GENERAL INSPECTION

PROGRAMME

WEEKLY

Check all hold down straps, gripes or lashings, tighten if necessary.

SIX WEEKLY

Grease all lubrication points where necessary.
Check oil level in hoist winch.
Check hydraulic oil level in power pack unit.
Check condition of falls rope for damage.
Check operation of deadman brake on winch, lift brake lever, pull on falls rope should rotate barrel.

ANNUALLY

Check clutch and brake linings on winch.
Check all rotating parts for free movement on both the davit and winch.

WIRE ROPES

Wire ropes must be inspected at least once every three months for signs of excessive wear, corrosion or other defects and must be replaced when deemed necessary by a competent inspector.

Rope lubricant should be applied regularly to ropes in quantities sufficient to produce a thin, even, adherent coating which will remain flexible and fully protective over the full range of temperatures likely to be encountered in service.

Ropes should be cleaned of foreign matter and corrosion and must be absolutely dry before lubricant is applied.

DAVIT

MAINTENANCE

GREASE POINTS - 19 OFF PER DAVIT SET (1 Winch, 2 Arms, 2 Cylinders)

See D407254 for positions.

In order to maintain the efficiency of the davit it is essential that it is lubricated and inspected regularly.

Lubrication of the davit should be carried out at approximately 6 week intervals.

A schedule of recommended lubricants is included in this booklet.

For ease of location of grease points it is advisable to encircle each point with paint of a contrasting colour.

Wire ropes must be inspected at least once every 6 weeks for signs of excessive wear, corrosion or other defects and must be replaced when deemed necessary by a competent inspector.

Rope lubricant should be applied regularly to ropes in quantities sufficient to produce a thin, even adherent coating which will remain flexible and fully protective over the full range of temperatures likely to be encountered in service.

Ropes should be cleaned of foreign matter and corrosion and must be absolutely dry before lubricant is applied.

NOTE

PAINTING

Careless painting is the most frequent source of trouble with davits.

When painting it is essential to ensure that no paint is applied to lubrication points or bearing or any moving parts in such a way as to impede their free movement.

EQUIPMENT	SHELL	ESSO	B.P.	TOTAL	CHEVRON	MOBIL	TEXACO	GULF	CASTROL	LORCO	ROCOL	ELF-ANTAR	
WINCHES GEARBOXES	OMALA 100 / MELINA 30	SPARTAN EP68	ENERGOL GR-XP 150 ✓	CARTER EP 110	GEAR COMP'D 150	GEAR 629 / SHC 629	MEROPA 150	E.P. HD 150	ALPHA ZN 150	HT 100		EPONA Z 100 OR 68	
GREASE POINTS DAVITS-WINCH ELECT/MOTORS DAVIT TRACKS	ALVANIA GREASE R2 / R3 OR EP2	BEACON 3	ENER-GREASE MM=EP2 ✓	MULTIS SPECIAL 3	DURALITH GREASE EP2	MOBILUX 2 OR EP2	MULTI FAK EP2	CROWN GREASE N°2	SPHEERO AP3	GREASE LG 23	ROCOL BG 151	MULTI SERVICE.	
WIRE ROPES	CARDIUM COMP'D OR FLUID D	SURETT FLUID N 5K	ENERGOL WRP ✓	OSYRIS TP4A	PINION GREASE MS / 250 TCB	MOBIL-TAC A	CRATER 1X	LUBCOTE N° 1	RUSTILO 553	OPEN GEAR COMP'D	ROCOL-R0105 OR WIRE ROPE SPRAY	ENGREN-AGE 1401	
ELECTRICAL OVERLOAD RELAY DASH POT	DIALA OIL B	NUTO H15	ENERGOL JS-A	ISOVOL-TINE	E.P. HYDRALIC-LIC OIL 5	D.T.E 11	TRANS-FORMER OIL	MECH-ANISM LP 15	DASHPOT OIL	TRANS FORMER OIL		TRANSFO-RMATEUR 40	
THICKENING OF DASH POT OIL IF NECSSESARY	TALPA OIL 40	NUTO H68	ENERGOL HLP68 / BARTRAN HV68	CORTIS 100	MARINE OIL R&O 65	D.T.E. 3 OR D.T.E. 18	DORO AR 30	VERITAS 30	MARINE HEAVY	HT 100		MISOLA H100	
HYDRAULIC SYSTEMS	TELLUS 37	NUTO H 32	ENERGOL HLP 32 / BARTRAN HV 32	AZOLLA VG 32	E.P. HYD 32	D.T.E 13 OR D.T.E 24 SHC 524	RANDO HD 32	MECH-ANISM LP 32	HYSPIN AWS 32	HT 32		VISG A 32	
SPRAG-CLUTCHES	ALVANIA GREASE R2/R3	BEACON 3	ENER-GREASE MM-EP2	MULTIS-SPECIAL 3	DURALITH GREASE EP2	MOBILUX 2 MOBILPLEX 47	MULTI-FAK EP2	CROWN GREASE N°2	SPHEERO AP2	GREASE LG 23	ROCOL MG	MULTI-SERVICE	
STIEBER ROLLER CLUTCHES	TELLUS 10 OR C10	NUTO H10	ENERGOL HLP-10 ENERGOL SHF-LT15	AZOLLA 10	EP HYDRAULIC 10	VELOCITE N°6 D.T.E. 21	RANDO 10 HD A-10		HYSPIN VG-10 HYSPIN AWS-10				

REV	3	89

SCHAT-DAVIT COMPANY

RECOMENDED LUBRICANTS

EQUIVALENT GRADES BY OTHER REPUTABLE MAKERS ARE EQUALLY SUITABLE

HOIST WINCH

MAINTENANCE

GENERAL ARRANGEMENT M901595
SECTIONAL ARRANGEMENTS D407251 & D407252

OIL CAPACITY 20 LITRES
GREASE POINTS 2 OFF

Check oil level and grease winch once every 6 weeks. A schedule of recommended lubricants is included in this Manual.

The cone clutch and centrifugal brakes linings should be inspected annually, if linings are worn down to within 1mm of screw/rivet heads they should be replaced.

HOLDING CLUTCH CONE

For replacement linings only Ferodo brake lining should be used.

CENTRIFUGAL BRAKE

Replacement shoes c/w linings should be obtained from manufacturer.

Both cone clutch and centrifugal brake linings must be kept free from grease and in good condition. Grease on the linings will cause slippage and a serious accident may result.

The brake unit should never be greased other than by the grease nipples provided and only then should receive a single pump of grease. Excessive greasing here is not necessary.

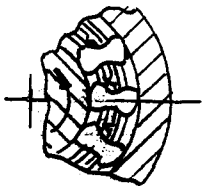
When gravity lowering, the centrifugal brake housing will heat up owing to the action of the brake shoes. As long as this is not accompanied by an increase in lowering speed this may be ignored. During tests or drills the brake housing should be allowed to cool before lowering again.

The threaded sleeve and dust seals on the 'deadman' brake lever assembly must be kept free of paint. The 'deadman' brake lever must return by its own weight to the full on - engaged - position when released.

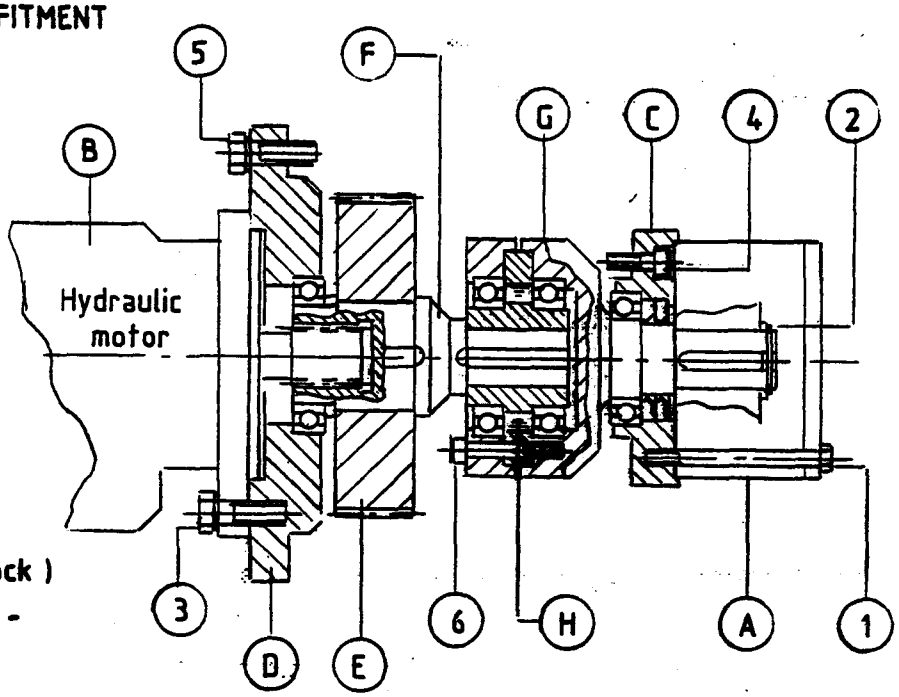
All winch gearing should be inspected regularly for any evidence of excessive wear or defect.

When inspection covers are removed a watertight seal must be ensured on reassembly.

FOR BEARING & OILSEAL FITMENT
REFER TO D407251



View on Sprag unit looking from Hyd. motor. Inner race to engage (lock) in anticlockwise direction - winch lower direction.



NOTE Before commencing work on motor shaft assembly ensure falls rope is not under load raise deadman brake lever to release tension on falls

1 Undo Hydraulic brake unit bolts (1), remove outer body of brake unit (A)
1.1 Remove circlip (2) c/w spacer, draw off brake hub.
1.2 Undo bolts (3), remove Hydraulic motor (B)
1.3 Undo capscrews (4), remove Hydraulic brake adaptor plate (C)
1.4 Undo bolts (5), remove Hydraulic motor adaptor plate (D)
1.5 Remove spur gear (E) c/w spacer, shaft (F) and Sprag unit assembly (G) from winch
1.6 Remove spur gear (E) and shaft (F) from Sprag unit assembly (G)
Note It may not be necessary to remove shaft (F) at this stage - see below
1.7 Undo capscrews (6) split Sprag unit assembly (G)
1.8 Dismantle Sprag unit (H) and examine for excessive wear or damage.
Note The inner race of the Sprag unit may still be attached to shaft (F) but need only be removed if a new Sprag unit is to be fitted.

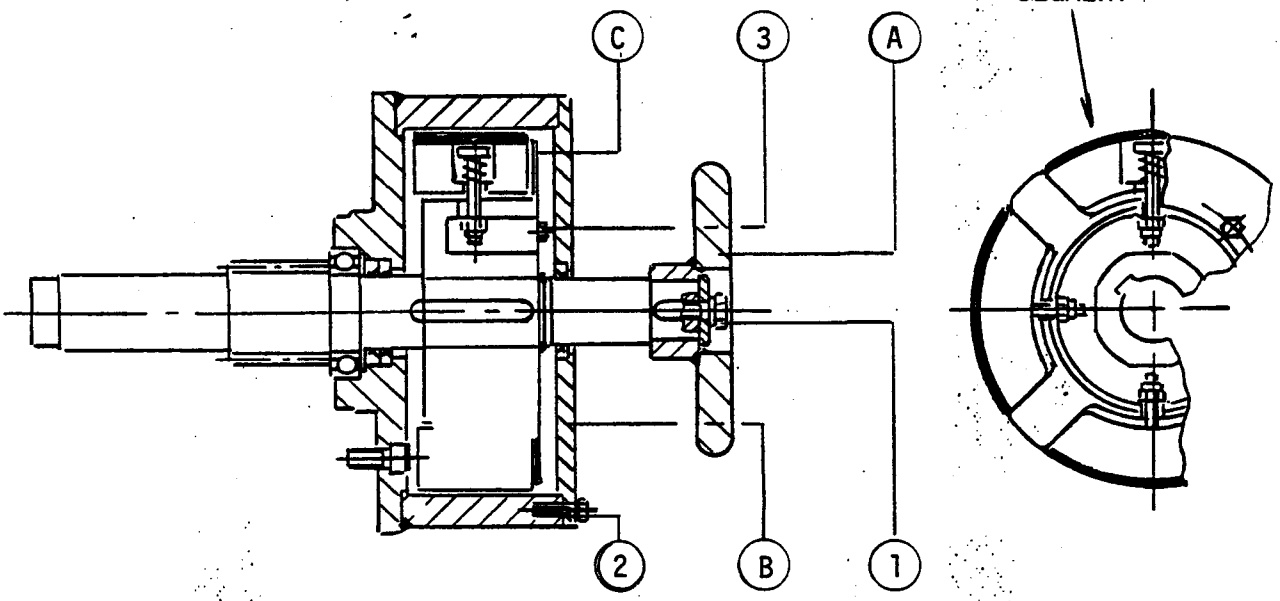
Reassembly is the reverse of the above procedure

Replace all oilseals and bearings if damaged

Ensure Sprag unit is reassembled correctly. Check rotation - rotate hoist motor shaft both directions it should be free to rotate in hoist direction and lock solid in lower direction.

SPRAG UNIT
DISMANTLING INSTRUCTIONS

FOR BEARING AND OILSEAL
FITMENT REFER TO D407251



1 Undo bolt (1), remove handwheel (A).

1.1 Undo bolt (2), remove cover (B).

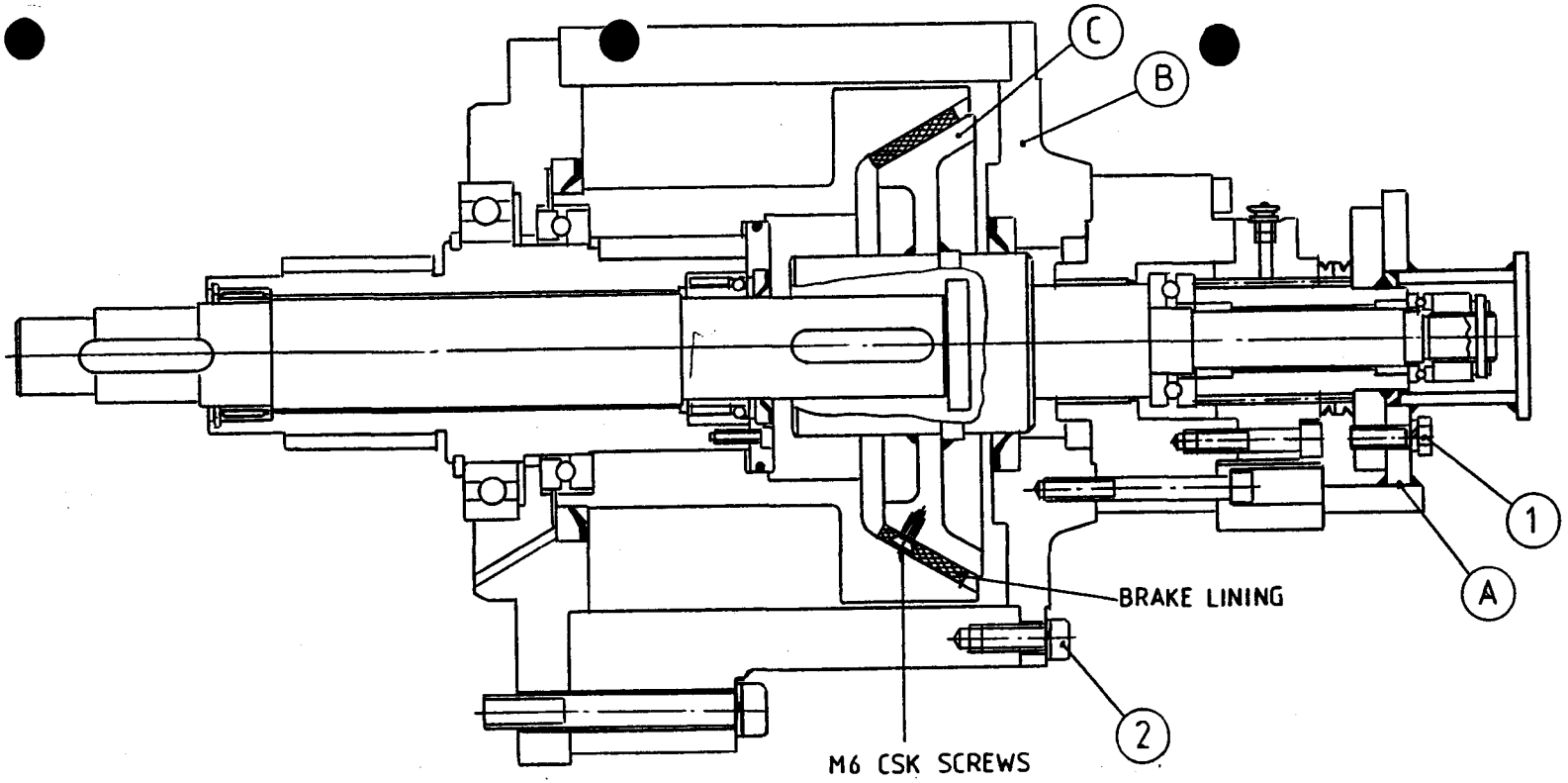
1.2 Undo bolt (3), remove cover (C).

1.3 Extract shoes (4 segments - slide out) and examine lining material. Replace if worn down to 1mm of brake shoe material.

Also refer to Broadbent Drive Sheets D1 and D2

Reassembly is the reverse of the above procedure.

CENTRIFUGAL BRAKE
DISMANTLING INSTRUCTIONS



NOTE!! BEFORE DISMANTLING BRAKE UNIT ENSURE THERE IS NO LOAD IN THE FALLS BY FULLY RAISING BRAKE LEVER

1) TO EXAMINE CONE BRAKE LINING

1.1) UNDO SCREWS (1), REMOVE BRAKE LEVER ASSEMBLY

1.2) UNDO SCREWS (2) REMOVE BRAKE COVER (B) C/W MALE CONE SHAFT

1.3) EXAMINE LINING MATERIAL FOR WEAR. REPLACE IF WORN TO WITHIN 1MM. OF CSK SCREW HEADS

REASSEMBLY IS THE REVERSE OF THE ABOVE

FOR BEARING AND OILSEAL FITMENT REFER TO D407252

	BY	DATE	SCHAT-DAVIT COMPANY
DRAWN	K.B-d	25.07.90	
CHECKED			
CONE BRAKE REMOVAL			M 901821

SECTION XI

SPARES LIST

SPARES LIST CONTENTS

DAVIT	:	1 SHEET
WINCH	:	1 SHEET
BRAKE UNIT	:	1 SHEET
HYDRAULIC EQUIPMENT	:	2 SHEETS

SCHAT-DAVIT CO. LTD.   AVAILABLE SPARES LIST

HYDRO/MECH DAVIT TYPE PHA	GRIFFON J3031A					
DESCRIPTION	DETAIL Nº	No off per Davit				
SHEAVE	M901608	8				
GREASE NIPPLE TAT TYPE M10		16				
FALLS Ø 29 12 x 6 (3 x 24)	SK 715	1 Set				

SCHAT-DAVIT CO. LTD.

AVAILABLE **SPARES LIST**

WINCH BRAKE UNIT D407252 GRIFFON J3031A

DESCRIPTION	DETAIL Nº	No off per Unit				
BALL BEARING 6021	Item 2	1				
THRUST BEARING 51120	Item 3	1				
THRUST BEARING 51306	Item 4	1				
THRUST BEARING 51105	Item 5	1				
THRUST NEEDLE BEARING NKIA 5910	Item 6	1				
NEEDLE BEARING NK 50/25	Item 7	1				
OIL SEAL 150 180 15	Item 8	1				
OIL SEAL 85 120 12	Item 9	1				
OIL SEAL 50 72 8	Item 10	1				
DUST SEAL VA 0060	Item 11	2				
CIRCLIP Ø 105 EXT	Item 12	1				
'O' RING RM 1145-30	Item 13	1				
CIRCLIP Ø 62 INT	Item 14	1				
PLAIN BEARING MB 2815 DU	Item 33	2				
INNER RING IR 45 x 50 x 35	Item 34	1				
GREASE NIPPLE TAT M10		2				

WINCH TYPE BHY 12500 GRIFFON J3031A

DESCRIPTION	DETAIL Nº	No off per Winch				
OIL SEAL 150 180 15	D407251 (1)	2				
ROLLER BEARING NJ 216	(3)	2				
BALL BEARING 6207	(5)	1				
CIRCLIP Ø 30 EXT	(8)	1				
OIL SEAL 35 52 7	(9)	2				
BALL BEARING 6008	(10)	2				
BALL BEARING 6010	(11)	3				
CLUTCH UNIT BW167C/BW13167/BW167J	(12-14)	1				
OIL SEAL 40 72 7	(18)	1				
CIRCLIP Ø 68 INT	(19)	1				
BALL BEARING 6008-2RS	(20)	1				
BALL BEARING 6012	(22)	2				
OIL SEAL 58 80 8	(23)	1				
OIL SEAL 45 60 8	(24)	1				
CIRCLIP Ø 52 EXT	(25)	1				
CENTRIFUGAL BRAKE BC35H INC SHOES WITH LININGS,	(26)	1				
SPRINGS, BOLTS, NUTS & WASHERS						
HYDRAULIC BRAKE 022.519.23.002 INC SEALS +	(7)	1				
OUTER & INNER PLATES						
TANDEM LIMIT SWITCH SIGMA 560337	(16)	1				
LIMIT SWITCH LEVER 540031	(17)	1				
CLUTCH UNIT FOR HAND RATCHET	D406911					
BW167C/BW13167/BW167J	Items (15-17)	1				

SCHAT-DAVIT CO. LTD. — AVAILABLE SPARES LIST

HYDRO/MECH DAVIT TYPE PHA GRIFFON J3031A

DESCRIPTION	DETAIL Nº	No off per Unit
HYDRAULIC SPARES	S710815A	
DIRECTIONAL CONTROL VALVE VA35	Item 16 & 17	2
MINOR REPAIR KIT COMPRISING:		
SEAL KIT		
HANDLE GAITERS		
PRV CARTRIDGE		
HYD MOTOR WM 76A	Item 4	1
MAJOR REPAIR KIT COMPRISING:		
THRUST PLATES		
SEAL KIT		
4 BEARINGS		
SHAFT BEARING		
LOAD CONTROL VALVE E2B 300 Z 150 N	Item 5	1
SEAL KIT SK3-0008		
RELIEF VALVE R2V-24-333	Item 14	1
SEAL KIT		
FAIL SAFE BRAKES 0.022.512.23.002	Item 15	1

SCHAT-DAVIT CO. LTD. AVAILABLE SPARES LIST

HYDRO/MECH DAVIT TYPE PHA GRIFFON J3031A

DESCRIPTION	DETAIL Nº	No off per Unit
HYDRAULIC POWER PACK SPARES	D407281B	
ELECTRIC MOTOR (SPARES SET) L 364 TD	Item 1	2
2 x BEARING 1 x OIL SEAL		
HYDRAULIC PUMP P330	Item 2	2
SPARES KIT		
RETURN FILTER RFP 330 F10 B1.1	Item 6	1
CHECK VALVE - SEAL KIT 31C90SV	Item 11	4
SUCTION FILTER SFE 180	Item 5	2

SECTION XII

DRAWING INDEX

DRAWING INDEX

D407254	GENERAL ARRANGEMENT
D407279B	DECK PIPING
M901595	GENERAL ARRANGEMENT HOIST WINCH MK XL
D406911	RATCHET HANDCRANK
D407251	SECTIONAL ARRANGEMENT HOIST WINCH
D407252	SECTIONAL ARRANGEMENT BRAKE UNIT
M901635	POWER PACK OUTLINE
D407281B	POWER PACK ASSEMBLY
S710815A	HYDRAULIC CIRCUIT
N1112	CONTROL VALVE ASSEMBLY & MOUNTING
M901589	CYLINDER OUTLINE
SK 715	FALLS ASSEMBLY - SEE SECTION V

SCHAT-DAVIT COMPANY LTD

USE AND MAINTENANCE INSTRUCTIONS
****

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Fax 201 938 4839
Tlx 138629

INSTRUCTION MANUAL

SCHAT REF NO J3031A
DATE OF ISSUE :

GENERAL

EQUIPMENT: HANDLING SYSTEM FOR BARGE

CUSTOMER: SUPPLY & SERVICES CANADA
ONTARIO REGION SUPPLY CENTRE
6205 KESTRAL ROAD
MISSISSAUGA
ONTARIO
CANADA
L5T 2A1

ORDER NO: XLT89-00094-(015)/A

SHIP: CCGS GRIFFON

DESIGNER: SCHAT-DAVIT CO LTD (UK) / SCHAT-DAVIT CO CANADA LTD

MANUFACTURER: SCHAT-DAVIT COMPANY LTD (UK)

CONTENTS

HANDLING EQUIPMENT FOR BARGE

SECTION :

I	SPECIFICATION
II	GENERAL DESCRIPTION
III	POWER PACK OPERATING PROCEDURE
IV	SYSTEM OPERATING PROCEDURE
V	FALLS ASSEMBLY DETAILS
VI	HOIST WINCH UNIT
VII	HYDRAULIC CIRCUIT DESCRIPTION
VIII	FAULT FINDING (HYDRAULICS)
IX	ELECTRICAL EQUIPMENT
X	INSPECTION & MAINTENANCE
XI	SPARES LIST
XII	DRAWING INDEX
XIII	LEAFLETS ETC

SECTION I

SPECIFICATION

SPECIFICATION

HANDLING SYSTEM FOR BARGE

Safe Working Load 11400 kgs

Keel Travel 3700mm max

PERFORMANCE

Luff Out/In - from stowed position to full outboard position - 10 secs.

