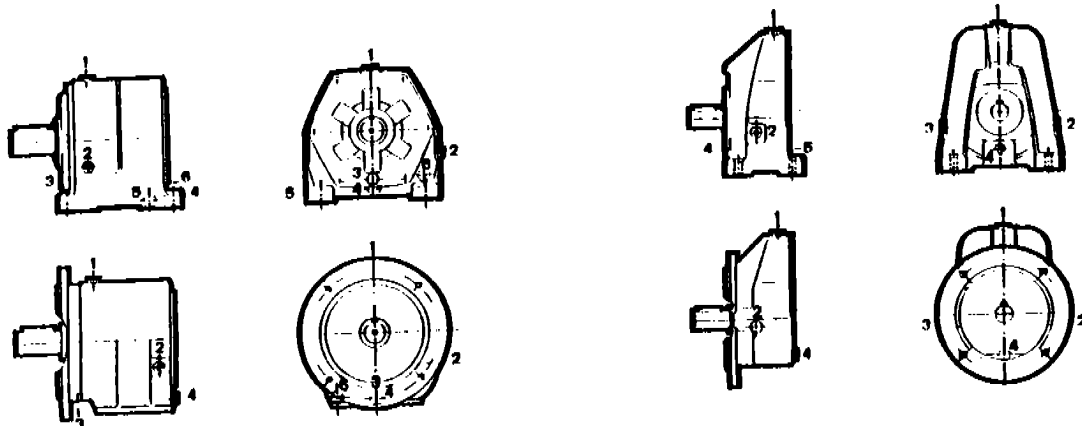
N: niveau

V: vidange

R/E: filling / breather

N: level

V: drain



CS 31

Intelligent decentralized automation system

FRCL 0005 92 GB

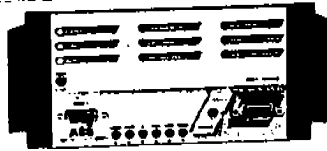


ABB Procontic
CS31 System

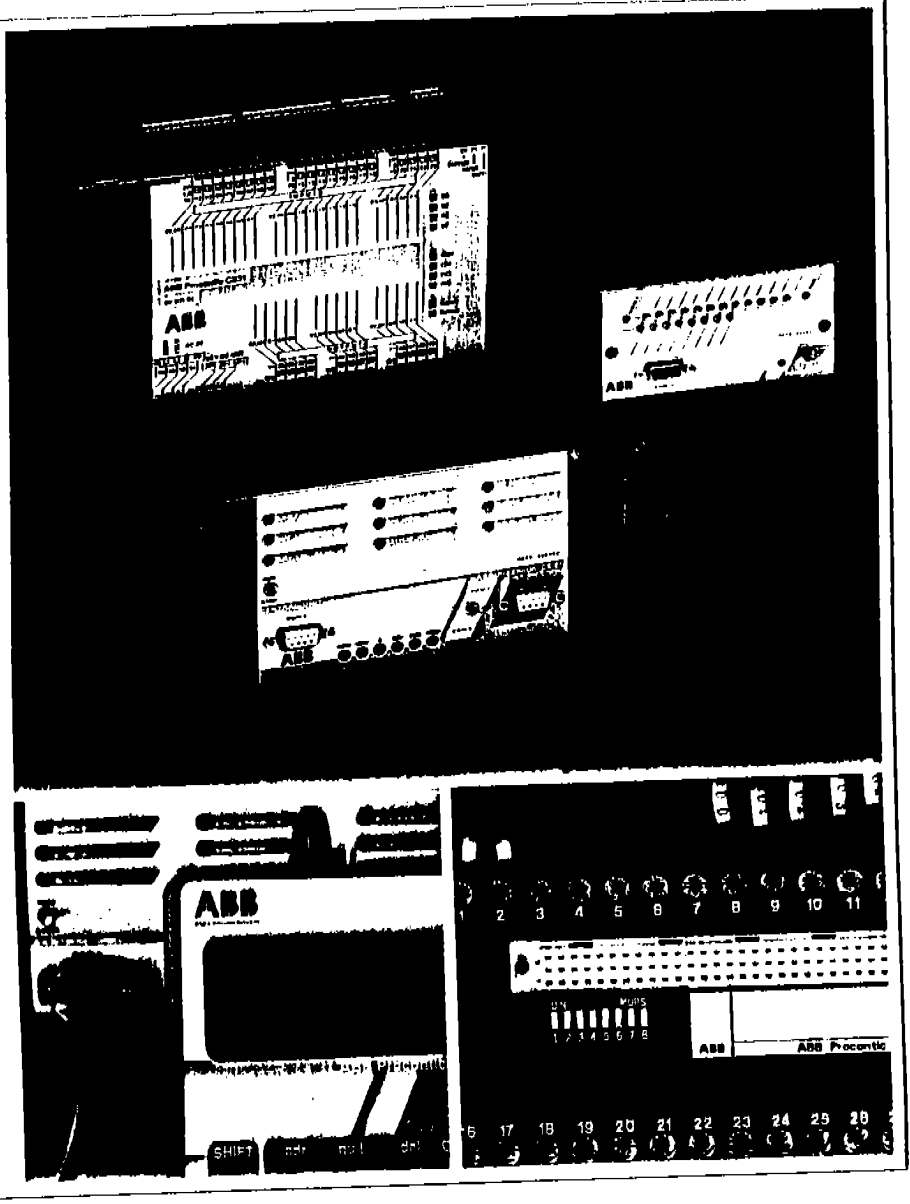
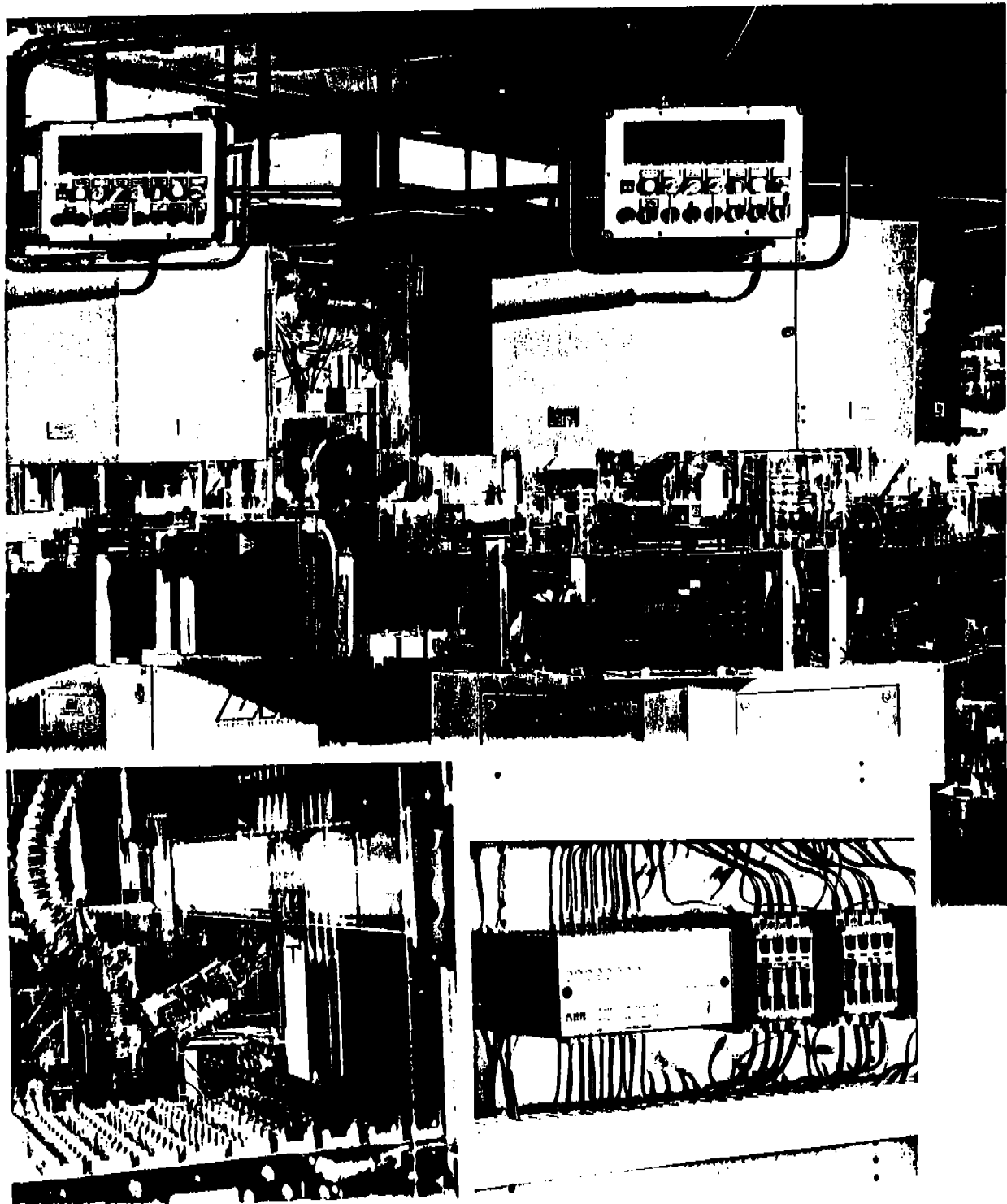