Hoist/Lower - 0 - 18 metres/min.

The system is hydraulically operated from a dual electro-hydraulic power pack.

NOTE

In the event of one pump/motor unit malfunctioning the handling system can still be operated at half speed.

Gravity Lower - between 40-60 metres/min.

Emergency Hand Hoist - ratchet lever.

All above motions can be operated at up to combined 20^{o} list and 10^{o} trim conditions.

TEST AUTHORITY

Canadian Coast Guard Ship Safety Life Saving Equipment Regulations.

SECTION II

GENERAL DESCRIPTION

GENERAL DESCRIPTION

HANDLING SYSTEM FOR BARGE

GENERAL ARRANGEMENT D407254

The handling system is designed for handling, ie launching and retrieving, a barge up to a maximum safe working load of 10000 kgs displaced (55/45) either end.

The system comprises a davit arm (operated by hydraulic cylinder) mounted on pivot pins attached to deck foundations. The hoist/lower winch is mounted on deck. The system is supplied with a dual electro-hydraulic power pack unit and is operated via a control panel mounted adjacent to power pack.

The 'double pivot pin' type davit arm is of steel plate construction with pivot pin bosses fitted with bronze bearing bushes, its movements are controlled by hydraulic cylinder (end fitted with self-aligning spherical bearing) mounted with rod end attached to davit arm and cylinder mounted to davit stool.

All rope sheaves are mounted on bronze bush assemblies. All pivot, cylinder and sheave pins are manufactured from stainless steel.

A hoist/lower winch (hydraulically operated) is mounted on deck.

The above equipment is supplied with a dual electro-hydraulic power pack unit mounted on deck.

Davit motions are controlled by manually (hand levers) operated directional control valves sited adjacent to davit structure.

NOTE

Each davit arm is individually controlled by the hand levers. Therefore, synchronised operation of the hand levers will be required when controlling the davit.

The winch has an emergency manual back-up system, ie by handcrank and gravity lower lever.

SECTION III

POWER PACK OPERATING PROCEDURE

POWER PACK UNIT

OPERATING PROCEDURE

Power pack unit comprises :

- dual 60 HP/1760 RPM electric motor/hydraulic pump units
- delivery 69.5 IGPM
- max working pressure 2500 psi

1) Check oil level in tank and replenish if necessary.

2) Switch 'ON' electrical supply to power pack unit starter control panels from ship's electrical control panel.

3) Switch 'ON' master switches on starter control panels (sited adjacent to power pack unit) 2 off - one per electric motor/hydraulic pump unit.

4) Check supply available light - GREEN and motor stopped light - RED

5) Press start buttons and check motor running light - GREEN.
The davit is ready for use.

In an emergency power pack unit to be shut down by use of master switches on both starter control panels - master switch to 'OFF' position.

When davit duties are completed press STOP button and switch off master switches.

NOTE

Starter control panels are also fitted with remote terminals for 'ON-OFF' operations via handcrank safety switches fitted to winch.

REF DRAWINGS

M901635A	Power Pack Outline
D407281B	Power Pack Assembly
S710815A	Schematic Circuit Diagram

SECTION IV

SYSTEM OPERATING PROCEDURE

SECTION IV

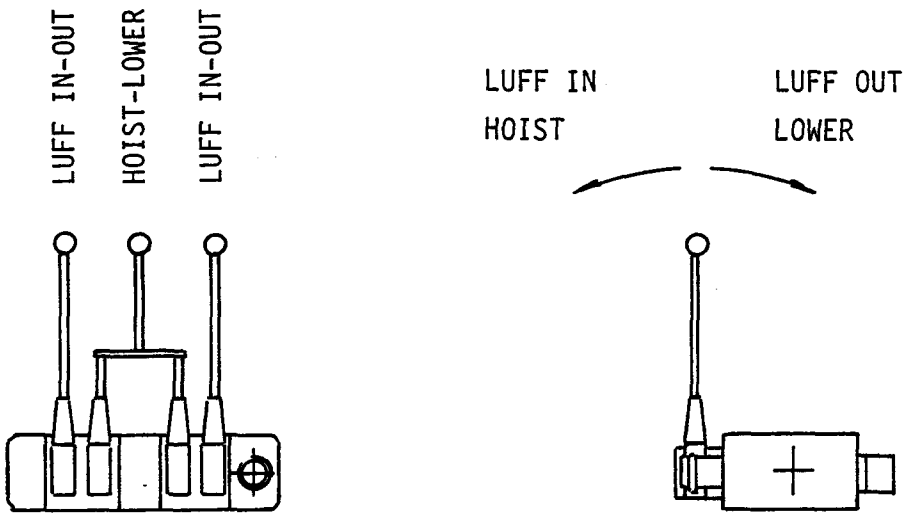
SYSTEM OPERATING PROCEDURE

OPERATING PROCEDURE

HANDLING SYSTEM FOR BARGE

Davit motions are controlled by manually (hand lever) operated directional control valves which are sited adjacent to davit structure.

Hoist/Lower - The 2 inner levers joined together
Luff In/Out - Left hand lever and right hand lever



H.C.V. BANK N1112

Directional control valve spools (hand levers) are self-centering to neutral position.

All motions are infinitely variable from creep to maximum speed.

All motions are protected against overload by relief valves incorporated in the hydraulic circuit.

Hoist winch unit is fitted with a 'fail-safe' hydraulic brake that re-engages automatically should system pressure collapse.

In the event of one of the power pack units (2 pump units) should fail/ breakdown it is still possible to operate the handling system but at reduced performance, ie half speed.

In the event of a total power pack unit failure/breakdown the winch can still be operated by manual means, ie hoisting by hand ratchet lever and lowering by gravity - controlled by centrifugal brakes.

PROCEDURES

POWER AVAILABLE

Start up power pack unit as described in Power Pack Unit Operating Procedure.

BOAT IN DECK CHOCKS

Ensure all hold down straps, gripes or lashings are removed.

LAUNCH

Hoist - ensure barge is clear of deck chocks. Do not overhoist so that the fall end enters the sheave block.

Luff Out - observe until barge is clear of deck edge.

Lower - until barge is just below deck level.

Luff In - until barge is held against ship's side. Embark crew.

Luff Out - observe until barge is clear of deck edge.

Lower - until barge is waterborne. Allow enough overrun on rope to enable crew to release hooks.

RECOVERY

It is advisable to have a light rope or nylon strop approx 4 ft long attached to rope hook to aid recovery.

Ensure enough rope to enable hook to be attached to boat.

Crew men to ensure hook is engaged correctly in boat lifting gear.

Hoist - until just below deck level.

Luff In - until boat is held against ship's side. Disembark crew and personnel.

Luff Out - observe until boat is clear of deck edge.

Hoist - until clearance is sufficient between boat and deck level to luff-in. Do not overhoist.

Luff In - until davit arm stops. Note hydraulic cylinder is protected against overload by relief valves incorporated in the hydraulic circuit.

Lower - boat into deck chocks.

Ensure all hold down straps, gripes or lashings are refitted.

Ensure power pack unit is closed down.

NOTE

In order to assist winch operator to judge correct hoisting height for luffing in and out we suggest the falls wire be banded or painted with an outstanding colour at the point where it starts to enter the sheave block with the barge at the luffing in/out height.

MANUAL WINCH OPERATION

Hoist - before fitting ratchet lever onto square drive, the limit switch lever arm must be rotated out of the way to expose the square shaft. Note this rotation of lever arm shuts off the power pack so operation of the motor is impossible whilst handcranking.

With the square shaft exposed, fit the ratchet lever and operate lever to hoist.

Lower - lift 'deadman' brake lever on hoist winch. This allows the winch to lower under the control of centrifugal brakes.

Pay-Out - to give slack falls. Lift 'deadman' brake lever on hoist winch and rotate handwheel on centrifugal brake shaft.

SECTION V

FALLS ASSEMBLY DETAILS

HYDRO/MECHANICAL DAVIT TYPE PHA

FALLS

FALLS ROPE DETAILS - Refer to drawing SK 715.

29mm dia galvanised boat fall rope 12 x 6 (3 x 24) construction, 180 kgf/mm^2 material with a minimum breaking load of 48000 kgs.

One end to be left plain wire bound, other end spliced round open thimble and secured with a swaged metal sleeve.

1 off 45 metres - SK 715 For'd Wire
1 off 33 metres - SK 715 Aft Wire

SUSPENSION SHACKLE & HOOK

For details refer to drawing SK 715 (items 1 and 2).

GRIPE (STROP) DETAILS

For details refer to shipyard.

Not davit makers supply.

SECTION VI

HOIST WINCH UNIT

HOIST WINCH UNIT

GENERAL ARRANGEMENT M901595
SECTIONAL ARRANGEMENTS D407251 & D407252

The hoist winch unit is powered by a single hydraulic fixed displacement motor.

The hydraulic motor drives the rope barrel via a spur gear train. The gearing is fully enclosed in a fabricated oil tight case and all shafts are laid up on either roller bearings, deep groove ball bearings or plain bushes. Lubrication is of the oil bath type ie gears running in oil. The inspection cover is fitted with an oil tight gasket.

Fitted to the hydraulic motor shaft are a hydraulic brake and sprag unit. The hydraulic brake is of the multiplate 'fail safe' type, ie can only be released when hydraulic pressure applied. The brake is maintenance free, plate wear being automatically compensated for by springs

POWER HOIST - sprag unit inner race freewheels in the hoist direction thus enabling the load to be hoisted without releasing the hydraulic brake.

POWER LOWER - sprag unit inner race engages (locks) with outer race thus holding the load until hoist motor and brake are hydraulically actuated.

Also incorporated in the winch are a brake unit and a centrifugal brake unit. The 'deadman' type brake unit contains a cone clutch that is held on - engaged - by a brake lever and weight.

GRAVITY LOWERING - with brake lever lifted the cone clutch is pulled off - disengaged - (hydraulic brake and motor disengaged from cone clutch) and load lowers under the influence of the centrifugal brake unit preset at required gravity lowering speed.

HANDCRANK - the hydraulic motor unit is also fitted with a handcrank point ie square cut on outer end of motor shaft, that enables load to be hoisted by hand via a ratchet hand lever. During this operation the sprag unit inner race freewheels in the hoist direction. Should motion be stopped the load is held by hydraulic brake and motor.

HAND PAY-OFF - light falls can be payed-off barrel by lifting 'deadman' brake lever and rotating handwheel fitted to centrifugal brake unit.

NOTE

Power hoist/lower and handcrank motions can only be achieved when the cone clutch is in the engaged position.

SECTION VII

HYDRAULIC CIRCUIT DESCRIPTION

HYDRAULIC CIRCUIT

DESCRIPTION

SCHEMATIC CIRCUIT S710815A
GENERAL ARRANGEMENT HOIST WINCH M901595

NOTE : See Schematic Circuit for all item number referred to below.

Dual power pack unit comprises 2 double pumps driven by electric motors (60 HP @ 1760 rpm) which deliver a total of 69.5 IGPM to the davit set of 2 arms and a winch.

All motions are controlled by a manually (hand lever) operated directional control valve (items 16 & 17) which is mounted in a control panel sited adjacent to davit structure.

NOTE

Each arm and the winch have independent controls. Therefore, synchronised movements of the levers will be required to achieve smooth and coordinated actions of davit and winches.

Hand lever movement causes the spool in the directional control valve to shift and direct flow to the appropriate port.

Directional control valve spools (hand levers) are self-centering to neutral position.

All motions are infinitely variable from creep to maximum speed.

A relief valve is incorporated in the directional control valve to protect the hydraulic system against overloads ie surge pressure - shock loads, should system pressure exceed relief valve setting flow is dumped to tank.

In the event of a failure/breakdown of one of the motor/pump units the handling system can still be operated but at reduced performance ie half speed.

WITH POWER PACK RUNNING

DIRECTIONAL CONTROL VALVE 'NEUTRAL' POSITION

Flow from pumps is through directional control valve (items 16 & 17) and back to tank.

NOTE

All work ports A and B open to tank.

HOIST

Flow from port 'A' is directed through relief valve (item 14) in manifold block (item 23), through free flow sections of load control valve (item 5) to hydraulic motor (item 4), with pressure on motor load is hoisted. Discharge from motor returns to tank via directional control valve.

NOTE

Winch is fitted with a 'fail safe' hydraulic brake (item 15) and sprag unit both mounted on the motor shaft, which enables the load to be hoisted even though the brake is engaged (sprag unit inner race freewheels in hoist direction). When load is stopped any reverse rotation engages (locks) sprag unit inner race with outer race and load is held by brake and motor.

Relief valve (item 14) is fitted to protect the motor against overload ie surge pressure - shock loads.

LOWER

Flow from port 'B' is directed through manifold block (item 22) to hydraulic motor, pressure on motor, simultaneously disengages hydraulic brake (item 15) and pilot opens load control valve (item 5) and motor lowers load. Discharge from motor returns to tank via directional control valve.

NOTE

Load control valve operation - The valve is set above maximum load induced pressure. Load pressure will not open valve until pilot pressure is applied. If the load tries to run ahead of supply flow pilot pressure will fall and valve will throttle or close to prevent runaway. When flow is reversed it passes through free flow section of valve.

If system pressure collapses ie hand lever 'neutral' position selected, load control valve will close and brake will automatically engage.

Should brake failure occur, the load control valve will sustain the load by hydraulic lock.

LUFF IN (2 Cylinders - 1 Per Arm)

Flow from port 'A' is directed to manifold block (item 24 or 25) through free flow section of overcentre valve (items 6 or 8) to annulus side of cylinder. Pressure on annulus pilot opens overcentre valve (items 7 or 9) and cylinder luffs in.

NOTE

Overcentre valve operation is the same as load control valve operation referred to above.

LUFF OUT

Flow from port 'B' is directed to manifold block (item 24 or 25) through free flow section of overcentre valve (item 7 or 9) to full bore side of cylinder. Pressure on full bore pilot opens overcentre valve (item 6 or 8) and cylinder luff out.

NOTE

Should system pressure collapse the overcentre valves (items 6, 7, 8 and 9) will sustain cylinder loads.

SECTION VIII

FAULT FINDING (HYDRAULICS)

TO BE READ IN CONJUNCTION WITH SCHEMATIC CIRCUIT S710815A

TROUBLE	POSSIBLE CAUSE	REMEDY
POWER PACK WILL NOT START	SHIP'S SUPPLY NOT 'ON'	SWITCH 'ON'
	STARTER OVERLOADS TRIPPED	RESET
	ELECTRICAL HOIST HANDCRANK PROTECTION SWITCH TRIPPED OR STICKING	REMOVE HANDCRANK UNIT
		REMOVE SWITCH DISASSEMBLE AND CLEAN
NOISY PUMP	PUMP SUCKING AIR	TEST BY POURING OIL ON PUMP INTAKE JOINTS WHILE LISTENING FOR CHANGE IN SOUND OF OPERATION. TIGHTEN AS REQUIRED
	TANK OIL LEVEL BELOW MINIMUM	REPLENISH TANK USING CORRECT GRADE OF HYDRAULIC OIL
	RESTRICTED SUCTION LINE	REPLACE SUCTION FILTERS IN TANK. CHECK INTAKE PIPING FOR OBSTRUCTIONS
	WORN PUMP	REMOVE, DISASSEMBLE AND CHECK FOR WEAR. REPLACE WORN PARTS.
	EXCESSIVE PRESSURE	CHECK RELIEF VALVE SETTINGS. CHECK LINES FOR OBSTRUCTIONS.

TROUBLE SHOOTING CHART 1

TO BE READ IN CONJUNCTION WITH SCHEMATIC CIRCUIT S710815A

TROUBLE	POSSIBLE CAUSE	REMEDY
PUMP NOT DELIVERING OIL	PUMP/MOTOR SHAFTS DISENGAGED	REMOVE ELECTRICAL MOTOR. CHECK FLEXIBLE COUPLING.
	PUMP SHAFT SHEARED DUE TO ROTOR SEIZURE	DISASSEMBLE AND REPAIR
PUMP NOT DELIVERING PRESSURE	RELIEF VALVE SETTING NOT HIGH ENOUGH	SCREW DOWN RELIEF VALVE ADJUSTING SCREW
	WORN PUMP	CHECK AS ABOVE - NOISY PUMP
RELIEF VALVES CHATTERING	AIR BEING DRAWN INTO SYSTEM AT PUMP INTAKE	CHECK AS ABOVE - NOISY PUMP
DAVIT WILL NOT HOIST OR LOWER	PUMP NOT DELIVERING OIL	CHECK AS ABOVE
	PUMP NOT DELIVERING PRESSURE	CHECK AS ABOVE
	CONE CLUTCH (BRAKE UNIT ON WINCH) DISENGAGED	ENSURE 'DEADMAN' BRAKE LEVER ON WINCH IS IN FULLY 'ON' POSITION
DAVIT WILL LOWER BUT NOT HOIST	CONE CLUTCH (BRAKE UNIT ON WINCH) NOT FULLY ENGAGED	ENSURE 'DEADMAN' BRAKE LEVER ON WINCH IS IN FULLY 'ON' POSITION
	UNLOADING RELIEF VALVE (14) VENTING	REMOVE, DISASSEMBLE AND CLEAN

TROUBLE SHOOTING CHART 2

TO BE READ IN CONJUNCTION WITH SCHEMATIC CIRCUIT S710815A

TROUBLE	POSSIBLE CAUSE	REMEDY
DAVIT WILL HOIST BUT NOT LOWER	WINCH HYD BRAKE (15) ENGAGED	ENSURE PRESSURE TO BRAKE
		REMOVE BRAKE, DISASSEMBLE AND CLEAN
	LOAD CONTROL VALVE (5) STICKING	REMOVE, DISASSEMBLE AND CLEAN
LOAD LOWERS WITH DEADMAN BRAKE 'ON'	SPRAG UNIT FAILURE IN WINCH	REMOVE AND REPLACE
CYLINDER WILL NOT LUFF IN	LOW PRESSURE	CHECK RELIEF VALVE IN DIRECTIONAL CONTROL VALVE (16 & 17). CHECK PUMP PRESSURE.
	OVERCENTRE VALVE (6 OR 8) ON CYLINDER PILOT BLOCKED	REMOVE, DISASSEMBLE AND CLEAN
	CYLINDER SEALS WORN OR DAMAGED	REMOVE, DISASSEMBLE AND FIT NEW SEALS
CYLINDER WILL NOT LUFF OUT	LOW PRESSURE	CHECK AS ABOVE - LUFF IN
	OVERCENTRE VALVE (7 OR 9) ON CYLINDER PILOT BLOCKED	REMOVE, DISASSEMBLE AND CLEAN
	CYLINDER SEALS WORN OR DAMAGED	PROCEED AS ABOVE - LUFF IN

TROUBLE SHOOTING CHART 3

SECTION IX

ELECTRICAL EQUIPMENT

SCHAT DAVIT COMPANY LTD

POWER PACK EQUIPMENT

(GRIFFON)

1) FIXED ELECTRIC MOTOR

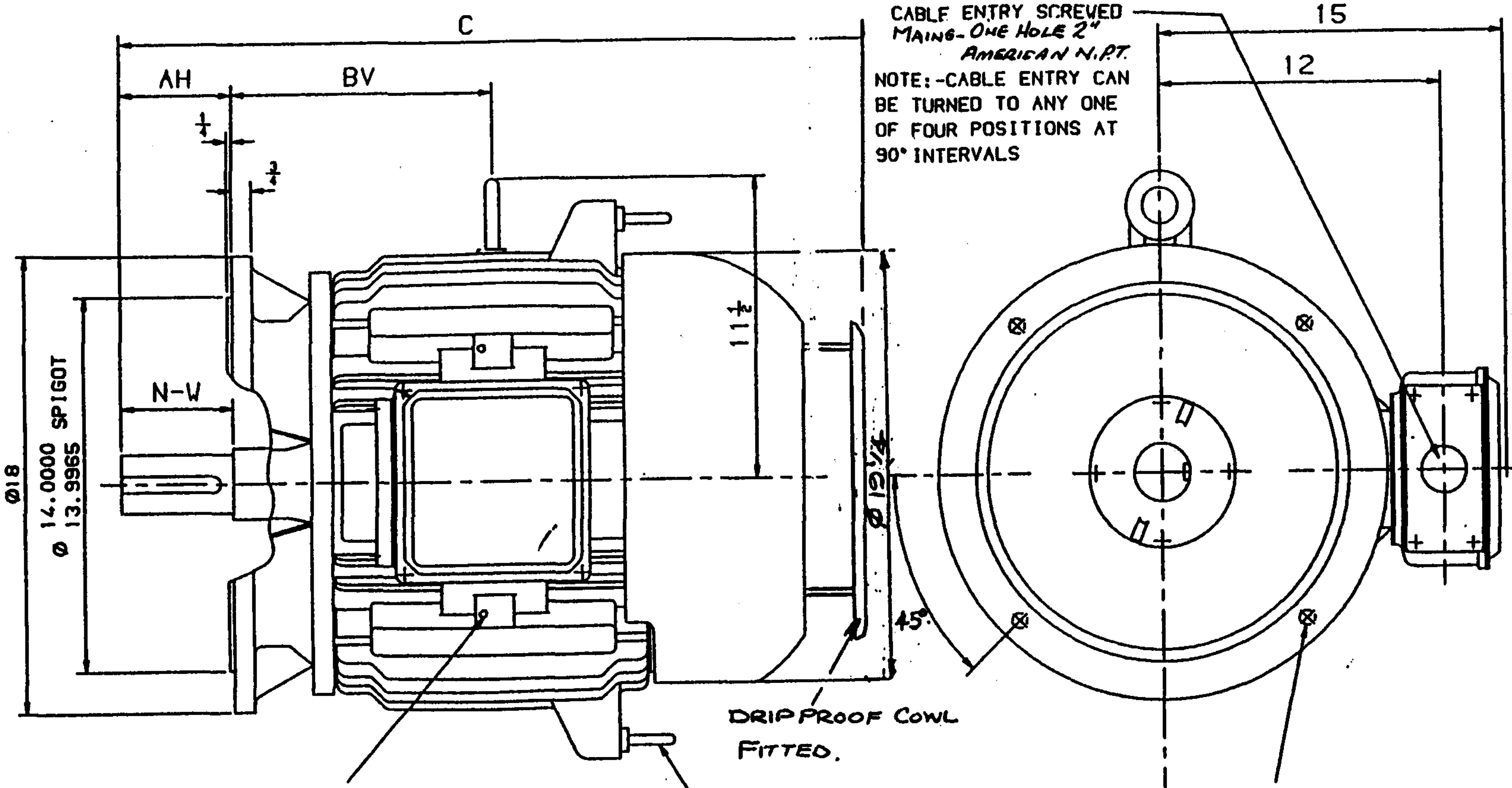
MAKERS	:	BROOK CROMPTON
FRAME SIZE	:	L 364 TD
VOLTAGE	:	460
PHASE/CYCLE	:	3/60
HP/RPM	:	60/1775
ENCLOSURE	:	IP56
WINDING	:	HT/LC SQUIRREL CAGE

2) STARTER

MAKERS	:	ACME ELECTRICAL MFG CO LTD
TYPE	:	DWT IP56 - STAR DELTA
VOLTAGE	:	460/3/60
PUSHBUTTON	:	INTEGRAL WITH STARTER BOX - STOP START

3) LIMIT SWITCHES

		HOIST	C/H PROTECTION
MAKERS	:	N/A	SIGMA
TYPE	:	N/A	560337 - TANDEM
LEVER	:	N/A	540031



DRIP PROOF COWL FITTED.

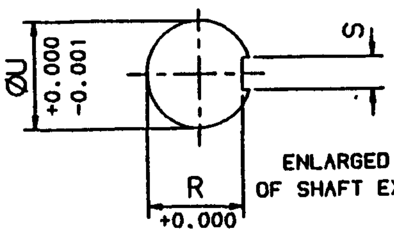
M10 EXTERNAL EARTH POSITION

2 EYEBOLTS SHOWN FITTED ON VERTICAL MACHINES ONLY.

4 HOLES Ø11/16 EQUALLY SPACED ON 16 PCD.

CUSTOMER	Schat-Da[illegible] Company		
ORDER No.	13943/3[illegible]1A.		
SERIAL No.	T904D.		
FRAME SIZE	L364TD.		
HP	60	RPM.	1775
Hz	60	PHASE	3
VOLTS	460/60Hz	POLES	4.
BRGS.	6215 C3 DE.	6215C3	NDE.
MOTOR NETT. WT.	318		Kg.
REMARKS			

FRAME	POLE	C	U	R	S	BV	N-W	AH
L364TSD	2	30	1 7/8	1.591	1/2	11 1/2	3 3/4	3 3/4
L364TD	4 UP	34 1/4	2 3/8	2.021	5/8	11 1/2	5 7/8	5 7/8
L365TSD	2	31	1 7/8	1.591	1/2	12	3 3/4	3 3/4
L365TD	4 UP	33 1/8	2 3/8	2.021	5/8	12	5 7/8	5 7/8



ENLARGED DETAIL OF SHAFT EXTENSION.

THIRD ANGLE PROJECTION, ALL DIMENSIONS IN INCHES

HAWKER SIDDELEY

Brook Crompton

CROMPTON PARKINSON LTD., GUISELEY, LEEDS.

NOTE:
1/32" ENDPLAY WILL BE PROVIDED FOR ENDTHRUST PROTECTION WHEN CUSTOMERS NOTIFY US OF THEIR INTENTION TO USE RIGID COUPLINGS AND DRIVEN MACHINES HOUT ENDPLAY.

OUTLINE DIMENSIONS OF STANDARD FLANGE MOUNTED INCH A.C. MOTOR TO NEMA STD. MG-1. TOTALLY ENCLOSED FAN COOLED. ALL POLES I MES L364TD/TSD, L365TD/TSD.

SCALE	NTS	DATE
DRAWN	J.M.L.	22/8/88
CHECKED	C.B	22/8/88
APPROVED	D.J.B.	22/8/88

DRG. No. M7506 ACTD

REVISION: "A" D/ 22.9

1	2	3	4	5	6	7	8	9	10	11

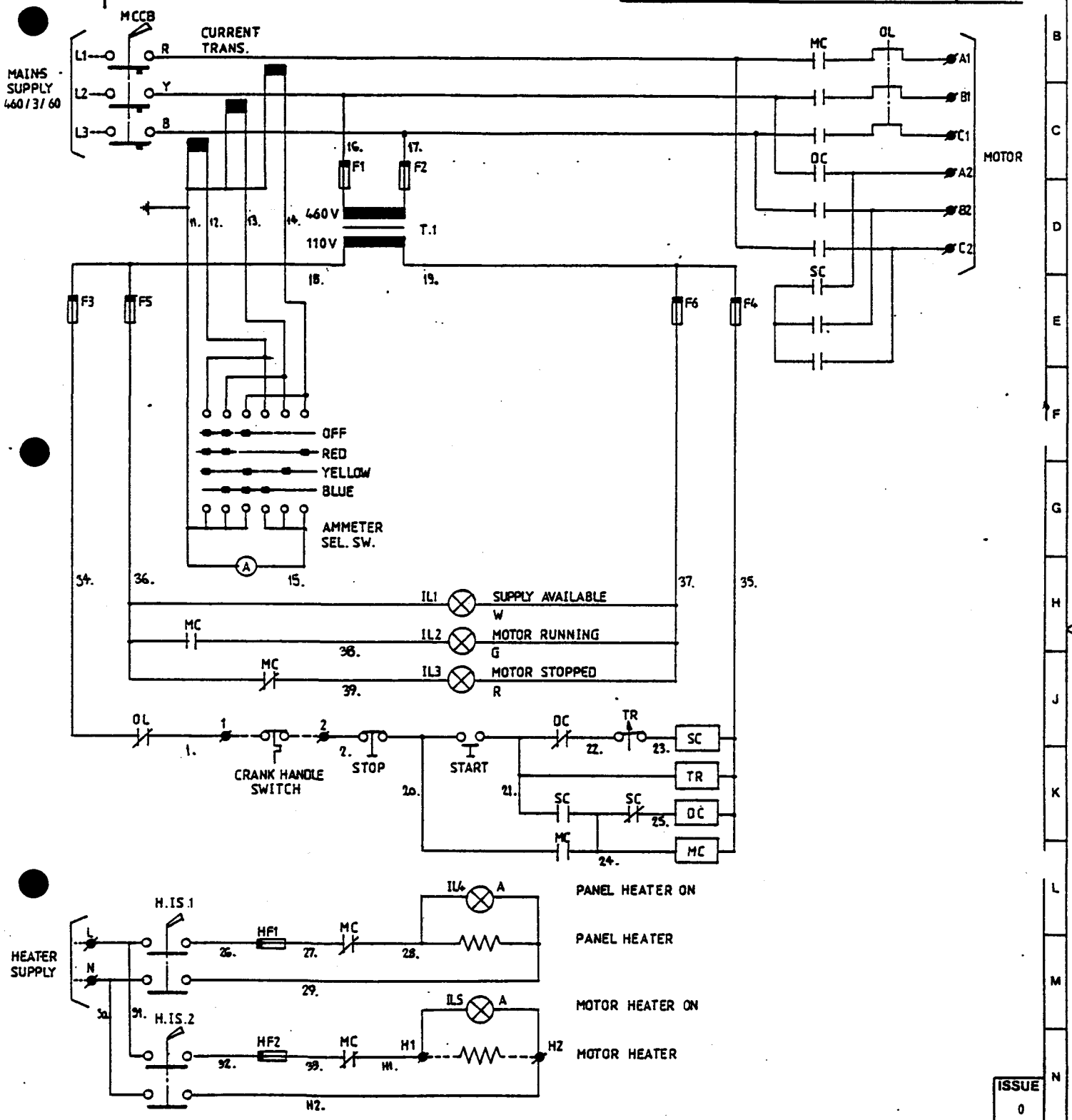
SECURITY CLASSIFICATION

3rd. ANGLE PROJECTION

APPLICABLE TO: METRIC / IMPERIAL

REFERENCE

NO.	TITLE	DRG. NO.



ISSUE 0

CHANGE	ISSUE	DATE	DR'N / CHD.

ORDER NO. SCHAT DAVIT 13956 / 3031A

REF NO.	DR.	BIN.	SEC.
SA9424	3A	19	2

CERT'D | CLASS

CHD.

DRAWN 27.3.90

DIMENSIONS | SCALE

CONTRACTOR: THE ACME ELECTRICAL MFG. Co.(Tottenham) LTD LONDON N.17.

M.O.D.(N)

TITLE: W.O. OF STAR DELTA STARTER WITH AMMETER SEL. SW.

PUNCH CARD TITLE

SECURITY CLASSIFICATION

CONTRACTOR'S DRG. NO. SK11102 — SHT 1 OF

SERVICE DRAWING NO. — SHT OF

A3

1	2	3	4	5	6	7	8	9	10	11

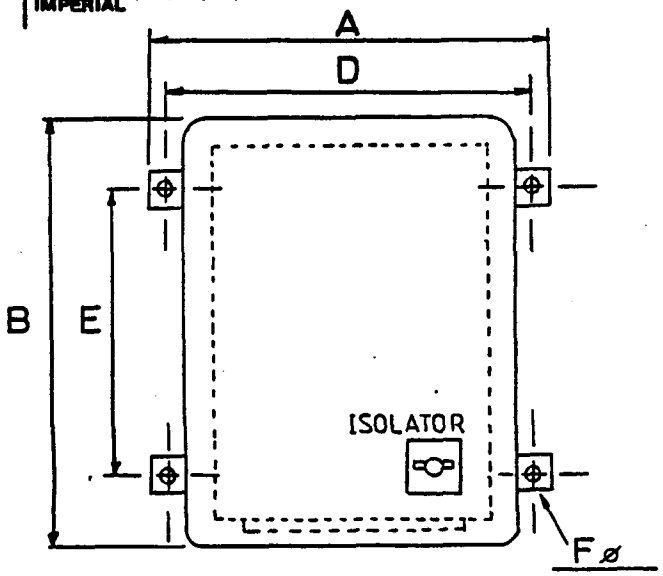
SECURITY CLASSIFICATION

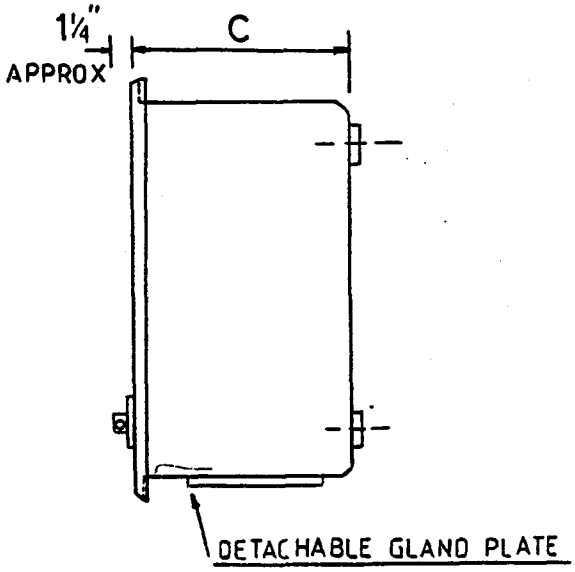
3rd. ANGLE PROJECTION

APPLICABLE TO ● METRIC / IMPERIAL

REFERENCE

NO.	TITLE	DRG. NO.





FRAME	HP	VOLTS	PH	Hz	A	B	C	D	E	F	BOX ref no
61					21½" 546mm	50¼" 1276mm		10⅛" 257mm	36" 915mm	7/16" 11mm	3179/61
62											3179/62
63	60	460	3	60	25½ 648mm	40¼ 1022mm		24 610mm	28 711mm	7/16 11mm	3179/63
64											3179/64
65											3179/65
66											3179/66
67											3179/67
68											3179/68
69											3179/69
70											3179/70
71											3179/71
72											3179/72
73											3179/73
74											3179/74
75											3179/75

ISSUE 1

CHANGE	ISSUE	DATE	DR'N / CHD.

ORDER NO.

REF NO.	DR.	BIN.	SEC.
	1	1	6

CERT'D | CLASS

CHD.

DRAWN D.O'M 1.5.87

DIMENSIONS

SCALE

CONTRACTOR: THE ACME ELECTRICAL MFG. Co.(Tottenham) LTD LONDON N.17.

M.O.D.(N)

TITLE DIMENSIONS OF TOTALLY ENCLOSED WATER CONTROL PANEL

PUNCH CARD TITLE

SECURITY CLASSIFICATION

CONTRACTOR'S DRG. NO. SK 9595

SHT 5 OF 6

SERVICE DRAWING NO.

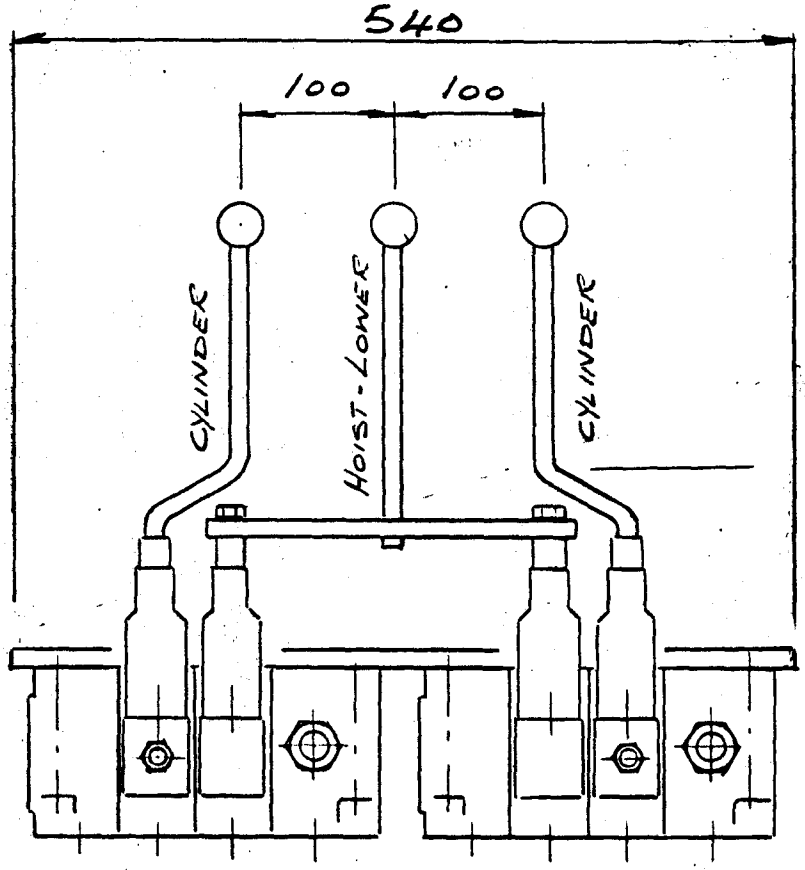
SHT OF

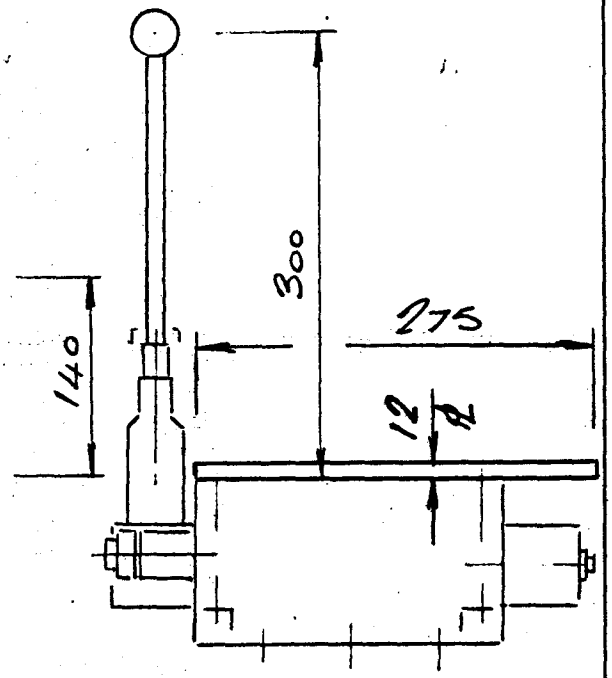
A3

SECTION X

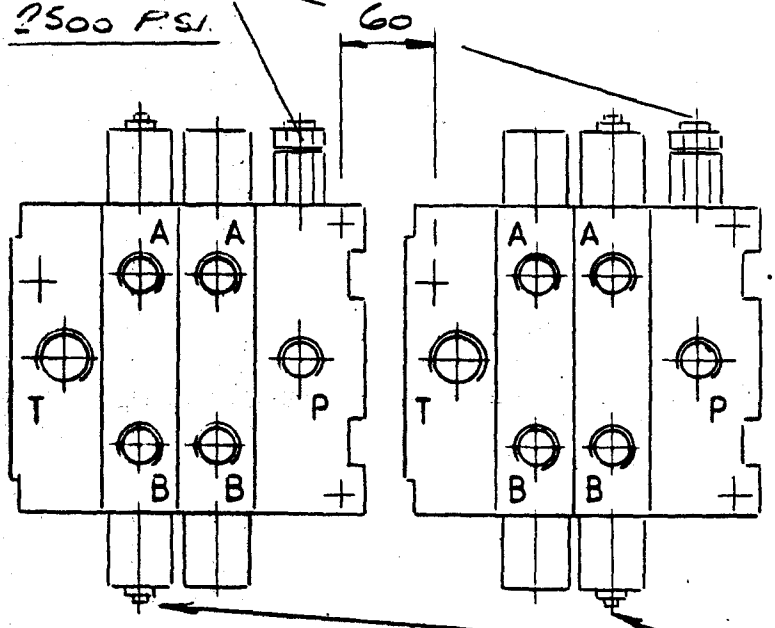
INSPECTION & MAINTENANCE

NOTE
DAVIT MANU. TO SUPPLY VALVE BANK BOLTED TO PLATE





R/V SET
2500 P.S.I.