ABB Control

ABB
ASEA BROWN BOVERI

Distributed auto for cost



Example of a CS31 application:
Automation of an electro-mechanical device, production line

mation devices reduction

The major concern of any automation expert, integrator or user today, is to reduce the total time taken to implement their systems. Machines and plant equipment, for reasons of competitiveness are becoming even more complex, the amount of information required from sensors and actuating devices is constantly on the increase. This demands more processing and interaction between various elements as processes become more complicated.

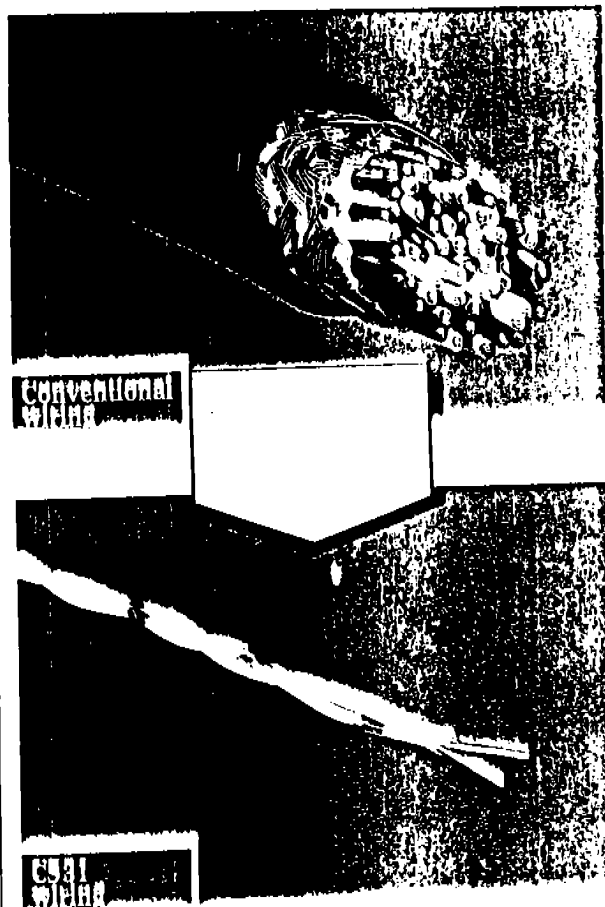
To deal with this evolution, ABB has developed the "CS31" an intelligent automation system offering a simple and low cost solution for industrial automation.

The key feature is "DECENTRALIZATION".

Small automatic control units, connected directly to sensors and actuator devices are linked together via a simple twisted pair over a maximum distance of 500 m. The complete system is controlled by a Central Processing Unit.

Reduction of cabling

The immediate and obvious advantage of such a system is the dramatic reduction in wiring costs, with the twisted pair replacing the many lengths of conventional control cabling originating at the central control unit and running through the complete installation. Savings are made on equipment used (cabling, trunking, terminal blocks) but also on installation time (laying, marking of cables and checking). These savings are substantial when the application requires the transfer of many signals.



The use of a simple twisted pair makes it possible to use the existing installation structures.

For system designers, a distributed architecture gives a better overall view. Each machine and/or function can be processed individually then integrated within the total solution.

Compact I/O Units

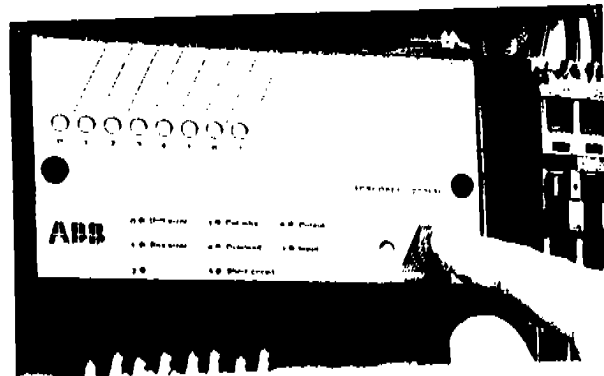
We are all aware of the constraints on space around machines in harsh industrial environments, space is therefore of premium importance when implementing a system.

The CS31 system has been designed to fulfil the requirements of the most demanding users, with electromagnetic immunity, galvanic isolation and protection by compact cases.

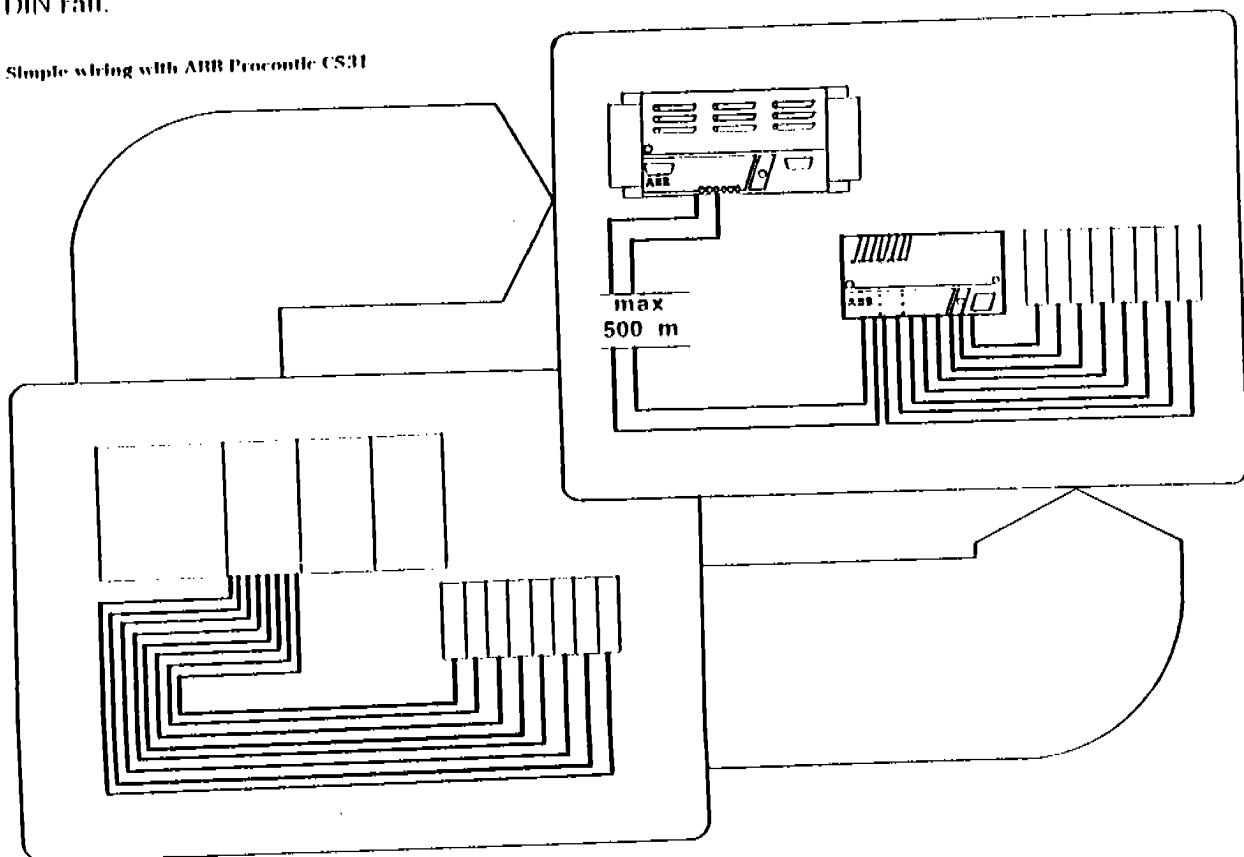
The units are suitable for mounting on a 35 mm DIN rail.