FIT ADJUSTABLE SPOOL STOPPERS

2 OFF - COMMERCIAL H.C.V.
VA 35 AA080 MA8
MA8 Z090

PORTS P, A & B
1 5/16"-12 UNF SAE STRAIGHT THREAD

PORT T
1 5/8"-12 UNF SAE STRAIGHT THREAD

ALL PORTS ON TOP OF VALVE

	BY	DATE
DRAWN	AT	07039o
CHECKED	CF	"

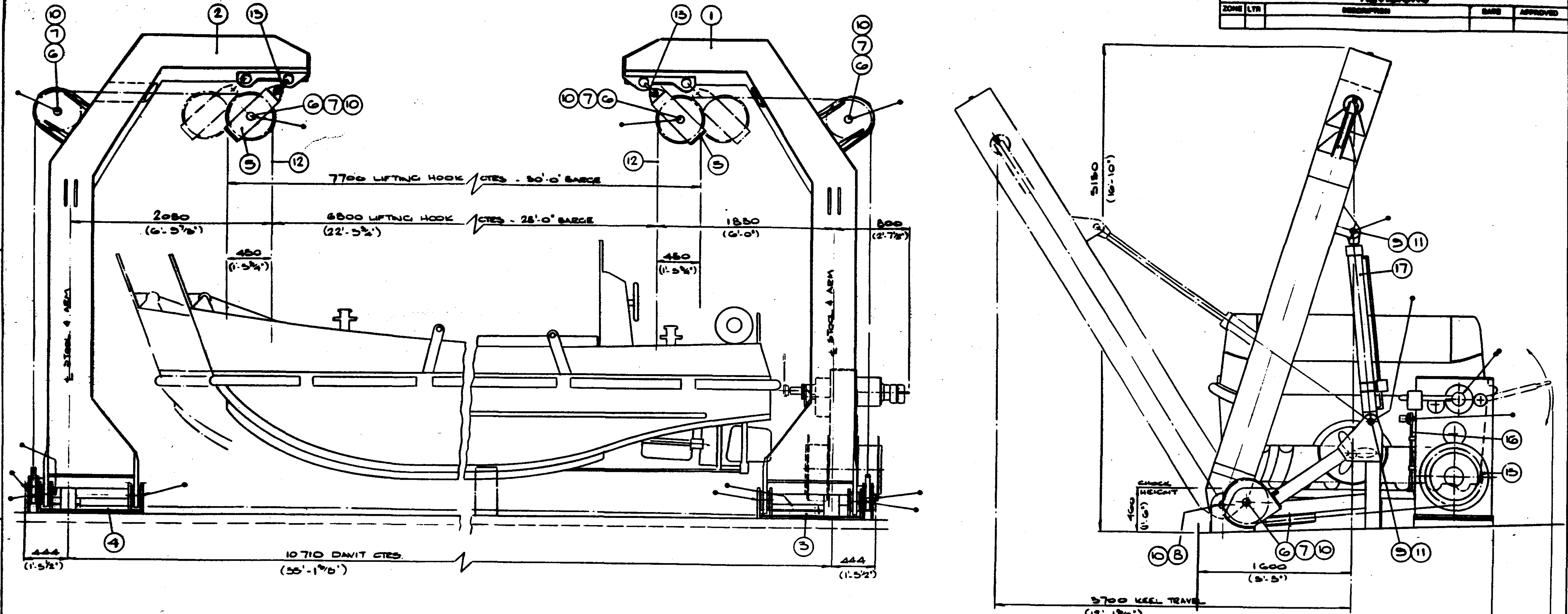
SCHAT-DAVIT COMPANY

H.C.V. BANK
VH35

N 1112

SCALE 1:5

ZONE	LTR	DESCRIPTION	DATE	APPROVED



LUBRICATION DETAILS

LUBRICATION POINTS INDICATED THUS ●———

ALL POINTS TO BE GREASED AT LEAST ONCE EVERY SIX WEEKS

Nº OFF PER DAVIT

SHEAVES - 8

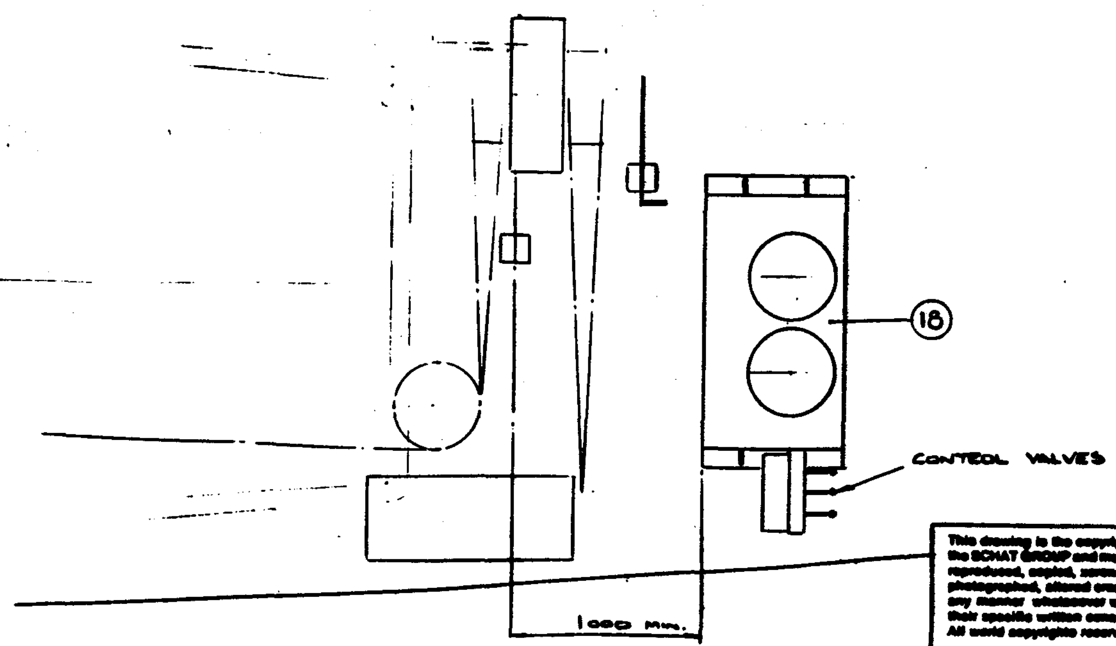
PIVOT PIN 4

RAM PIN 4

WINCH BRAKE 2

RATCHET LEVER 1

WINCH GEARCASE TO BE MAINTAINED AT CORRECT LEVEL WITH NON-FREEZING OIL



SEE D407255 FOR FOUNDATIONS

ITEM Nº	DESCRIPTION	DRAWING OR PART Nº	Nº OFF PER SET OF DAVITS	REMARKS	REF DWG
18	POWER PACK	M501638	1		
17	HYDRAULIC CYLINDER	M501585	2		
16	RATCHET CRANK	D406811	1		
15	WINCH	M501595	1		
14					
13	BOW SHACKLE - 1" SIZE	G-2130	2	CROSBY.	
12	FALLS ASSEMBLY	SK 715	2		
11	LOCK PLATE - TYPE 'C'	12-A-106	8		
10	" " " 'D'	12-A-106	12		
9	CYLINDER PIN	M501605	4		
8	PIVOT PIN	M501606	4		
7	SHEAVE PIN	M501607	8		
6	SHEAVE	M501608	8		
5	HANGING BLOCK	M501604	2		
4	FOR'D STOOL	D407259	1		
3	AFT STOOL	D407258	1		
2	FOR'D ARM	D407257	1		
1	AFT ARM	D407256	1		

PARTS LIST

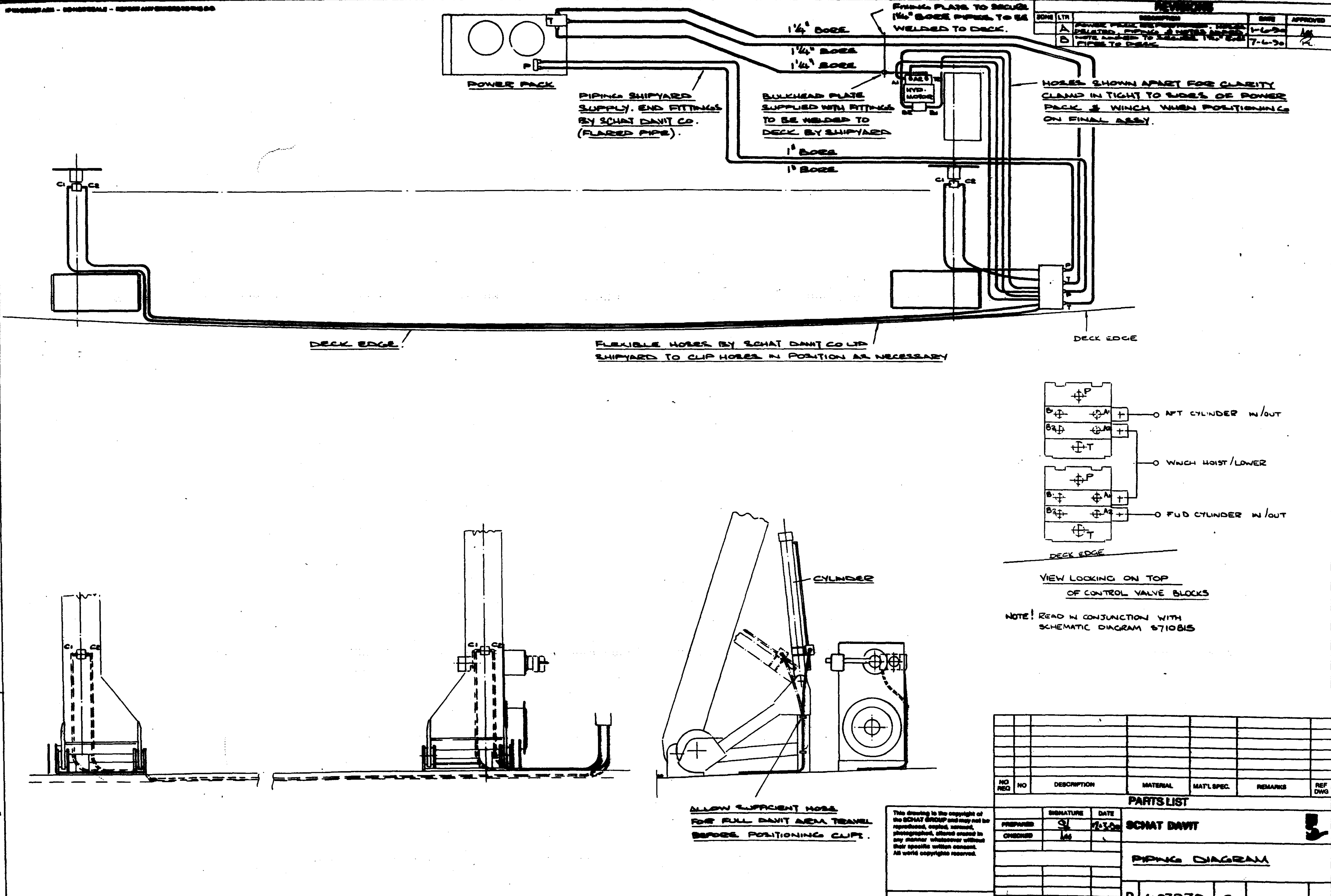
	SIGNATURE	DATE
PREPARED	[illegible]	[illegible]
CHECKED	[illegible]	

SCHAT-DAVIT CO. LTD.

GENERAL ARRANGEMENT OF HYDRO-MECHANICAL DAVITS TYPE PHA & WINCH TYPE SW 11.5 PL

D 407254 ISSUE

SCALE 1:30



REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	[illegible] DELETED, PIPING & NOTES ADDED.	1-6-90	[illegible]
	B	NOTE ADDED TO [illegible] PIPES TO DECK	7-6-90	[illegible]

NO REQ	NO	DESCRIPTION	MATERIAL	MAT'L SPEC.	REMARKS	REF DWG

PARTS LIST

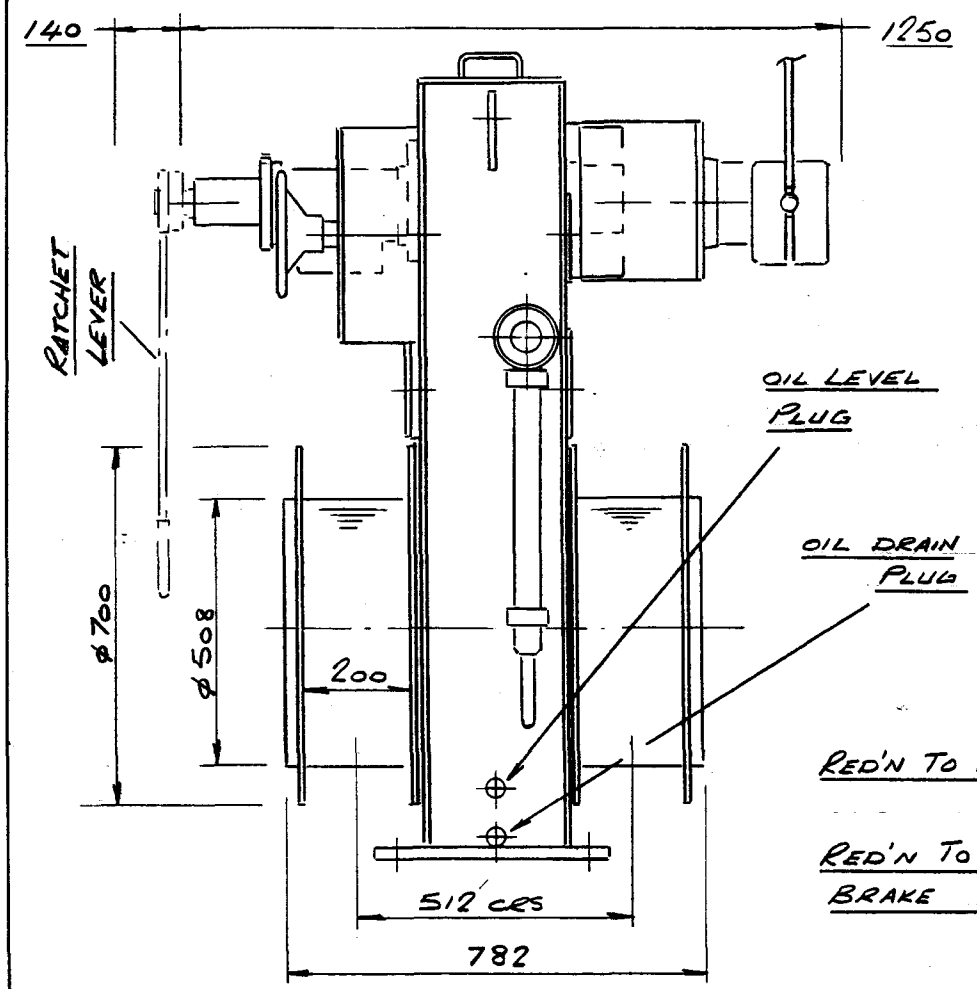
	SIGNATURE	DATE
PREPARED	[illegible]	[illegible]
CHECKED	[illegible]	

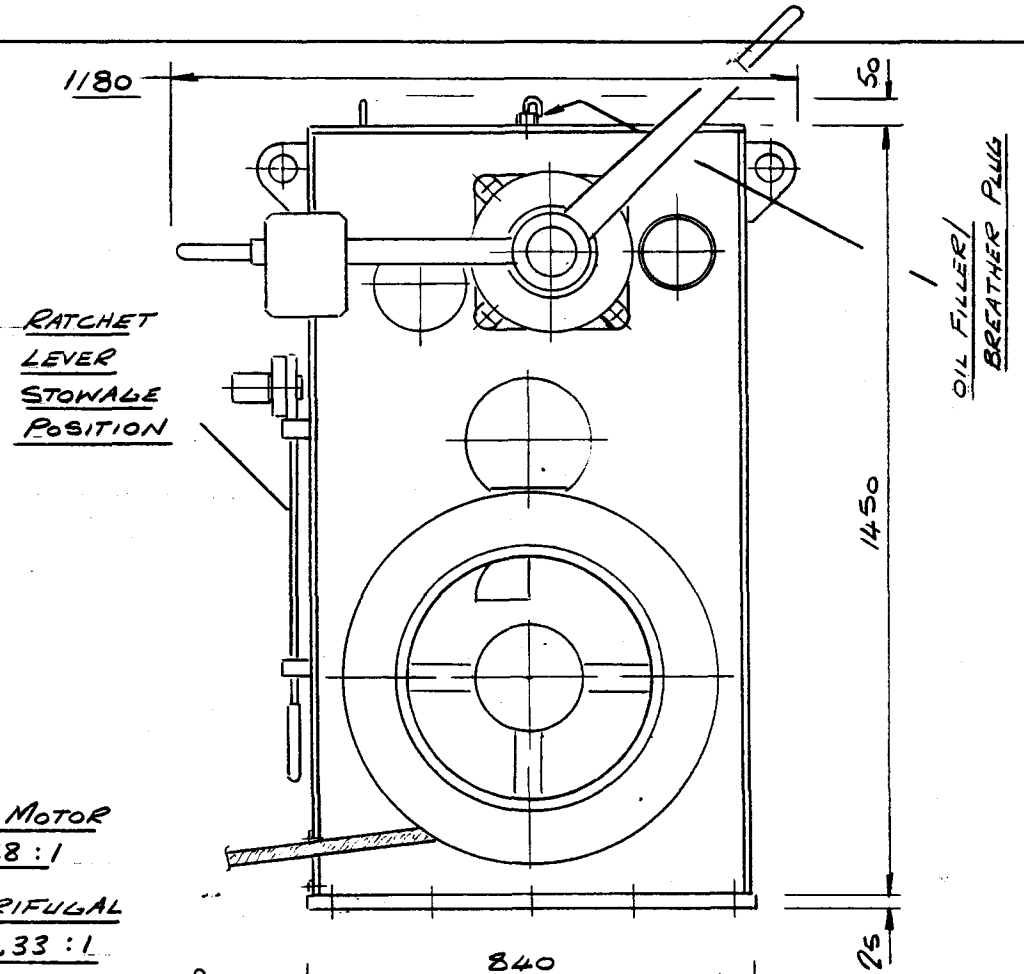
SCHAT DAVIT

PIPING DIAGRAM

D	407275	B

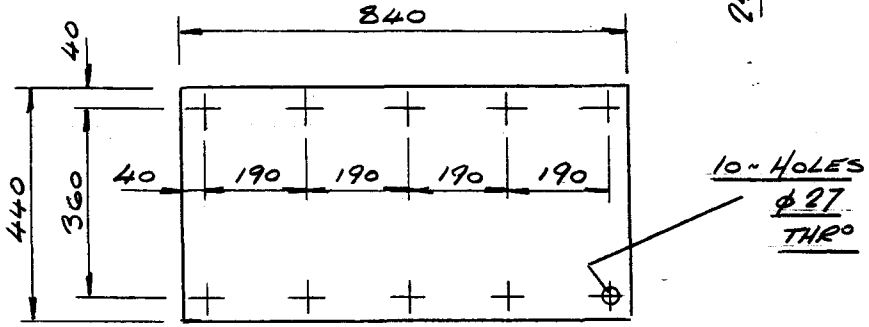
SCALE





RED'N TO HOIST MOTOR = 158 : 1

RED'N TO CENTRIFUGAL BRAKE = 44.33 : 1



ITEM	DR'G Nº	DESCRIPTION	REMARKS
10	M 901617	ADDITIONS TO GEARCASE	AS SHOWN
9	M. 96854	OIL FILLER/BREATHER PLUG	1 OFF
8	N. 1099	RATCHET LEVER MOUNTING	AS SHOWN
7	D. 406911	RATCHET LEVER	1 OFF TYPE 'X'
6	S. 710591	BRAKE LEVER -	1 OFF - AS SHOWN
5	N. 1098	GEARCASE COVER	1 OFF
4	D. 407253	GEARCASE	AS SHOWN
3	N. 1097	BRAKE & SPRAG UNIT MOUNTING	
2	D. 407252	CONE BRAKE UNIT - MK XL	
1	D. 407251	SECTIONAL ARRANGEMENT	

OIL CAPACITY - 20 LITRES APPROX

SCALE 1:10

	BY	DATE
DRAWN	AT	08.02.90
CHECKED	RJ	15.02.90

SCHAT-DAVIT COMPANY

GEN. ARR'GT WINCH - BHY 12500 MK XL

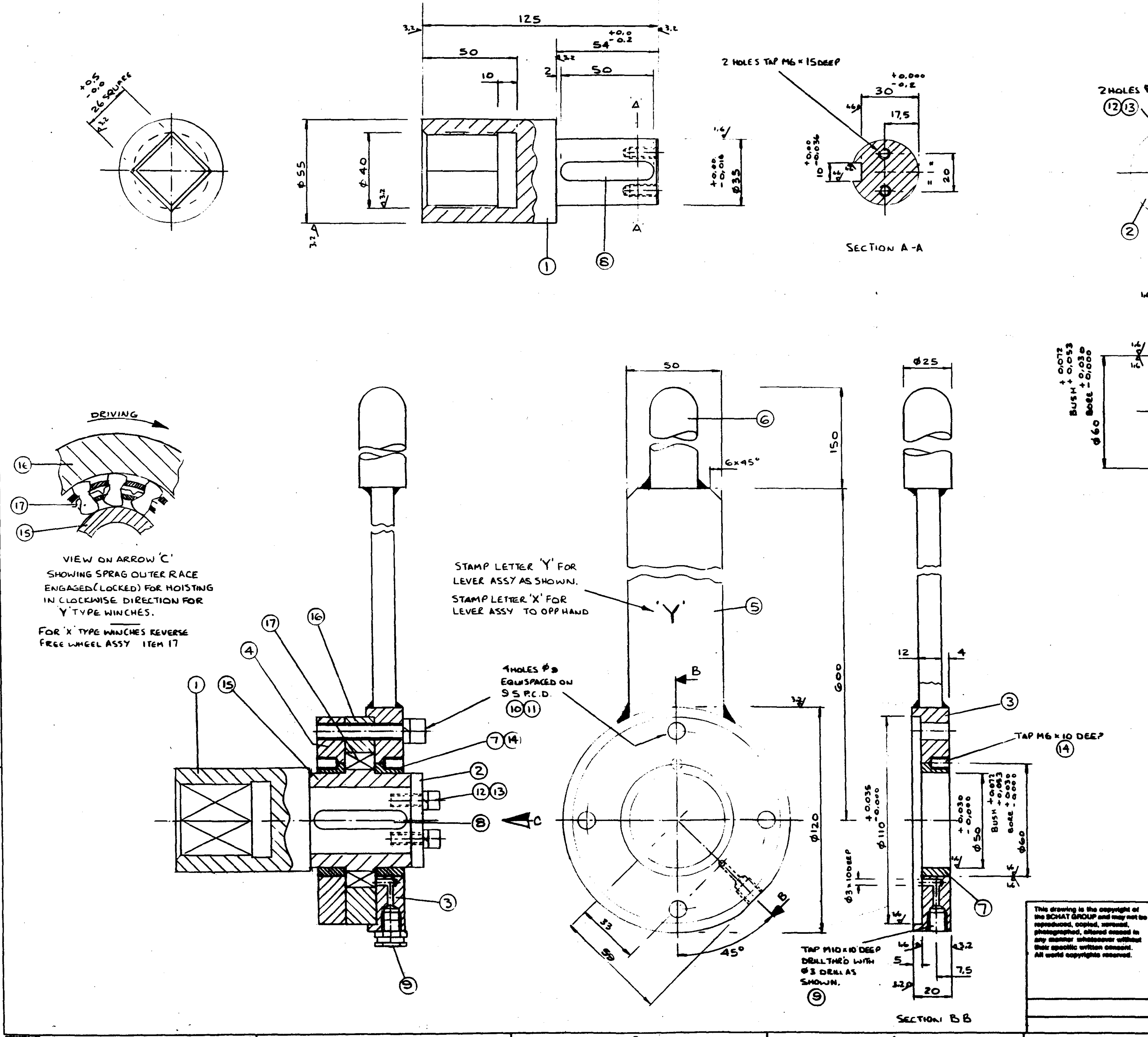
M 901595

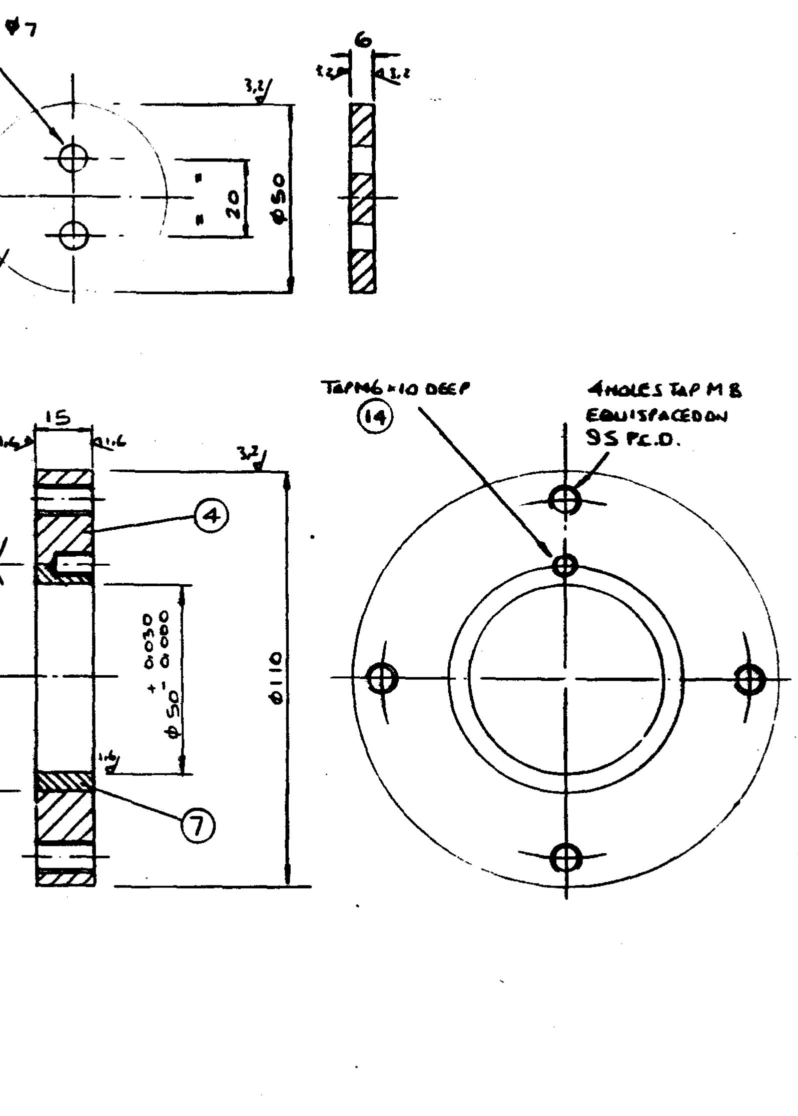
B.O.S. SALES PDS 882661

IF IN DOUBT ASK - DO NOT SCALE - REPORT ANY ERRORS TO THE D.O.