Due to the compact size of the units they can be directly mounted within:

- a control panel next to the contactors or on the cabinet door,
- a control console; an intelligent Central Processor Unit can be incorporated within the operator console which is then connected to



Simple wiring with ABB Procontle CS31

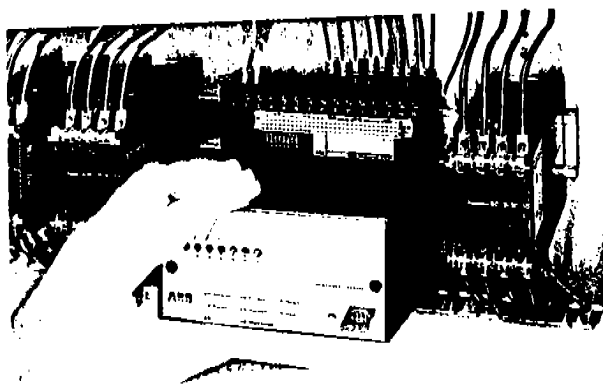


- the control panel by the simple twisted pair,
- an installation, local to sensors and controls, with remote connection to the rest of the system via the simple twisted pair.

Modularity

Few installations remain unchanged in the course of time. The system grows within its environment and must be capable of expansion and increased functionality.

The configuration of an installation is often altered with machines being added and removed according to an individual site requirement.



The CS31 system meets these requirements with built-in modularity:

- Configurable units.
Certain remote units have 8 or 16 user configurable channels for input or output, as set by the user program.
- Freely extendable network.
New units (max. 31) can be added to the system without a shutdown of the installation. Further expansion of the system is achieved with the addition of CS31 bus couplers for the larger ABB PROCONTIC T200 and T300 systems.

- Development potential.

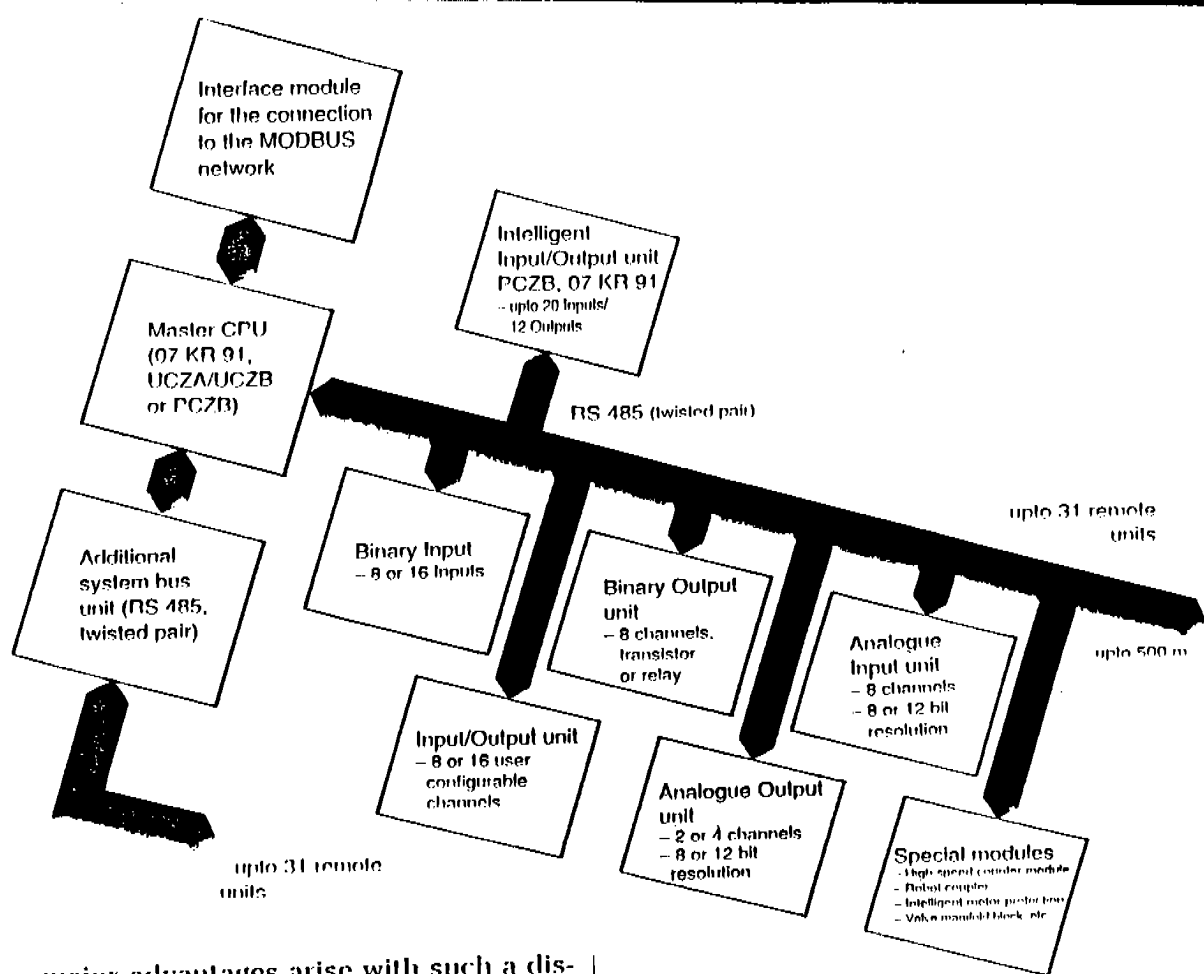
With the three available Central Processing Units and possibility for direct connection of the CS31 system to the centralized ABB PROCONTIC logic controllers, the user has tailor-made performance at his fingertips.

Distributed Intelligence

Intelligent Inputs and Outputs are a major feature of the CS31 concept.

The Central Processing Units (PCZB, 07 KR 91 and 07 KT 92) have been designed for use as intelligent remote units, with integral Inputs and Outputs.