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED





NO REQ	NO	DESCRIPTION	MATERIAL	MAT'L SPEC.	REMARKS	REF DWG
1	17	FREE WHEEL - BW 13167	Nº 550167		BORG WARNER	
1	16	OUTER RACE - BW 167C	Nº 556006		" "	
1	15	INNER RACE - BW 167J	Nº 556035	Ø35 BORE	" "	
2	14	GRUBSCREW - M6×10	STEEL			
2	13	SPR WASHER - Ø6				
2	12	SOCKET HEAD CAP SCREW	STEEL		M6×20LG	
4	11	SPR WASHER - Ø8				
4	10	SOCKET HEAD CAP SCREW	STEEL		M8×50LG	
1	9	GREASE NIPPLE - M10×1			TAT TYPE	
1	8	KEY - 10×8×50	STEEL	080M40		
2	7	BUSH - Ø60×Ø50×15	PHOS BR	PB2		
1	6	BAR - Ø25×150L	STEEL	G 43A		
1	5	FLAT - 12×50×LTS	STEEL	G 43A		
1	4	BAR - Ø110×15	STEEL	G 43A		
1	3	BAR - Ø120×15	STEEL	G 43A		
1	2	BAR - Ø50×6	STEEL	G 43A		
1	1	BAR - Ø55×125L	STEEL	080 M40		

PARTS LIST

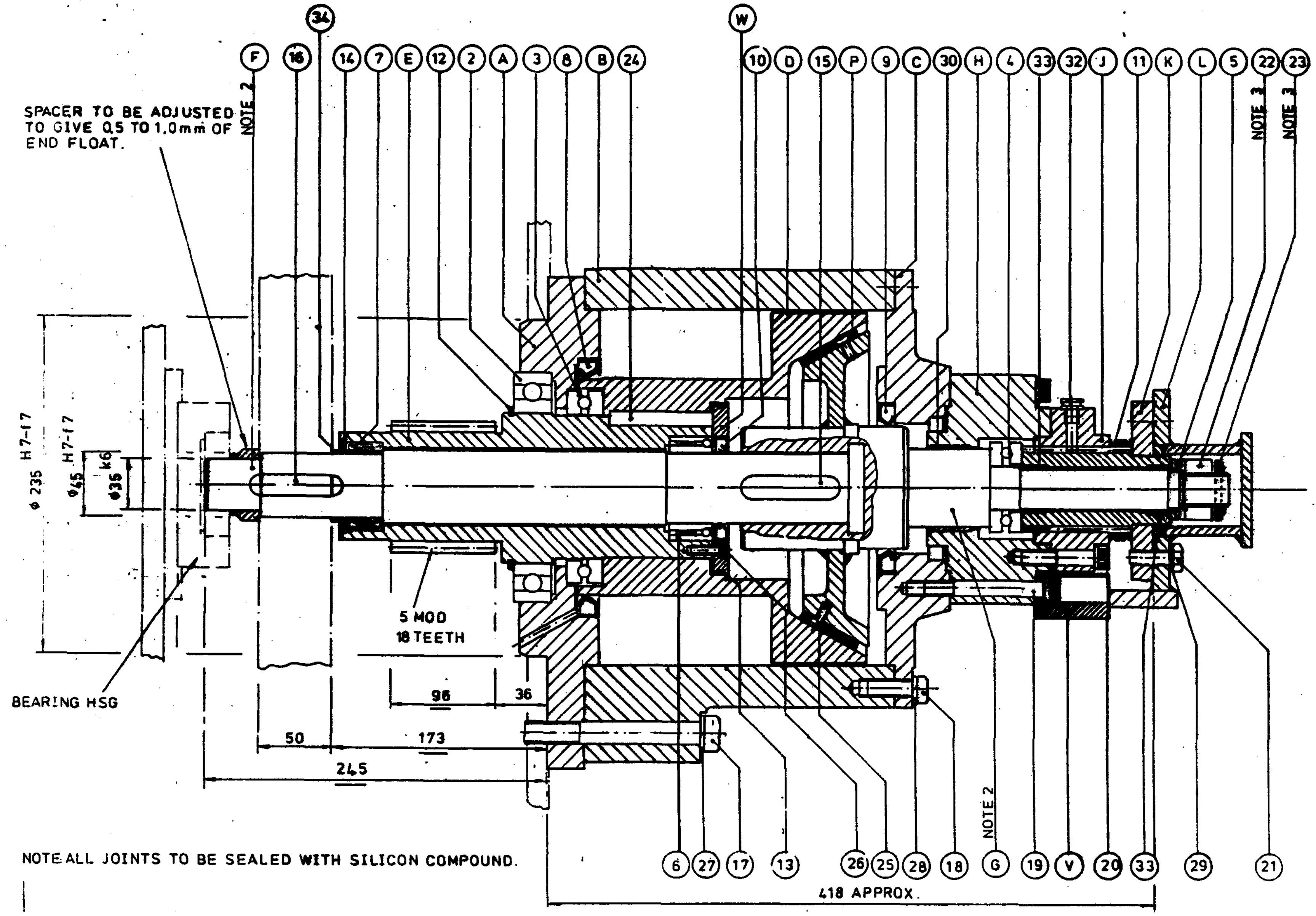
	SIGNATURE	DATE
PREPARED	JP	14-4-86
CHECKED	[illegible]	29.4.86

SCHAT-DAVIT Co LTD.

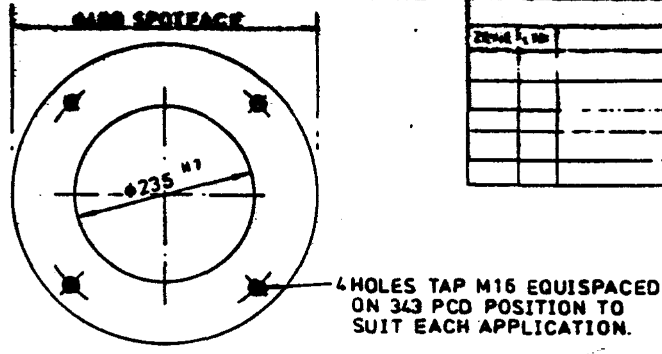
DETAIL & ASSEMBLY OF RATCHET LEVER.
'Y' TYPE AS SHOWN - 'X' TYPE TO OPP HAND.

D 406911

SCALE 1:1



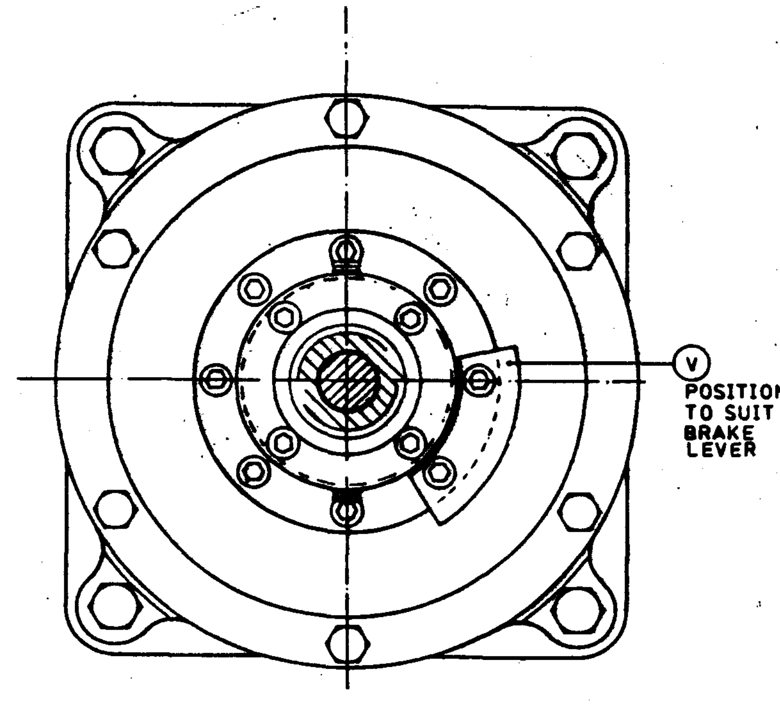
NOTE ALL JOINTS TO BE SEALED WITH SILICON COMPOUND.



MOUNTING DETAILS

REVISIONS

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

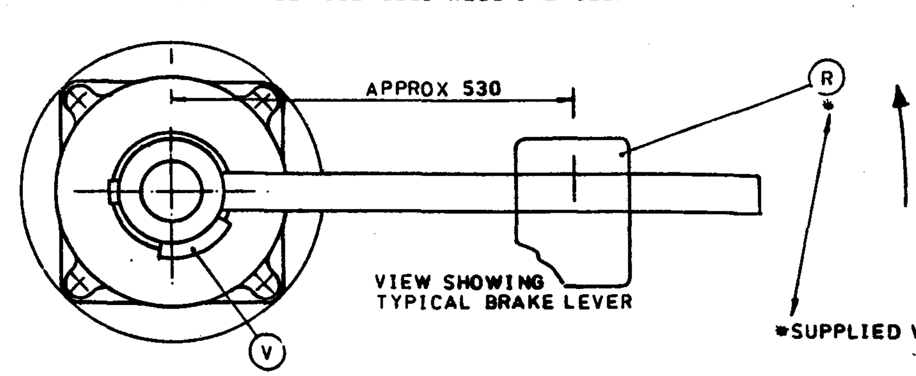


SECTION A-A

ITEM	N° OFF	DESCRIPTION	DESIGNATION	MAT'L	REMARKS
35					
34	1	INNER RING	IR 45×50×35		INA
33	2	PLAIN BEARING	MB 2815 DU		GLACIER
32	2	GREASE NIPPLE	M10×1	BRASS	TAT TYPE
31					
30	1	PLAIN BEARING	MB 5530 DU		GLACIER
29	4	SPRING WASHER	M10		
28	6	SPRING WASHER	M12		
27	4	SPRING WASHER	M16		
26	4	SOCKET HD CAP SCREW	M 6 x 20LG	STEEL	
25	21	CSK HEAD SCREW	M 6 x 12 LG	BRASS	
24	1	KEY	16×10×68	080M40	1 END RADIUS
23	1	SPRING PIN	Φ5 x 40LG	STEEL	SEL-LOK
22	1	CASTLE NUT	M24	STEEL	
21	4	HEX BOLT	M10×30 LG	STEEL	
20	4	SOCKET HD CAP SCREW	M10×50 LG	STEEL	
19	8	SOCKET HD CAP SCREW	M10×80 LG	STEEL	
18	6	HEX HEAD BOLT	M12 x 35LG	STEEL	
17	4	HEX HEAD BOLT	M16 x 125LG	STEEL	
16	1	KEY	14×9×49	080M40	SQUARE ENDS
15	1	KEY	16×10×76	080M40	RADIUS ENDS
14	1	CIRCLIP	Φ62		INTERNAL
13	1	'O' RING	RM1145-30		
12	1	CIRCLIP	Φ105		EXTERNAL
11	2	'V' SEAL	VA 0060		BACK TO BACK
10	1	OIL SEAL	58 72 8		
9	1	OIL SEAL	85 120 12		
8	1	OIL SEAL	150 180 15		
7	1	NEEDLE BEARING	NK 58/25		INA
6	1	THRUST NEEDLE BRG	NKIA 5910		INA
5	1	THRUST BEARING	51105		
4	1	THRUST BEARING	51306		
3	1	THRUST BEARING	51120		
2	1	BALL BEARING	6021		
1					

NOTES:

1. ENSURE THAT SHAFTS 'F' AND 'G' ARE AN EASY SLIDING FIT WITHIN THE CONE BRAKE SHAFT AND PLAIN BEARING (ITEM 30)
2. TIGHTEN NUT (ITEM 22) JUST ENOUGH TO PREVENT ANY END FLOAT ON ITEMS 4&5 DRILL HOLE Φ5 THROUGH ITEM 'G' USING A SLOT IN THE CASTLE NUT (ITEM 22) AS A GUIDE AND FIT SPRING PIN (ITEM 23).
3. BEARINGS TO BE ASSEMBLED WELL GREASED. OIL SEALS TO BE LIGHTLY LUBRICATED WHEN ASSEMBLING. WHERE APPLICABLE LIGHTLY GREASE SHAFTS DURING ASSEMBLY. THREADED SLEEVES TO BE ASSEMBLED WELL GREASED.



VIEW SHOWING TYPICAL BRAKE LEVER

*SUPPLIED WITH BRAKE LEVER

ITEM	DRAWING N°	DESCRIPTION	MARK-'XL'	MARK-'XR'	MARK-'YL'	MARK-'YR'
W	M 900850	SEAL HOUSING	1 OFF	1 OFF	1 OFF	1 OFF
V	N 1003	BRAKE LEVER STOP	1 OFF	1 OFF	1 OFF	1 OFF
T						
S						
* R	M 97457	BRAKE WEIGHT	1 OFF	1 OFF	1 OFF	1 OFF
P	M 900734	CONE BRAKE LINING	1 SET	1 SET	1 SET	1 SET
L	M 900743	BRAKE LEVER FLANGE	1 OFF	1 OFF	1 OFF	1 OFF
K	M 900738	THREADED SLEEVE L.H	1 OFF		1 OFF	
K	M 900736	THREADED SLEEVE R.H.		1 OFF		1 OFF
J	M 900739	THREADED SLEEVE L.H.	1 OFF		1 OFF	
J	M 900737	THREADED SLEEVE R.H.		1 OFF		1 OFF
H	M 900746	BEARING HOUSING	1 OFF	1 OFF	1 OFF	1 OFF
G	M 900745 A	CONE BRAKE SHAFT	1 OFF	1 OFF	1 OFF	1 OFF
F	M 901081 A	BRAKE SHAFT	1 OFF	1 OFF	1 OFF	1 OFF
E	S 716426 A	HOLLOW PINION	1 OFF	1 OFF	1 OFF	1 OFF
D	[illegible]	FEMALE CONE	1 OFF	1 OFF	1 OFF	1 OFF
C	M 900731	BRAKE COVER	1 OFF	1 OFF	1 OFF	1 OFF
B	M 900729	BRAKE HOUSING	1 OFF	1 OFF	1 OFF	1 OFF
A	M 900728 A	BRAKE FLANGE	1 OFF	1 OFF	1 OFF	1 OFF
			N° OFF PER WINCH			

PARTS LIST

	SIGNATURE	DATE
PREPARED	[illegible]	[illegible]
CHECKED	[illegible]	[illegible]

SCHAT-DAVIT Co Ltd

SECTIONAL ARRANGEMENT OF CONE BRAKE UNIT
(WITHOUT CLUTCH UNIT & BRAKE SHOES)

D 407252 REV

SCALE 1:2

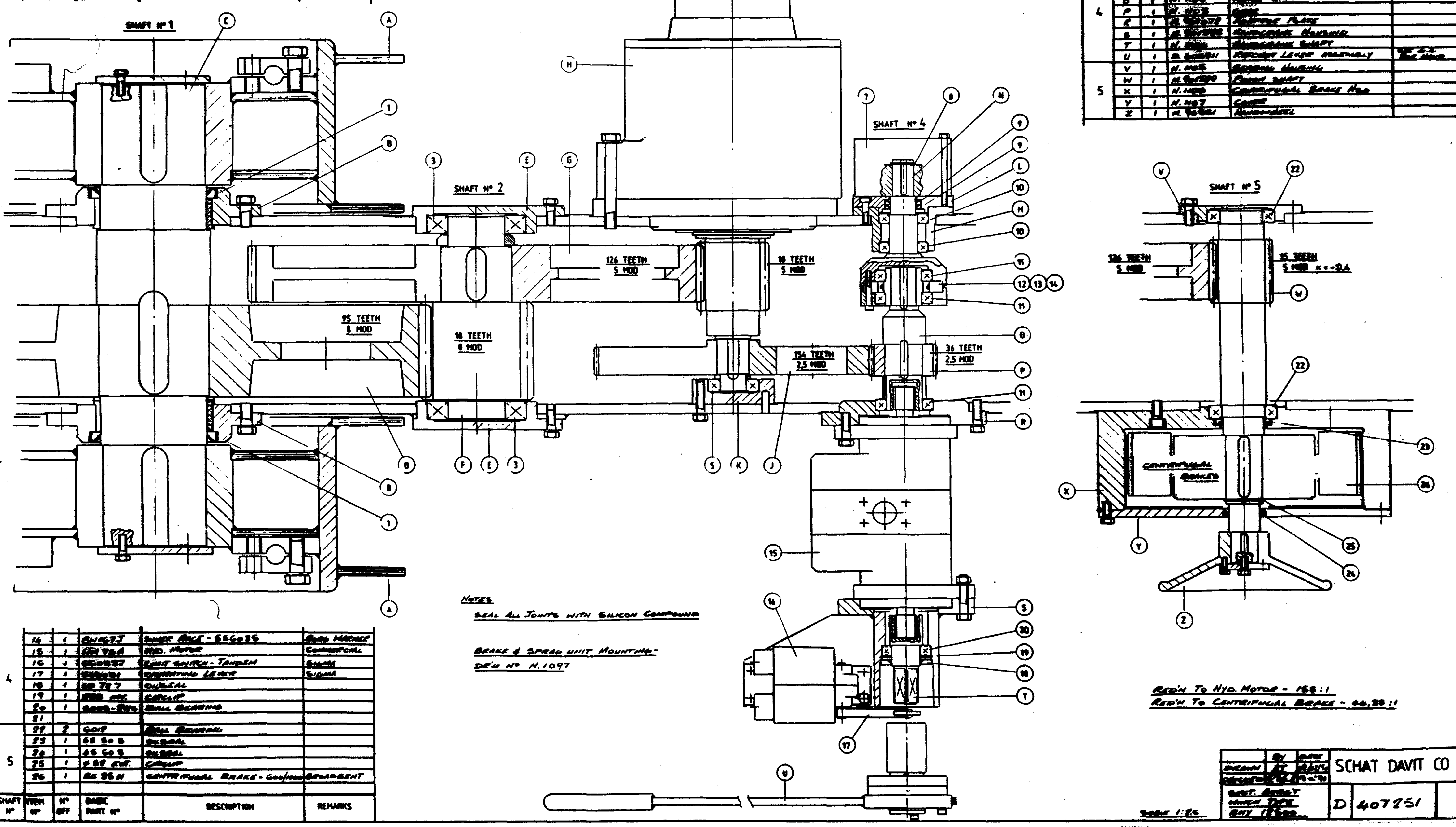
1 2 3 4 5 6

PARTS LIST

SHAFT Nº	ITEM Nº	Nº OFF	BASIC PART Nº	DESCRIPTION	REMARKS
1	1	2	180 180 16	OILSEAL	
	2				
2	3	2	NJ 216	ROLLER BEARING	
	4				
3	5	1	6807	BALL BEARING	
	6				
4	7	1	[illegible]	HYD. BRAKE	ORTLINGHAUS
	8	1	Ø30 EXT.	CIRCLIP	
	9	2	35 52 7	OILSEAL	
	10	2	6008	BALL BEARING	
	11	3	6010	BALL BEARING	
	12	1	BW1676	OUTER RACE - 556006	BORG WARNER
	13	1	BW13167	SPRAG UNIT - 550167	" "

PARTS LIST

SHAFT Nº	ITEM Nº	Nº OFF	DRG Nº	DESCRIPTION	REMARKS
1	A	2	S.710809	BARREL	[illegible]
	B	2	N.1100	BEARING HOUSING	
	C	1	M.[illegible]1597	BARREL SHAFT	
	D	1	M.[illegible]	GEAR	
2	E	2	M.[illegible]	BEARING HOUSING	
	F	1	M.[illegible]	PINION SHAFT	
	G	1	M.[illegible]	GEAR	
3	H	1	D.[illegible]	CONE BRAKE UNIT	[illegible]
	J	1	N.1101	GEAR	
	K	1	M.[illegible]	BEARING HOUSING	
4	L	1	M.[illegible]	CLUTCH HOUSING	
	M	1	M.[illegible]	BEARING HOUSING	
	N	1	S.710549	SPRAG CLUTCH HSG./SHAFT	
	O	1	N.1102	PINION SHAFT	
	P	1	N.1103	GEAR	
	R	1	M.[illegible]	ADAPTOR PLATE	
	S	1	M.[illegible]	HANDCRANK HOUSING	
	T	1	N.[illegible]	HANDCRANK SHAFT	
	U	1	[illegible]	RATCHET LEVER ASSEMBLY	[illegible]
5	V	1	N.1105	BEARING HOUSING	
	W	1	M.[illegible]	PINION SHAFT	
	X	1	N.1106	CENTRIFUGAL BRAKE HSG.	
	Y	1	N.1107	COVER	
	Z	1	M.[illegible]	HANDWHEEL	



NOTES
SEAL ALL JOINTS WITH SILICON COMPOUND

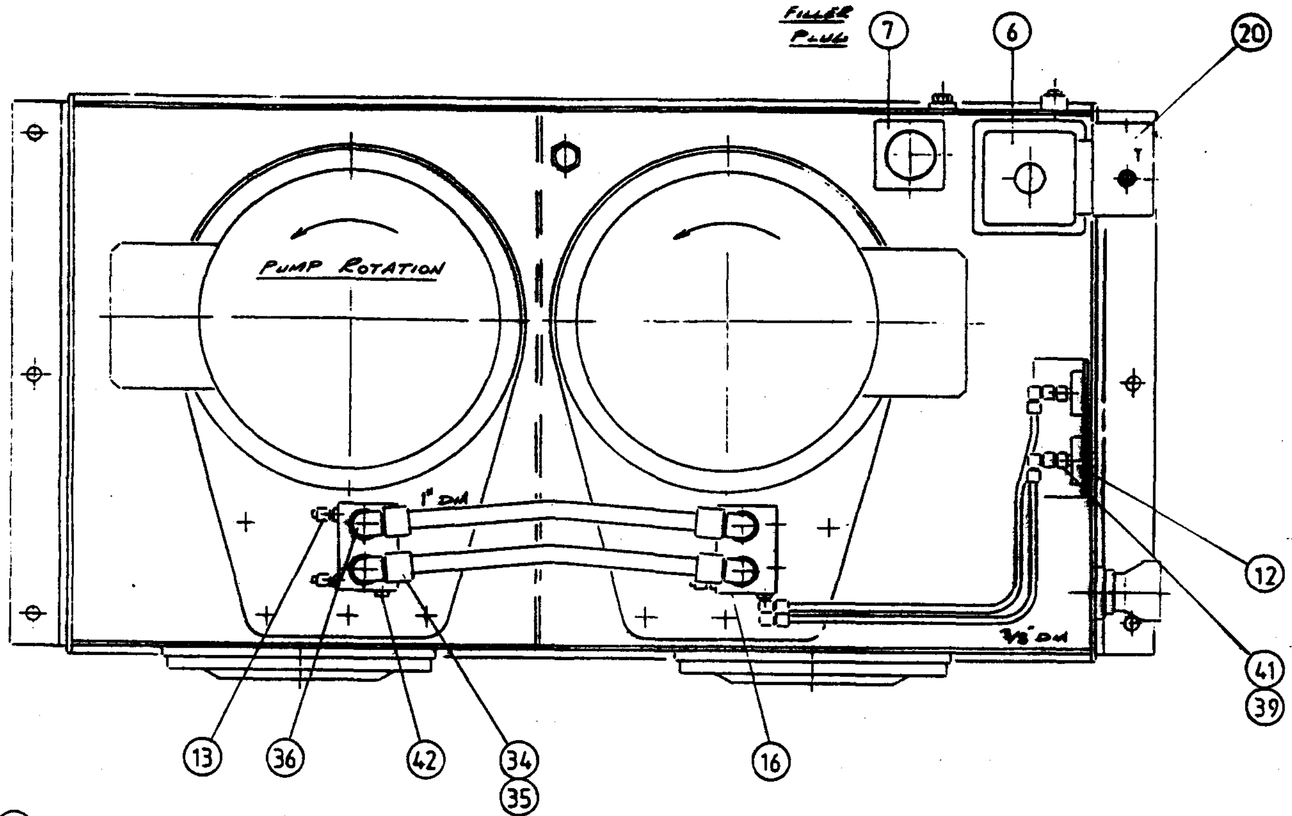
BRAKE & SPRAG UNIT MOUNTING-
DR'G Nº N.1097

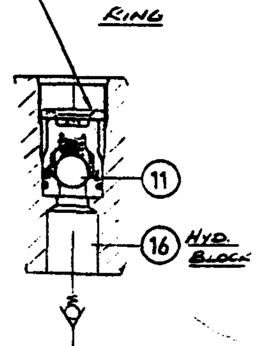
RED'N TO HYD. MOTOR - 168:1
RED'N TO CENTRIFUGAL BRAKE - 44,38:1

	14	1	BW1673	INNER RACE - 556035	BORG WARNER
	15	1	[illegible]	HYD. MOTOR	COMMERCIAL
	16	1	[illegible]	LIMIT SWITCH - TANDEM	SIGMA
4	17	1	[illegible]	OPERATING LEVER	SIGMA
	18	1	50 72 7	OILSEAL	
	19	1	Ø80 INT.	CIRCLIP	
	20	1	6009-2RS	BALL BEARING	
	21				
	22	2	6012	BALL BEARING	
	23	1	68 90 8	OILSEAL	
5	24	1	45 60 8	OILSEAL	
	25	1	Ø 58 EXT.	CIRCLIP	
	26	1	BC 38 N	CENTRIFUGAL BRAKE - 600/1000	BROADBENT
SHAFT Nº	ITEM Nº	Nº OFF	BASIC PART Nº	DESCRIPTION	REMARKS

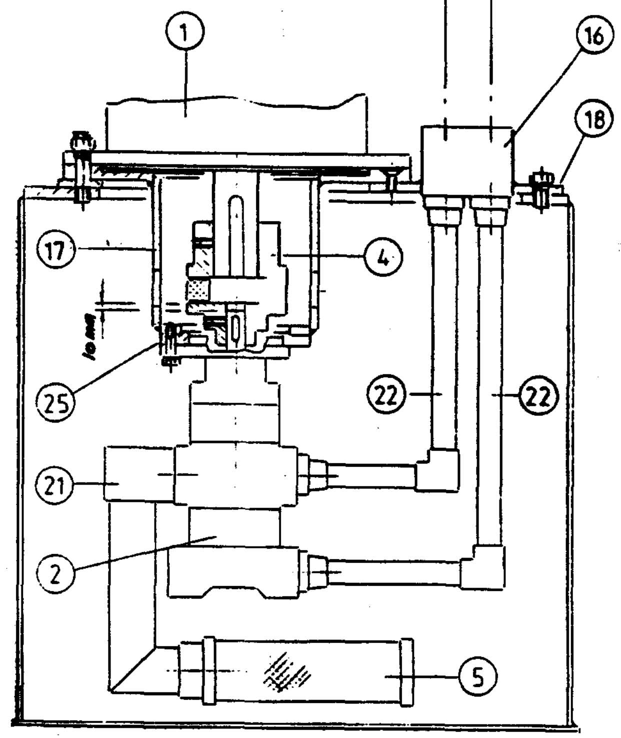
SCALE 1:2.5

	BY	DATE	SCHAT DAVIT CO
DRAWN	[illegible]	[illegible]	
CHECKED	[illegible]	[illegible]	
SECT. ASSY WINCH TYPE BHY 18500			D 407251



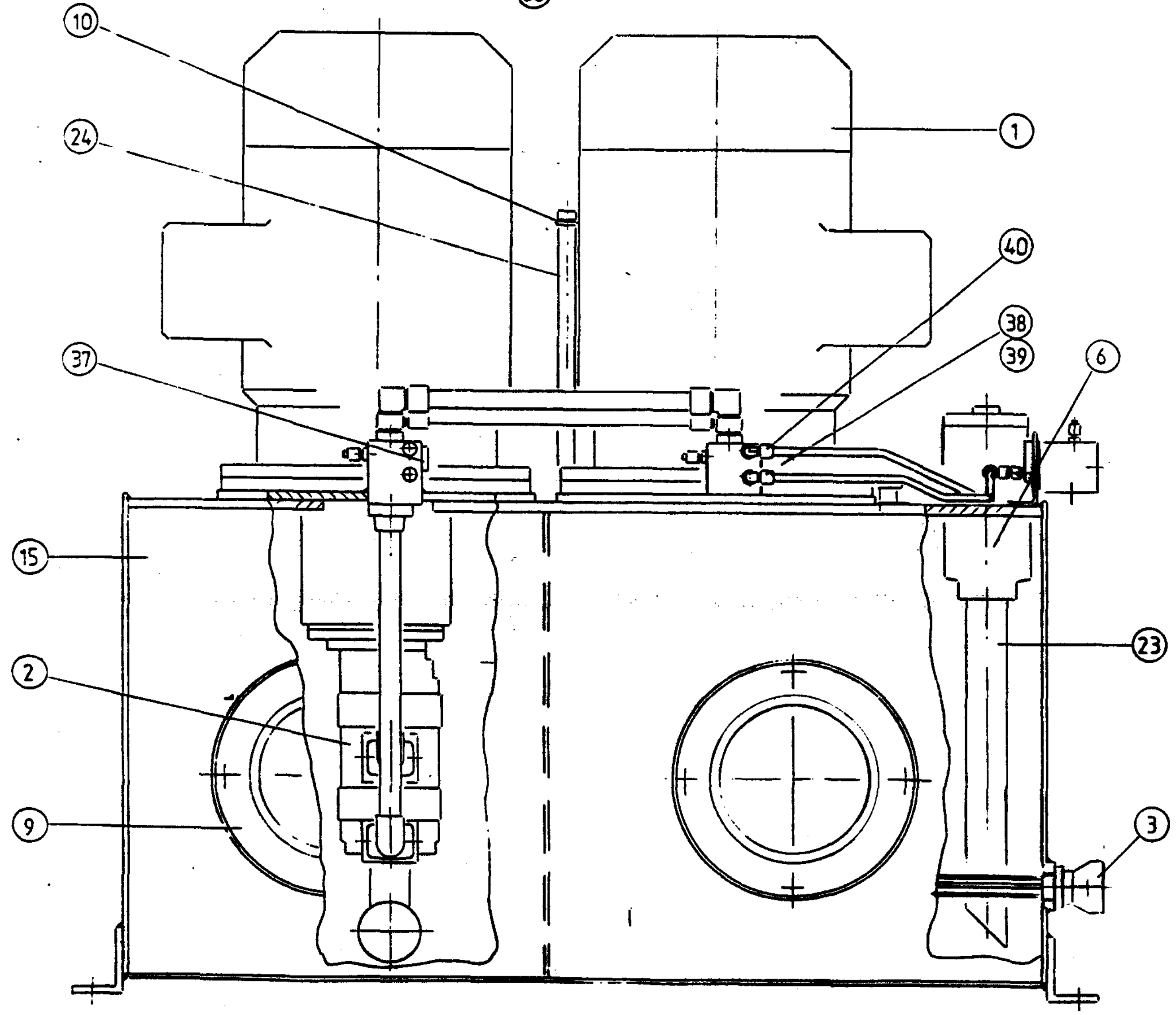


SECTION THR° HYDRAULIC BLOCK SHOWING CHECK VALVE ASSEMBLY

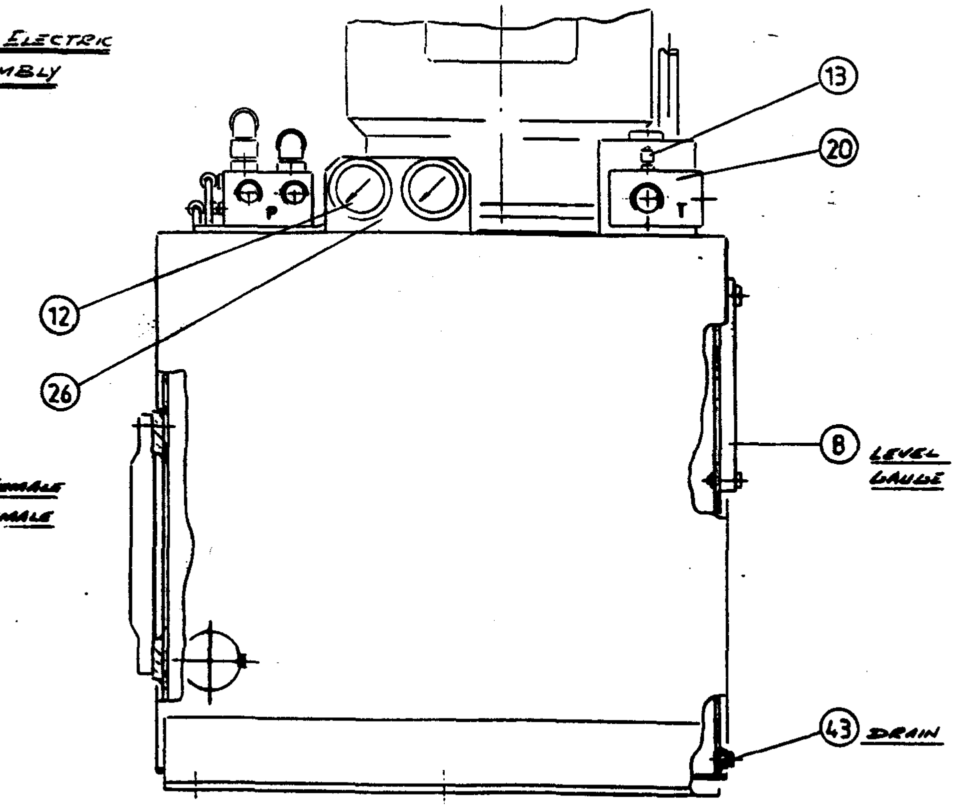


PART SECTION THR° ELECTRIC MOTOR / PUMP ASSEMBLY

ITEM Nº	Nº OFF	DESCRIPTION	DESIGNATION	SUPPLIER
1	2	ELECTRIC MOTOR	FRAME L364TD	CROMPTON
2	2	HYDRAULIC PUMP	P330B 575 20 28 15 43 TN AB15·1	COMMERCIAL
3	1	HEATER	FFSMB 075/12	ELTRON
4	2	FLEXIBLE COUPLING - N.1113	AGS/ST	HYDRA POWER
5	2	SUCTION STRAINER	SFE 180	" "
6	1	RETURN FILTER	RFP 300 F 10 B 1.1	" "
7	1	FILLER PLUG - N.1117	TRBF TYPE 3	" "
8	1	FLUID LEVEL GAUGE	FSA 254 1.1/T/12	" "
9	2	ACCESS COVER	OF 350	" "
10	1	BREATHER PLUG	TBF TYPE 3	HYDRA POWER
11	4	CHECK VALVE	3IC 903	FLUID CONTROL
12	2	PRESSURE GAUGE		PARKER
13	5	TEST POINT PLUG	HSP 728	HSP
14				
15	1	HYDRAULIC RESERVOIR	S. 710821	SCHAT DAVIT C
16	2	HYDRAULIC BLOCK	S. 710819	" "
17	2	BELLHOUSING	M. 901631	" "
18	2	MOUNTING PLATE	M. 901632	" "
19				
20	1	HYDRAULIC BLOCK	M. 901634	" "
21	2	SUCTION PIPE	N. 1114	" "
22	4	OUTLET PIPE - PRESSURE	N. 1115	" "
23	1	RETURN PIPE - TANK	N. 1116	" "
24	1	BREATHER PIPE	N. 1118	" "
25	2	ADAPTOR PLATE	N. 1119	" "
26	1	MOUNTING BRACKET	N. 1120	" "
27	1	LIFTING LUG ARR'G'T	M. 901727	SCHAT DAVIT C
28				
29				
30				
31				
32				
33				
34	2	UNION MALE UNF - ADAPTER	16F5OXS	PARKER
35	2	SWIVEL NUT ELBOW	16C6BXS	"
36	2	MALE ELBOW UNF	16C5BXS	"
37	2	PLUG	16HP5ONS	"
38	1	UNION MALE UNF - ADAPTER	GF5OXS	"
39	3	SWIVEL NUT ELBOW	GC6BXS	"
40	1	MALE ELBOW UNF	GC5BXS	"
41	2	MANOMETER CONNECTION	GG4X5MO	"
42	2	PLUG	GHP5ONS	"
43	1	PLUG	3/4 HPS	PARKER



OUTLINE OF POWER PACK SEE DRG M901365A



INTERFACE PORT CONNECTIONS

PRESSURE = 1 5/16" -12 UNF SAE STRAIGHT THR'D FEMALE
TANK = 1 5/8" -12 UNF SAE STRAIGHT THR'D FEMALE

NOTE

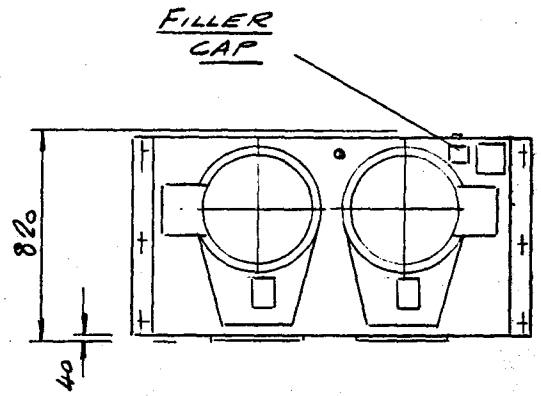
EXTERNAL PIPING TO BE STAINLESS STEEL - AISI 316
ALL PIPE SIZES ARE OUTSIDE DIAMETERS
WALL THICKNESS AS FOLLOWS

PRESSURE - 1" DIA x 0·083"
PRESSURE GAUGE - 3/8" DIA x 0·065"

ZONE	LTR	DESCRIPTION		DATE	APPROVED
	B	ITEM 3 ADDED		11-06-90	AT
	A	ADDITION OF DRG M901727		10-5-90	AT

SCALE 1:5

	BY	DATE	SCHAT-DAVIT CO
DRAWN	AT	12-03-90	
CHECKED			
POWER PACK ASSEMBLY			D 407281 B

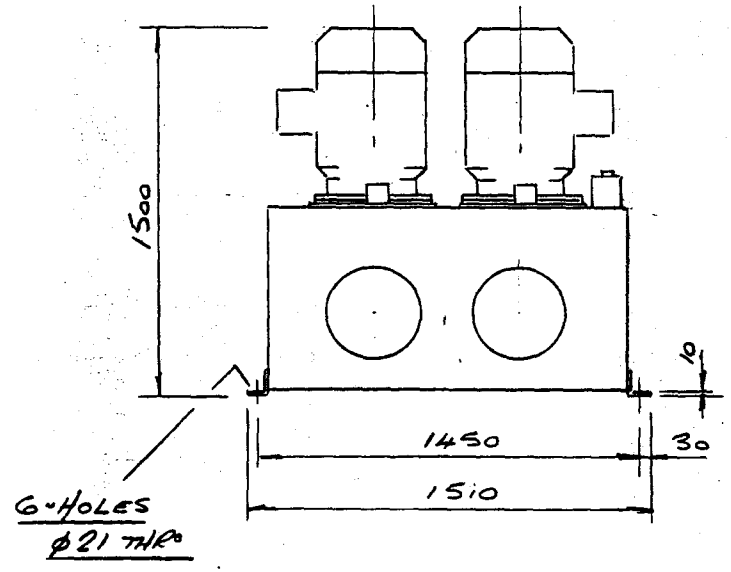


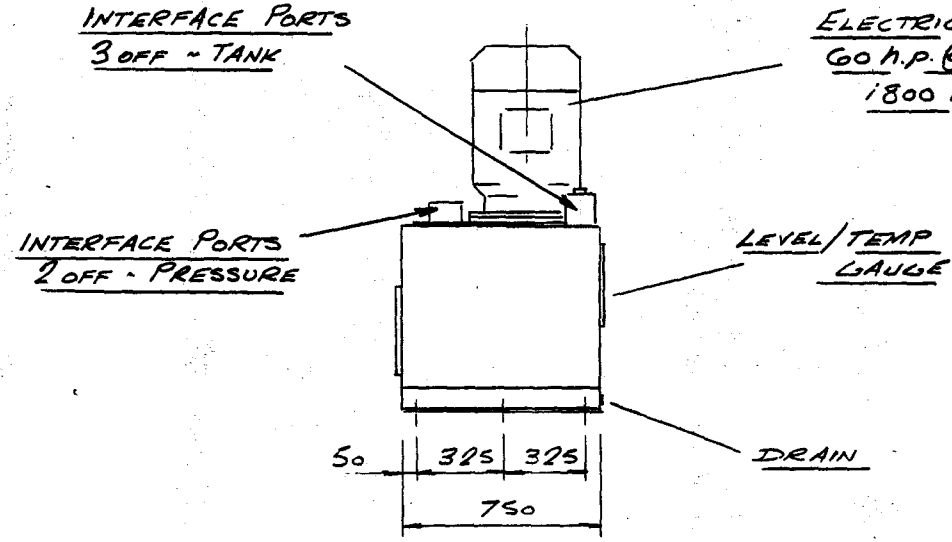
WORKING PRESSURE ~ 2500 p.s.i.
DELIVERY = 69,5 i.g.p.m.
TANK CAPACITY = 120 imp. gals

INTERFACE PORT SIZES
PRESSURE = 1 5/16" - 12 UNF SAE STRAIGHT THR'D FEMALE
TANK = 1 5/8" - 12 UNF SAE STRAIGHT THR'D FEMALE

APPROX WEIGHT WITHOUT OIL = 2300 lbs
APPROX WEIGHT WITH OIL = 3500 lbs

REFER TO POWER PACK ASSEMBLY FOR LIST OF COMPONENTS





	BY	DATE
DRAWN	AT	08 03 90
CHECKED	MB	"