A machine or process element can be controlled locally by intelligent remote units. The main processor exchanges operational parameters with the remote units and is therefore relieved of local control.



Two major advantages arise with such a distributed control architecture:

- a complete installation can be divided into simple control outstations. Design, programming and maintenance becomes much easier to handle.
- each control outstation can work autonomously, with the local backup mode enabling intelligent remote units to handle their own operation in the unlikely event of a fault on the Central Processor Unit, or damage to the twisted pair system bus.

Increased productivity

The productivity of an installation depends largely upon the availability of spares and ease of maintenance, in addition to the performance of the equipment. These are major strengths of the CS31 system.

Excellent availability and reliability are ensured with ABB distributed controllers being deve-

loped and produced in Europe to total quality standards (ISO 9001).

Each of the remote units contains a dedicated microprocessor for diagnostics and management of the Inputs and Outputs. Short circuits, open circuits, overloads, units not connected or defective and interruption of the system bus are amongst the fault conditions that are handled by the dedicated microprocessor.

Faults associated with the Input/Output remote units or actuating devices can be located and rectified rapidly and efficiently with the extensive fault diagnostic capability of the system.

Information regarding faults is displayed on the front panel of the Input/Output units or accessed via a test terminal (TCZ), which is connected to the Processor unit. The test terminal also enables forced setting of outputs and access to all information for the entire network.

Maintenance is greatly simplified because the remote units can be replaced with the installation remaining operational. The plug-in base arrangement adopted for the wiring eliminates the need to re-wire the Input/Output and System Bus terminations.

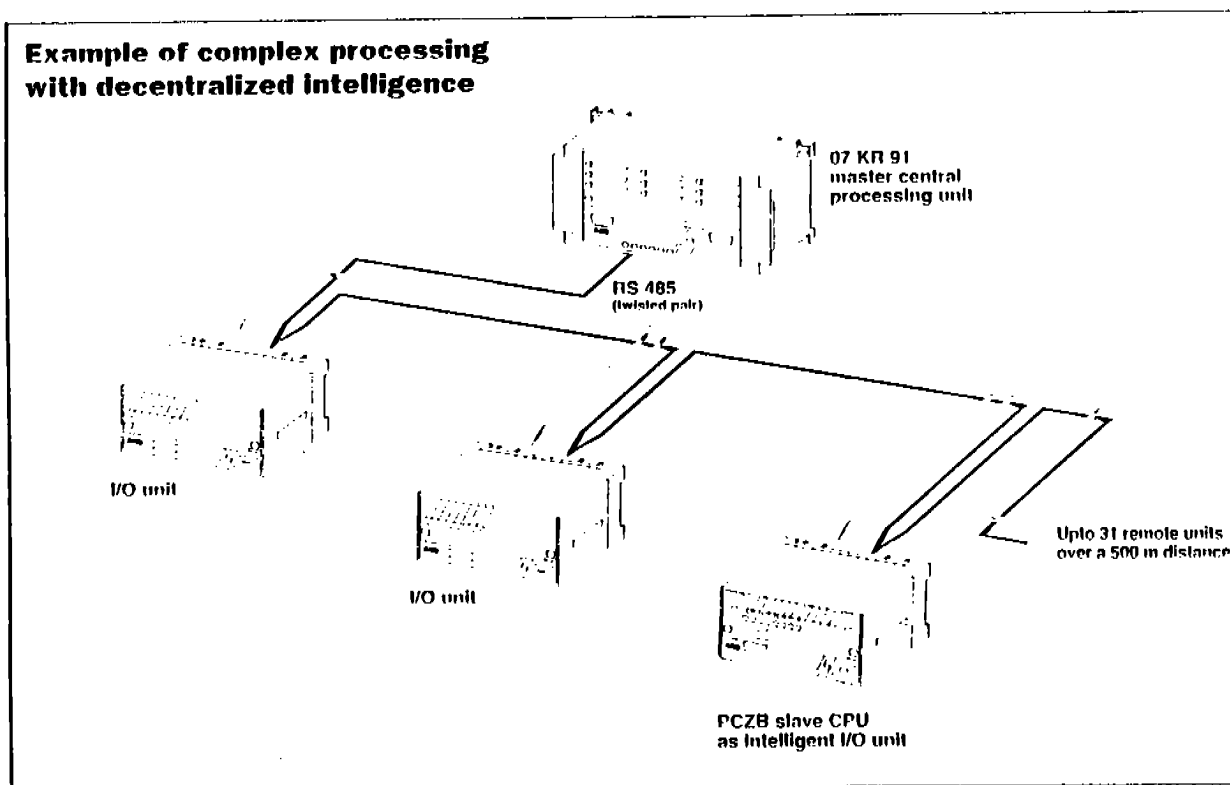
* 07 KR 91 is designed for complex applications with a higher level of functionality (Data manipulation, PID regulation, etc.).

* With the additional System Bus unit, the UCZA/UCZB can control two CS31 networks simultaneously, allowing the use of a vast number of Inputs and Outputs.