SCHAT-DAVIT COMPANY

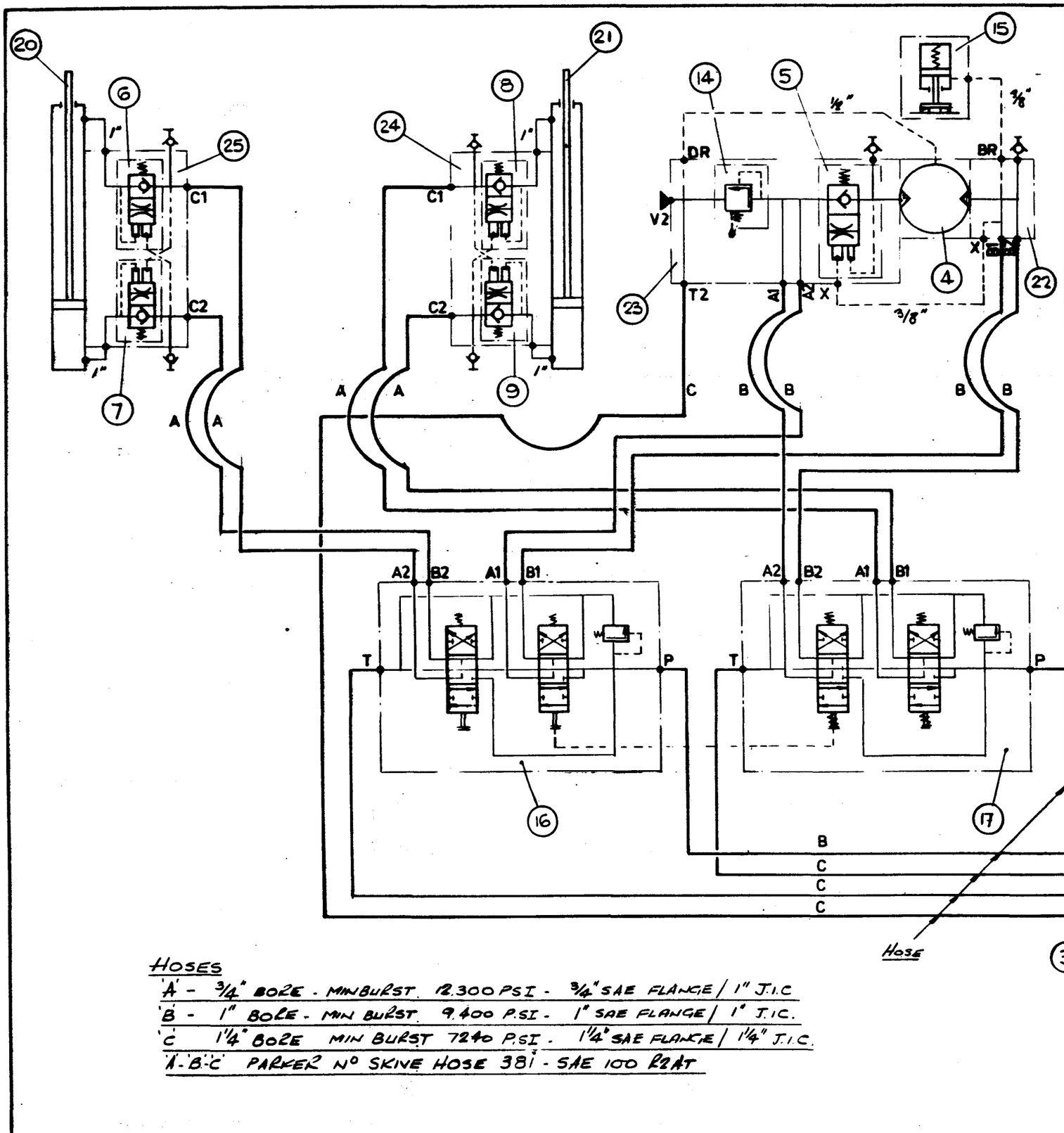
POWER PACK OUTLINE

M | 901635 | A

ISSUE A - 20 03 90 - HCV BANK REMOVED

SCALE 1:20

B.O.S. SALES PDS 082091



ITEM Nº	Nº OFF	DESCRIPTION	DESIGNATION	SUPPLIER
1-2	2	DOUBLE PUMP	P3308 - 2 x 1 1/2"	ENSIGN
3	1	RETURN FILTER	RFP 300 F10 B 1.1	HYDRA-POWER
4	1	HYDRAULIC MOTOR	WM 764 - 2 1/2"	ENSIGN
5	1	LOAD CONTROL VLV	E2B 300-Z-150-N	STERLING
6-9	4	LOAD CONTROL VLV	E2B 60-T N	STERLING
10-13	4	CHECK VALVE	31C90S	FLUID CONTROLS
14	1	RELIEF VALVE	R2V-24-333	DENISON
15	1	HYDRAULIC BRAKE	0-022-519-23-002	OETLINGHAUSE
16-17	2	DIRECTIONAL CONTROL VLV	A35	ENSIGN
18-19	2	SUCTION STRAINER	SFE 180	HYDRA-POWER
20-21	2	CYLINDER		MAILHOT
22	1	MANIFOLD BLOCK	S 710564	S.D.A
23	1	MANIFOLD BLOCK	S 710563	S D A
24-25	2	MANIFOLD BLOCK	D.4063924	S D A
26-27	2	MANIFOLD BLOCK	S 710819	S D A

TUBE MAT'L - STAINLESS STEEL AISI 316

ALL TUBE SIZES SHOWN ARE OUTSIDE DIAMETERS

WALL THICKNESS AS SHOWN

1" = 0.083"

1/2" = 0.065"

3/8" = 0.065"

HOSES

'A' - 3/4" BORE - MIN BURST 12.300 PSI - 3/4" SAE FLANGE / 1" J.I.C

'B' - 1" BORE - MIN BURST 9.400 P.S.I - 1" SAE FLANGE / 1" J.I.C.

'C' 1 1/4" BORE MIN BURST 7240 P.S.I - 1 1/4" SAE FLANGE / 1 1/4" J.I.C.

'A-B-C' PARKER Nº SKIVE HOSE 381 - SAE 100 R2AT

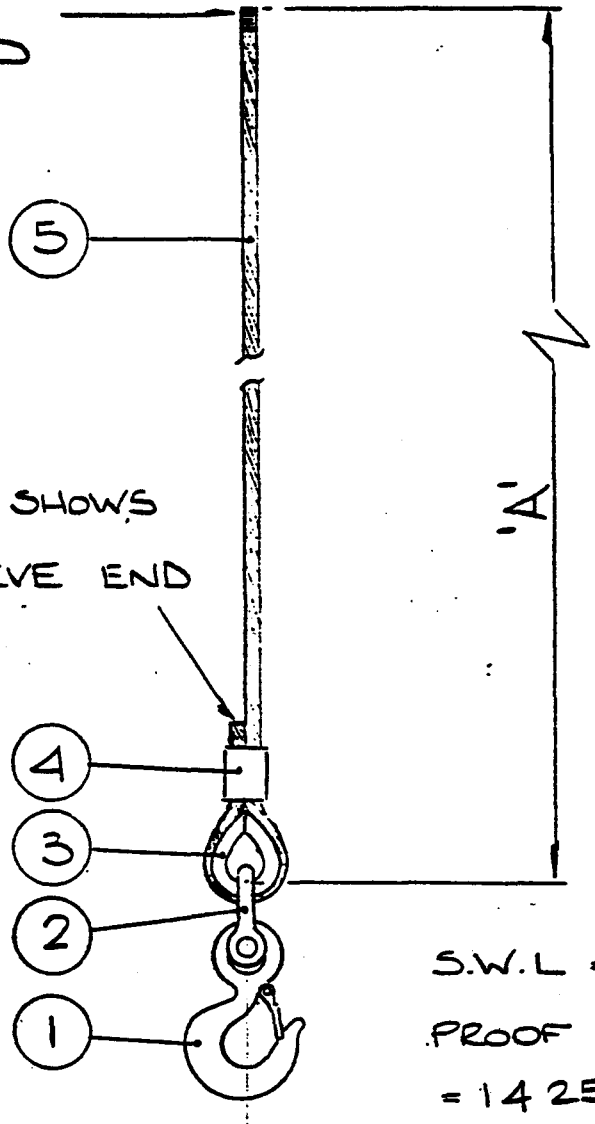
	BY	DATE
DR'N	RH	14.3.90
CH'CD		

SCHAT-DAVIT COMPANY

SCHEMATIC CIRCUIT DIAGRAM | S | 710815.A

ISSUE A - 11-05-90 - AT - TUBE SIZES ON HOIST WINCH & CYLINDERS ADDED RH

THIS END PLAIN
& WIRE BOUND



ENSURE TAIL SHOWS
THROUGH SLEEVE END

S.W.L = 5700 KGS
PROOF TEST LOAD
= 14250 KGS

TEST CERTIFICATES TO BE SUPPLIED

ITEM Nº	Nº OFF PER ASS'Y	DESCRIPTION	DIMENSIONS	REMARKS
5	1	GALVN STEEL WIRE ROPE	ϕ29 - 12x6(3:24) FC CONST	48 000 KGS MIN. B.S.
4	1	SWAGE SLEEVE	ϕ29 NON TAPERED	
3	1	ORDINARY THIMBLE	ϕ29 BS 464	
2	1	SHACKLE	ϕ32 PIN - RR-C-271A	SK 590
1	1	EYE HOOK KA	11 TONNES	CROSBY 520A

	BY	DATE
DRAWN	RE	8.02.90
CHECKED		

SCHAT-DAVIT COMPANY

FALLS ASSEMBLY

SK 715

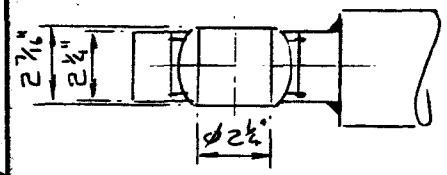
SECURITY CLASSIFICATION

SERVICE DRAWING No./SHT. No.

USED ON

3rd ANGLE PROJECTION

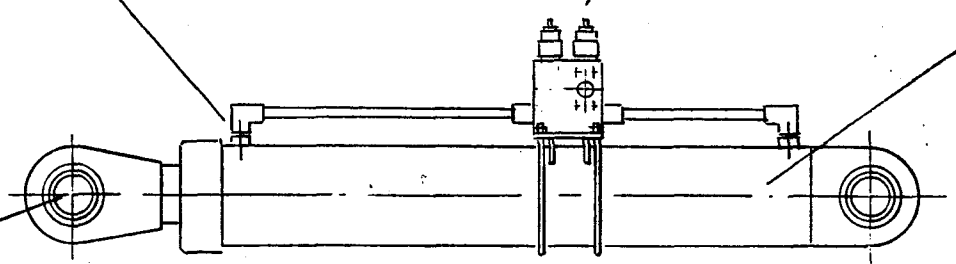
METRIC / IMPERIAL



CYLINDER PORTS
1 1/16"-12 UNF
2 POS'NS

BLOCK C/W VALVES
~ SCHAT SUPPLY

CYLINDER DETAILS
BORE ~ 5" DIA
ROD ~ 3" DIA



SPHERICAL BEARING
2.25" BORE x 2.46"
WIDE MAX. ~ BOTH
ENDS

CLOSED CRS 79"
OPEN CRS 138"

CYLINDER LOAD ~ 33000 lbs
(FULLY EXTENDED IN TENSION)

WORKING PRESSURE ~ 2500 P.S.I.
TEST PRESSURE ~ 3750 P.S.I.
MIN. BURST PRESSURE OF
4:1 ON WORKING PRESSURE

CERT'D.				MATERIAL	TOLERANCE	CONTRACTOR: SCHAT DAVIT CO. CANADA	SECURITY CLASSIFICATION
CHECKED: Les				FINISH	SURFACE ROUGHNESS	TITLE: CYLINDER OUTLINE	CONTRACTOR'S DRG. No.: M901589
DRAWN: R. LYNCH 24.01.90	CHANGE	ISSUE	DATE	DIMS. IN	SCALE: N.T.S.		SERVICE DRAWING No./SHT. No.
				PUNCH CARD TITLE			

MY (1) 158690 R A3

HYDRO/MECH DAVIT TYPE PHA

LIST OF COMPONENTS PER 1 SET OF DAVITS

ELECTRICAL: Refer to SK 10997 & M7506
Supply 460v AC 3ph 60hz

2 off Acme DWT Starter 60HP 460v AC 3ph 60hz
Auto-transformer type with 'Push to Run Start and Stop' Buttons.
Heter 110v 1ph.

2 off Brook Crompton Electric Motors 60HP x 1775 rpm
Totally enclosed fanless vertical. Squirrel cage induction pattern.
10 min rated. Frame L 364 TD.

2 off Commercial Hydraulic Pump
P330B 578 XO AB15-43 TH AB15-1

1 off Reservoir (S-DC Alnwick)
120 Imp Gals capacity S710821

2 off Flupac Suction Filter
SFE 180

1 off Flupac Return Filter
RFP 330 F10B1.1

4 off Check Valve Cartridge
31 C 90SV

HAND CONTROL VALVE

1 off Commercial Directional Control Valve c/w Waterproof Handles to S-DC Drg N1112
VA 35 AA080 MA8 MA8 Z090 (x2)

WINCH

1 off Commercial Hydraulic Motor
WM76A 1878 BE PO 25-7

1 off Abex Relief Valve
R2V-24-333

1 off Sterling Load Control Valve
E2B 300

1 off Ortlinghaus Brake
0.022.519.23.002

1 off Broadbent Centrifugal Brake
BC 35H dia 52

1 off Borg Warner Sprag Clutch
BW167J BW13167 BW167C

1 off Sigma Limit Switch 600 Series Tandem Type
Switch 560337
Lever 540031

HYDRAULIC CYLINDERS

4 off Sterling Load Control Valves
E2B 60-T-N

SECTION XIII

LEAFLETS ETC

Design Characteristics

These technical data sheets contain only standard pump options. Other types are available for special applications. Supply of modified pumps can require additional lead time. For information on these types, please consult the Commercial representative in your area.

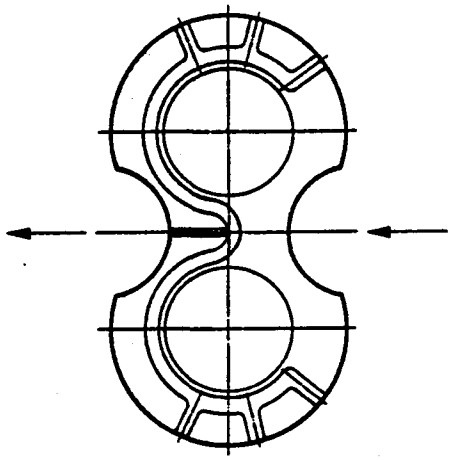
The P365/330 piggyback configuration provides a greater range of pump outputs than is available from standard multiple units by allowing the pump sections to be sized for optimum efficiency and economy.

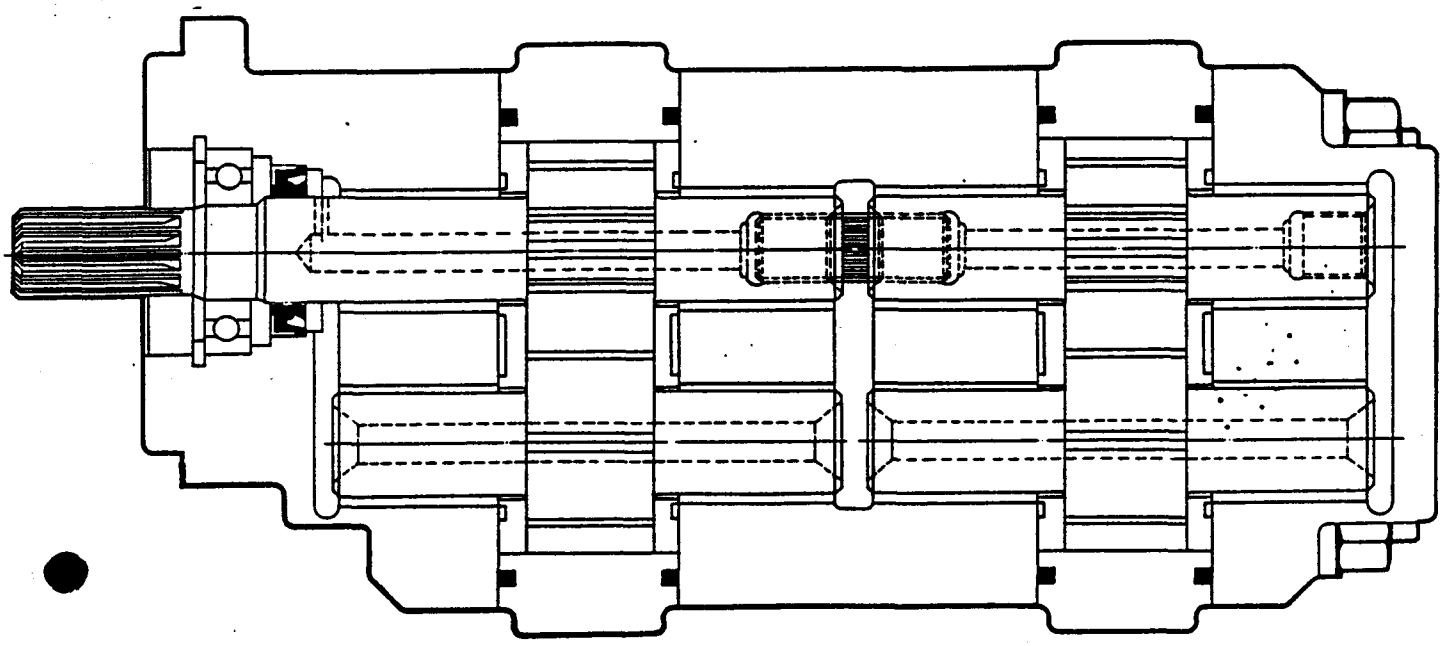
The P330/350/365 gear pumps are designed for operating pressures above 250 bar. They are the result of an extensive development programme involving computer aided design methods and more than 100.000 hours of test time in our laboratories and under actual field conditions. Combined with Commercial's 50 years of experience in the mobile hydraulics industry this has produced a range of heavy duty cast iron gear pumps of a completely new design.

In order to withstand the bearing loads at these high operating pressures and still maintain a very compact envelope size it was decided to use hydrodynamic bearings. The extremely rigid journals allow the use of long bushings which ensure high bearing load capacity. The use of hydrodynamic bearings makes the 300 series pumps eminently suitable for use with all types of low lubricity fire resistant fluids.

An important design feature is the low pressure bearing feed. The vacuum created by the un-meshing of the teeth is used to draw fresh oil from the pump suction side along the journals towards the gears. This gives optimum lubrication and cooling. A new thrust plate design ensure excellent sealing between the high and low pressure sides of the pump. The result is a pump with exceptionally high volumetric efficiencies.

The inlet and outlet ports are located in either the port end cover or in the bearing carrier. This ensures optimum suction conditions and high strength gear housings.





General Data

Pump type
External gear pump

Mounting
SAE standard flanges

Port options
SAE flanges and threaded ports

Rotation
Clockwise, counter clockwise, double

Weights
See below table

Dimensions
See page 4 and 5

Drive
Direct drive with flexible coupling is recommended.
Pumps subjected to radial loads must be specified with an outboard bearing.

Maximum radial loads
With outboard bearing

P330	3500 N
P350	5000 N
P365	6500 N

Hydraulic Data

Inlet pressure range
0,8 to 2,0 bar, absolute

Maximum intermittent pressure
See below table

Maximum continuous pressure
See below table

Hydraulic fluids
Mineral oil
Fire resistant fluids
- Water in oil emulsions 60/40, HFB
- Water glycol, HFC
- Phosphate ester, HFD

Fluid temperature range
Mineral oil with standard seals
−20°C to +80°C
Fire resistant fluids HFB + HFC
−20°C to +60°C

Fluid viscosity range
Minimum 10 mm²/s
Maximum 1600 mm²/s
Recommended 15 mm²/s to 75 mm²/s

Filtration
10 micron nominal

Flow velocity
With mineral oil and HFD
- Inlet velocity up to 2,5 m/s
- Outlet velocity up to 6 m/s

With fire resistant fluids HFB + HFC
- Inlet velocity up to 1,5 m/s
- Outlet velocity up to 4 m/s

Theoretical displacements
See below table

Performance curves
See pages 6 to 13

Speed range
Minimum 400 rev/min
Maximum 2800 rev/min

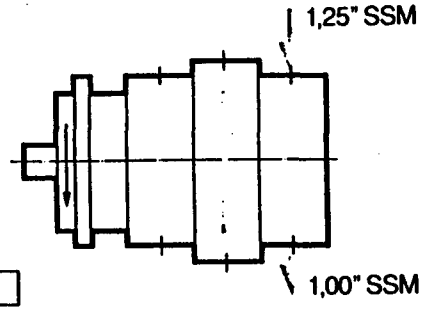
For operation outside above parameters, please consult the Commercial representative in your area.

	Gear Width		Theoretical Displacement	With mineral oil + HFD		With fire resistant fluids HFB + HFC		Weight	Weight addition per section
	Code	Size		Maximum intermittent pressure	Maximum continuous pressure	Maximum intermittent pressure	Maximum continuous pressure	Single unit	Multiple units
		mm	cm³/rev	bar	bar	bar	bar	kg	kg
P330	05	12,7	16,2	280	250	230	210	15,0	12,0
	07	19,1	24,2	280	250	230	210	15,5	12,5
	10	25,4	32,3 ✓	280	250	230	210	16,0	13,0
	12	31,8	40,4	280	250	230	210	16,5	13,5
	15	38,1	48,5	270	250	230	210	17,0	14,0
	17	44,5	56,5 ✓	250	230	210	190	17,5	14,5
	20	50,8	64,6	220	200	190	170	18,0	15,0
P350	05	12,7	20,9	280	250	230	210	19,0	16,0
	07	19,1	31,4	280	250	230	210	20,0	17,0
	10	25,4	41,8	280	250	230	210	21,0	18,0
	12	31,8	52,3	280	250	230	210	22,0	19,0
	15	38,1	62,7	270	250	230	210	23,0	20,0
	17	44,5	73,2	250	230	220	200	24,0	21,0
	20	50,8	83,6	230	210	200	180	25,0	22,0
	22	57,2	94,1	210	190	180	160	25,0	22,0
	25	63,5	104,5	190	170	160	140	27,0	24,0
P365	07	19,1	44,3	280	250	230	210	26,0	23,0
	10	25,4	59,0	280	250	230	210	27,0	24,0
	12	31,8	73,8	280	250	230	210	28,0	25,0
	15	38,1	88,5	280	250	230	210	29,0	26,0
	17	44,5	103,3	280	250	230	210	30,0	27,0
	20	50,8	118,0	270	250	230	210	31,0	28,0
	22	57,2	132,8	250	230	210	190	32,0	29,0
	25	63,5	147,5	230	210	190	170	33,0	30,0

Coding Examples

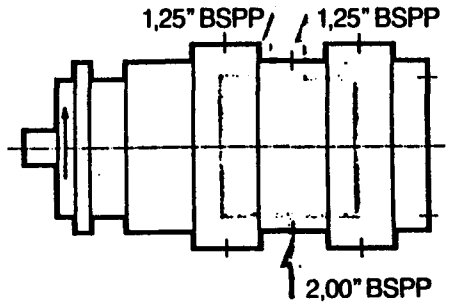
Please see below for details on the coding system. For ease of explanation we have shown as a model a tandem pump, but singles or multiples are coded in the same way.