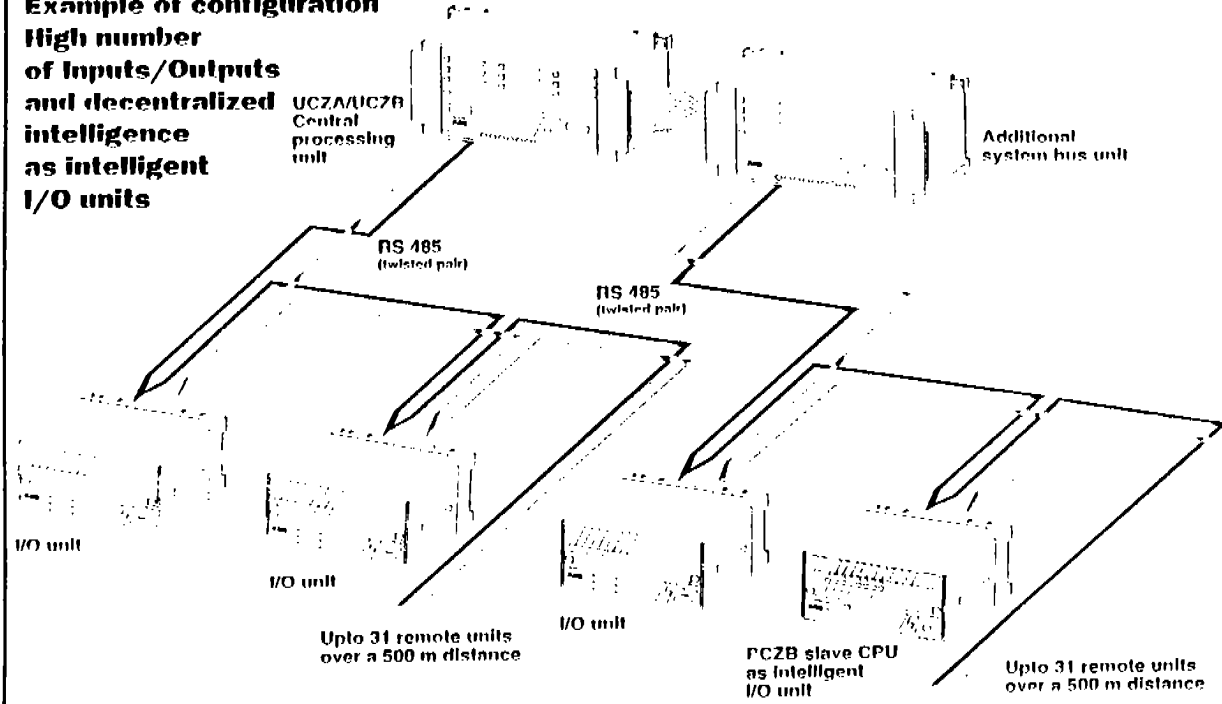
* PCZB incorporates all of the functions required for smaller decentralized applications, thus providing an excellent Price / Performance ratio. When used in conjunction with the 07 KR 91 or UCZA/UCZB unit as a slave processor, it fully exploits the concept of intelligent distributed logic control.

An intelligent product

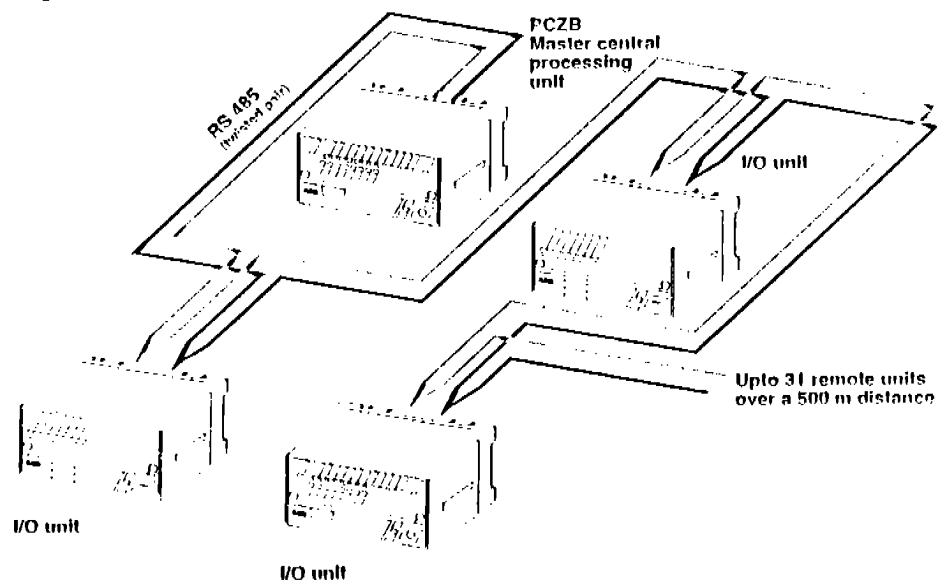
The CS31 range is based on three Central Processing Units: 07 KR 91, UCZA/UCZB and PCZB (see following configuration examples).



Example of configuration
High number
of Inputs/Outputs
and decentralized
intelligence
as intelligent
I/O units



Example of configuration for simple process
with intelligent I/O units



The level of flexibility of the system is increased due to the fact that the same programming package is used for the PROCONTIC T300 large multi processor system, the 07 KR 91 and the PCZB (under preparation).

Transparent Programming

Programming of the CS31 system is very simple. The remote Inputs and Outputs are programmed as if they were centralized, with a dedicated microprocessor handling all remote I/O communications.

All remote (upto 500 m) sensors and actuators, etc., are directly accessible to the programmer without the need for special commands.

All of the central processing units and slave processors can be programmed with an IBM compatible pc, providing full test and documentation facilities. Ladder Diagram, Function Plan and Instruction List are the languages which are used to program the units, step sequence programming can also be implemented.

Programming Software is available at two levels:

- 907 PC 331: is intended for powerful "top-line" applications, it is the platform for program development for the 07 KR 91 processor.
- PC 29: this is intended for low cost applications, utilising the PCZB as the master or slave processor within a system.

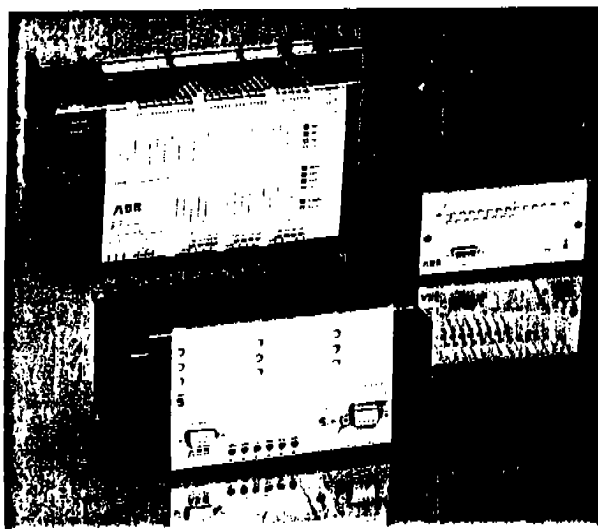
Operator Interfaces

A range of operator interfaces (35 BS 40) and graphics terminals (35 BS 93) are available for the CS31 system.

These devices provide an immediate display of the machine or plant status, report all error messages and allow process data input from the operator.

Central processing unit	PCZB	07 KR 91	07 KT 92	UCZA/UCZB
Program memory (instructions)	2 K EEPROM	7 K flash EPROM	7 K flash EPROM	8/16 K EPROM
Cycle time 1 K Binary instructions	3 ms	2 ms	2 ms	2.5 ms
Cycle time 1 K instructions (35% analogue 65% binary)	30 ms	2.9 ms	2.9 ms	80 ms
Interfaces				
RS 232	1	1	2	2
RS 485 System bus	1	1	1	1+1
Timers	16	No limit	No limit	60
Counters	16	No limit	No limit	16
Internal flags	512	4096	4096	1024
Real time clock	Yes	Yes	Yes	Yes
Binary I/O (with 16 channel units)	496	496	496	992
Integral I/O binary	12/8	20/12	12/8	-
Analogue I/O	64/32	96/96	96/96	128/64
Integral I/O analogue	-	-	4/1	-

CS 31 Equipment references

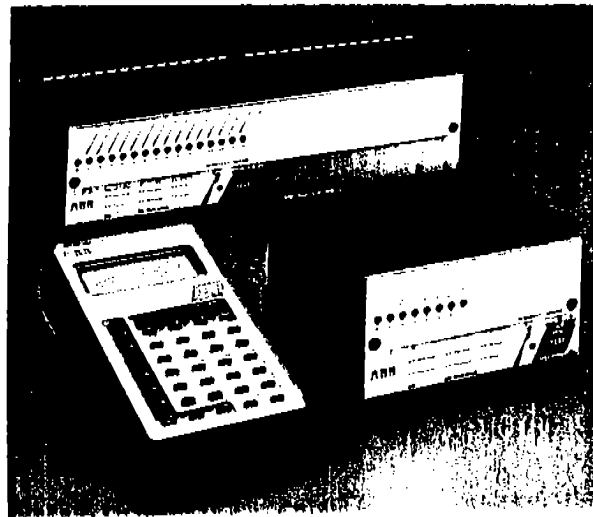


Central processing units

Type	Supply	Description
07 KR 91	21 V d.c. 230 V a.c.	7K Instructions 1 RS 485 system bus 1 RS 232 port (programmable) Real time clock 20 Inputs/12 Outputs (binary) 1 High speed counter
07 KT 92	21 V d.c.	7K Instructions 1 RS 485 system bus 2 RS 232 port (programmable) Real time clock 12 Inputs/8 Outputs (binary) 4 Inputs/1 Output (analogue) 1 High speed counter
UCZA/UCZB	24 V d.c. 230 V a.c.	8/16K Instructions 1 RS 485 system bus 1 RS 232 port (programmable) Real time clock
PCZB	21 V d.c. 230 V a.c.	2K Instructions 1 RS 485 system bus 1 RS 232 port Real time clock 12 Inputs/8 Outputs (binary) 1 High speed counter

Additional system bus unit

Type	Description
SCZ	RS 485 System bus coupler 1 Line CS31 for UCZA/UCZB



Test/Programming terminal

Type	Description
ICZ	Test and programming terminal for PCZB; UCZA/UCZB; 07 KR 91; 07 KT 92

Plug-in base

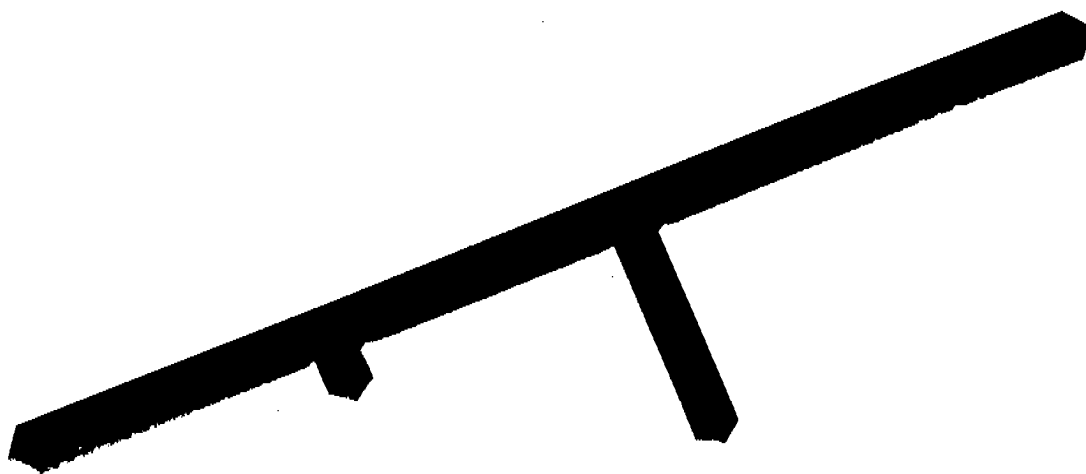
Type	Description
ICZ	Plug in din rail mounting base for I/O units and PCZB (2 plug in bases required for ICFC 16 L1)

Binary Input units

Type	Supply	Description
ICSI 08 D1	21 V d.c. 230 V a.c.	8 Inputs 24 V non isolated
ICSI 08 E1	24 V d.c. 230 V a.c.	8 Inputs 24 V opto isolated
ICSI 16 D1	24 V d.c. 230 V a.c.	16 Inputs 24 V non isolated
ICSI 16 E1	24 V d.c. 230 V a.c.	16 Inputs 24 V opto isolated

Tomorrow's system - today!

ABB Procontic CS31

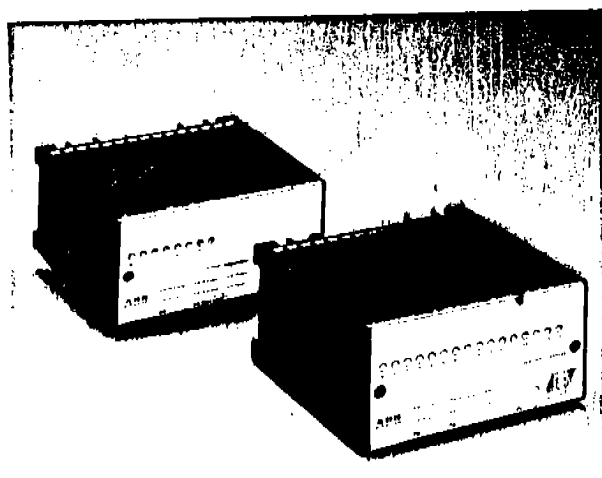


decentralized

ABB's automation team has been involved with a huge variety of different processes. Solutions tailored to your individual needs are available from the experts via the ABB local sales organizations for
Low Voltage
Apparatus

Binary Input/Output units

Type	Supply	Description
ICSC 08 L1	24 V d.c. 230 V a.c.	8 Channel user configurable 24 V d.c. Inputs 24 V d.c. 0.5A Outputs
ICTC 16 L1	24 V d.c.	16 Channel user configurable Input/Output unit 24 V d.c. Inputs 24 V d.c. 0.5A Outputs Low profile case
ICSR 20 L1	24 V d.c. 230 V a.c.	12 Inputs 24 V d.c. 8 relay Outputs 250 V a.c./2A



Binary Output units

Type	Supply	Description
ICSO 08 R1	24 V d.c. 230 V a.c.	8 Relay Outputs 250 V a.c./2A
ICSO 08 Y1	24 V d.c. 230 V a.c.	8 Transistor Outputs 24 V d.c./2A

Analogue Input units

Type	Supply	Description
ICSE 08 A6	24 V d.c. 230 V a.c.	8 Channel analogue Input unit 8 Bit resolution
ICSE 08 B5	24 V d.c. 230 V a.c.	8 Channel analogue Input unit 12 Bit resolution

Analogue Output units

Type	Supply	Description
ICSA 01 B5	24 V d.c. 230 V a.c.	8 Channel analogue Output unit 12 Bit resolution

Analogue Input/Output unit

Type	Supply	Description
ICSM 06 A6	24 V d.c. 230 V a.c.	Analogue Input/Output unit, 1 Channel Input, 2 Channel Output, 8 Bit resolution

High speed counter unit

Type	Supply	Description
ICSF 08 D1	24 V d.c. 230 V a.c.	2 High speed counter Inputs upto 50 kHz

Robot coupler card

Type	Supply	Description
ICBG 32 L7	taken from the robot	32 Channel binary Inputs/Outputs mounted in the robot rack (1 slot)
ICBG 64 L7	taken from the robot	64 Channel binary Inputs/Outputs mounted in the robot rack (2 slots)

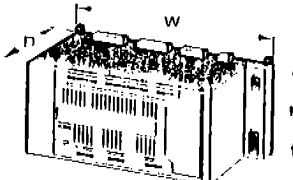
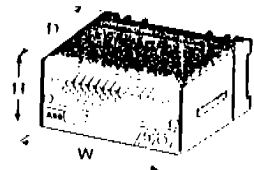
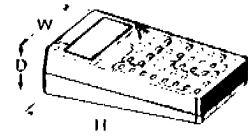
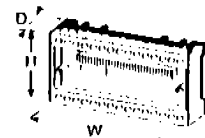
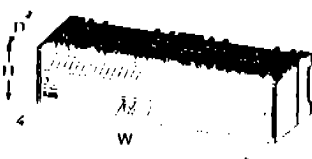
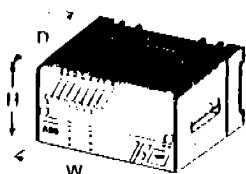
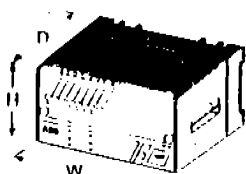
Modbus communication unit

Type	Supply	Description
NCJ	5 V d.c.	CS31 to Modbus Interface (Slave operation)

Software packages

Type	Description
PC 29	Programming software for PC/ZB
907 PC 33	Programming software for 07 KR 91/07 KF 92
907 PC 32	Programming software for UCZA/UCZB

CS 31 Equipment dimensions

Type	Short description	Dimensions in mm with unit cable terminals					
		W	x	H	x	D	
07 KR 91 07 KT 92	Central processing units						240 x 140 x 85
UCZA UCZB	Central processing units						185 x 85 x 80
SCZ NCJ	Additional system bus unit Modbus communication unit						123 x 60 x 115
PCZB	Central processing unit						82 x 155 x 34
ECZ	Base						122.5 x 60 x 30
ICFC 16 L1	Binary Input/Output unit						245 x 60 x 80
ICS	Binary or analogue units Input; Output; Input/Output						123 x 60 x 115
ICSF	High speed counter unit						123 x 60 x 115