Single unit
Displacement: 40 cm^3/rev
Rotation: clockwise
Mounting flange: SAE B 4 bolt
Drive shaft: SAE B 13 teeth
Port standard:
SAE flange metric thread (SSM)



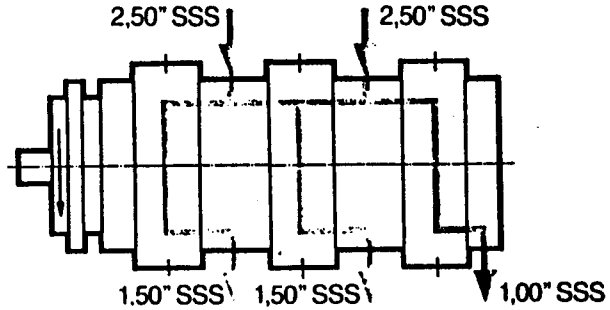
P330	A	1	42	EY	AB	12	–	25

Tandem Unit
Displacement section 1: 84 cm^3/rev
section 2: 84 cm^3/rev
Rotation: counterclockwise
Mounting flange: SAE C 4 bolt
Drive shaft: SAE C keyed
Port standard:
British standard pipe parallel (BSPP)



P350	B	2	78	IB	AB	20	–	11	MJ	AB	20	–	1

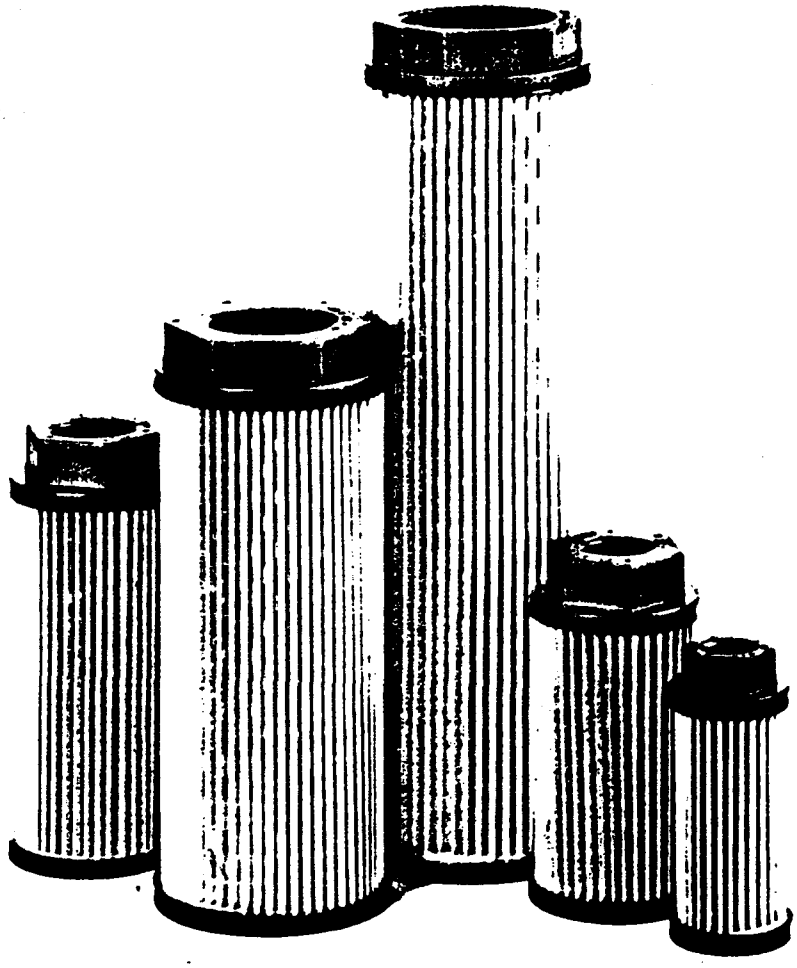
Triple Unit
Displacement section 1: 118 cm^3/rev
section 2: 118 cm^3/rev
section 3: 45 cm^3/rev
Rotation: clockwise
Mounting flange: SAE C 2 bolt
Drive shaft: SAE C 14 teeth
Port standard: SAE flange UNC thread



P365	B	1	98	ON	AB	20	–	07	CJ	AB	20	–	I	CJ	AB	07	1

Flupac

SUCTION FILTER ELEMENT



1. DESCRIPTION

The suction filter elements are designed for mounting into the suction lines of pumps.

It is important to ensure that the suction filter elements are always fitted well below the minimum oil level.

The standard filtration rating is 125 micron. Other micron ratings on request.

In order to avoid suction problems caused by contaminated elements or cold starts, the suction filter elements can also be supplied with by-pass valves.

The opening pressure of the by-pass valve is 0.2 bar.

MATERIALS

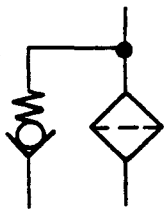
Filter material: phosphate bronze
End caps: Polyamid
Supporting tube:
sheet steel, galvanised

2. CHARACTERISTIC DETAILS

2.1. GENERAL

2.1.1. **Designation and hydraulic symbol**

without by-pass valve



with by-pass valve

2.1.2. **Type Code**
(also ordering example)

SFE 50 G 125 A 1 . 0 / BYP

Suction Filter Element

Nominal flow rate in lpm
15
25
50
100
180

Threaded connection

Filtration rating in micron
(other micron ratings on request)

Type of indicator
A = without indicator

Type Code

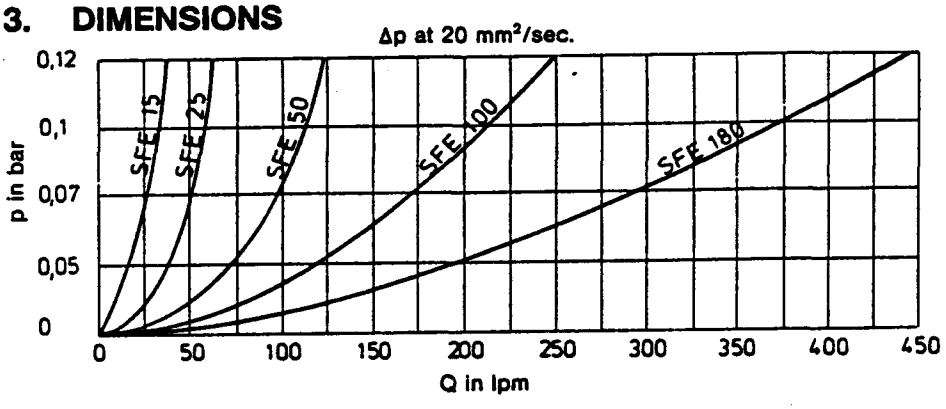
Modification number

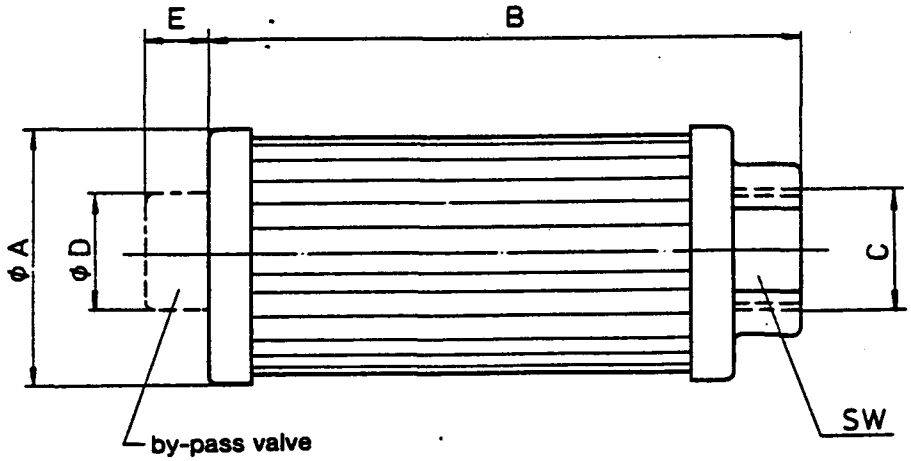
Supplementary details
BYP = with by-pass valve
no details = without by-pass valves

2.2. HYDRAULIC DETAILS

2.2.1. **Δp-Q-curve to ISO/DIS 3968.2 Kl. B**

3. DIMENSIONS





Type	Flow Rate lpm	A	B	C (ISO 228)	D	E	SW	Filtration Area m²
SFE 15	15	43	102	G ½	18	15	30	0.02
SFE 25	25	62	127	G ¾	36	18	46	0.03
SFE 50	50	62	159	G 1	36	18	46	0.05
SFE 100	100	86	210	G 1½	46	19	69	0.13
SFE 180	180	86	311	G 2	46	19	69	0.20

Subject to technical modifications!

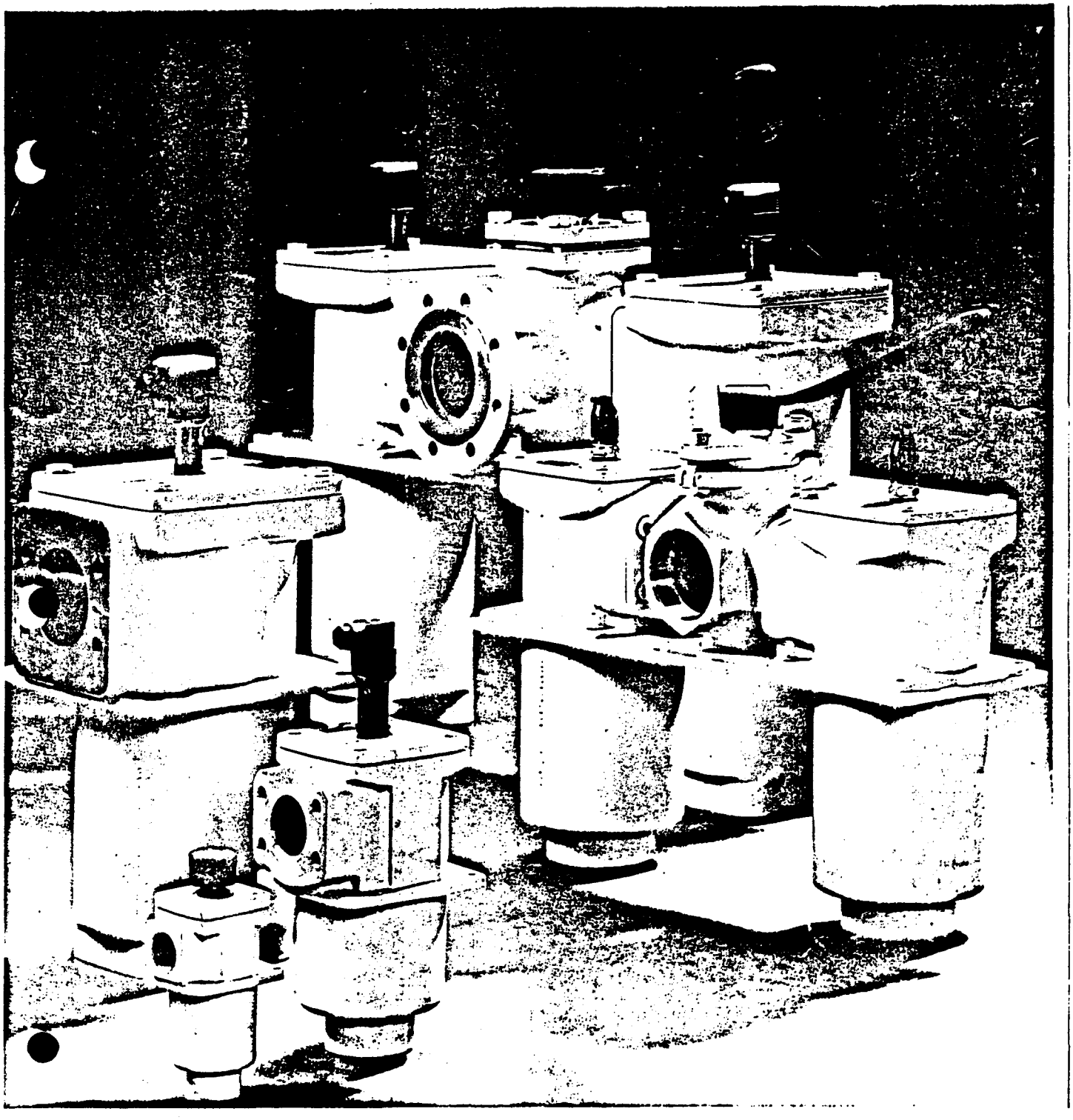
FLUPAC Limited
Unit 15, Blenheim Road
Cressex Industrial Estate
High Wycombe, Bucks HP12 3RS

Telephone: High Wycombe
(04 94) 40101/2/3
Telex: 837107

Leaflet E 7.701 0/6.83

Flupac

RETURN LINE FILTERS



1. DESCRIPTION

1.1. ELEMENTS

1.1.1. Metal fibre element

The 4*plus*4 metal fibre element has 8 special advantages:

- High contamination retention capacity due to deep filtering
- which results in a longer service life
- High retention rate
- Low flow resistance despite of small construction

plus

- Corrosion protection due to stainless steel filter material and zinc-plated steel parts
- High differential pressure
- Economical due to cleanability
- High temperature range

1.1.2. Wire mesh element

- High temperature range
- Corrosion protection due to stainless steel filter material and zinc-plated steel parts
- Cleanable (surface filter)
- High differential pressure

1.1.3. Paper throw-away element

- High contamination retention capacity due to deep filtering
- Low flow resistance
- Paper supported on both sides by wire mesh
- High temperature resistance due to paper being free of phenolic resin.

1.1.4. Beta micron® throw-away element based on inorganic fibres

- Superb absorption of finest particles over a wide differential pressure range
- Due to large specific absorption area high contamination retention capacity
- High chemical resistance due to the use of epoxid resins for impregnation and gluing
- Element protection due to high burst pressure resistance (i. e. during cold start and differential pressure surges)

1.2. FILTER HOUSING

The return line filters type RF and RFD are designed for mounting onto tank covers. The housing and all connections are designed to absorb pressure surges which can be caused by a sudden opening of large directional valves due to increased oil flows. A contamination retainer which sits in the filter housing encloses the element. This retainer is removed together with the element therefore preventing any accumulated contamination to fall back into the oil container.

The filters can be supplied with visual, electrical, or combined visual/electrical clogging indicators.

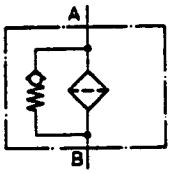
2. CHARACTERISTIC DATA

2.1. GENERAL

2.1.1. Designation and hydraulic symbol Return Line Filter

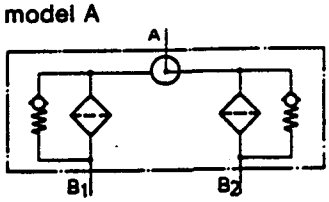
single filter

model A



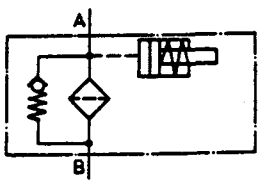
double filter

model A

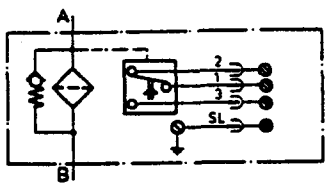


single filter with clogging indicator

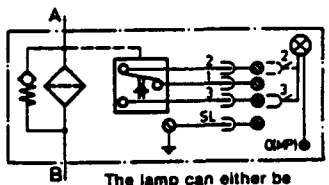
model B



model C

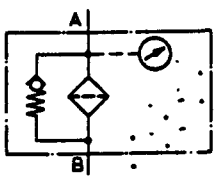


model D

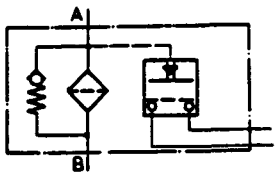


The lamp can either be fitted to closing contact (3) or opening contact (2).

model E

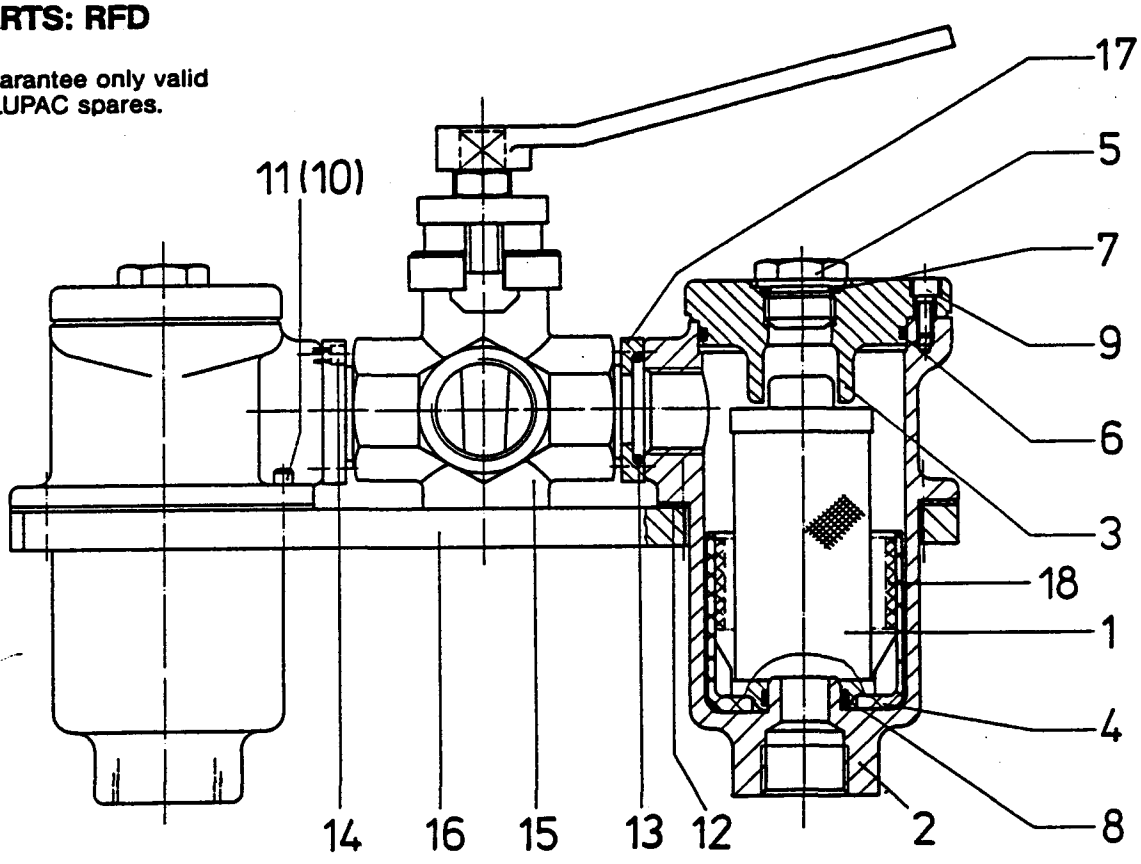


model F



SPARE PARTS: RFD

Please note:
Functional guarantee only valid for original FLUPAC spares.



Item	Description	RFD 60	RFD 110	RFD 160	RFD 240	RFD 330	RFD 660	RFD 950	RFD 1300
1	Element	2	2	2	2	2	2	2	2
	10 µm metal	0060R010V	0110R010V	0160R010V	0240R010V	0330R010V	0660R010V	0950R010V	1300R010V
	20 µm fibre	0060R020V	0110R020V	0160R020V	0240R020V	0330R020V	0660R020V	0950R020V	1300R020V
	25 µm wire mesh	0060R025W	0110R025W	0160R025W	0240R025W	0330R025W	0660R025W	0950R025W	1300R025W
	10 µm paper	0060R010P	0110R010P	0160R010P	0240R010P	0330R010P	0660R010P	0950R010P	1300R010P
	20 µm paper	0060R020P	0110R020P	0160R020P	0240R020P	0330R020P	0660R020P	0950R020P	1300R020P
	10 µm Beta micron® N	0060R010BN	0110R010BN	0160R010BN	0240R010BN	0330R010BN	0660R010BN	0950R010BN	1300R010BN
	20 µm Beta micron® N	0060R020BN	0110R020BN	0160R020BN	0240R020BN	0330R020BN	0660R020BN	0950R020BN	1300R020BN
2	housing	2	2	2	2	2	2	2	2
3	cover plate	2	2	2	2	2	2	2	2
4	cartridge	2	2	2	2	2	2	2	2
5	plug	2	2	2	2	2	2	2	2
	O-ring	2 59 x 3	2 59 x 3	2 80 x 4	2 80 x 4	2 105 x 5	2 142 x 6	2 175 x 5	2 175 x 5
	O-ring	2 18 x 2.5	2 18 x 2.5	2 18 x 2.5	2 18 x 2.5	2 18 x 2.5	2 18 x 2.5	2 18 x 2.5	2 18 x 2.5
8	O-ring	2 22 x 3.5	2 22 x 3.5	2 34 x 3.5	2 34 x 3.5	2 48 x 3	2 68 x 5	2 96 x 6	2 96 x 6
9	cylinder screw DIN 912; 12.9	8 M 5 x 16	8 M 5 x 16	8 M 6 x 16	8 M 6 x 16	8 M 8 x 16	8 M 12 x 20	8 M 16 x 30	8 M 16 x 30
10	spacer DIN 125-St	4 5.3	4 5.3	4 6.4	4 6.4	4 8.4	4 13	–	–
11	cylinder screw DIN 912; 8.8	4 M 5 x 20	4 M 5 x 20	4 M 6 x 25	4 M 6 x 25	4 M 8 x 20	4 M 12 x 20	4 M 16 x 25	4 M 16 x 20
12	seal	4	4	4	4	4	4	4	4
13	O-ring (gasket ring for RFD 950 & 1300)	2 34 x 3	2 34 x 3	2 48 x 3	2 48 x 3	2 54 x 3	2 84 x 4	2 ø 138/90 x 3	2 ø 158/100 x 3
14	cylinder screw DIN 912; 12.9	8 M 4 x 12	8 M 4 x 12	8 M 4 x 12	8 M 4 x 12	8 M 12 x 20	8 M 14 x 30	8 M 16 x 35	8 M 16 x 35
15	3-way valve	1	1	1	1	1	1	1	1
16	plate	1	1	1	1	1	1	1	1
17	flange	2	2	2	2	2	2	–	–
18	magnetic strip (on request)	2	2	2	2	2	2	2	2

5. CLEANING

Unscrew filter cover and remove contamination retainer together with filter element. Remove element from contamination retainer and clean off any contamination.

5.1. ULTRASONIC CLEANING
Contaminated elements can be sent to FLUPAC Ltd. for ultrasonic cleaning.

5.2. MANUAL CLEANING
(Wire mesh elements)

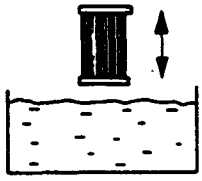
1. Remove build up of external dirt in separate cleaning tank with cleaning fluid.

2. Flush with cold cleansing agent and finally with compressed air.

5.3. PAPER ELEMENTS
Replace contaminated element – paper and Beta micron® N elements – with new element.

6.4. MANUAL CLEANING
(Metal fibre element)

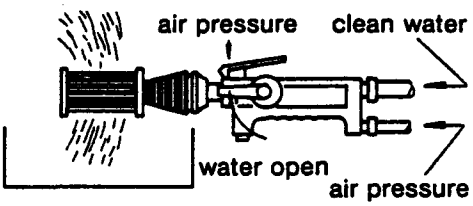
1. Remove any external build-up of contamination in separate cleaning tank with cleaning fluid (petrol, paraffin etc).


Cleaning fluid

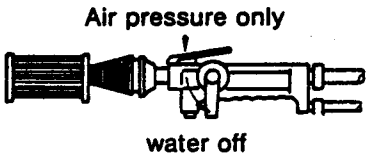
2. Immerse the element for 30 minutes in high quality fluid – Tiket (Super Takeoff) and finally


Tiket

flush from inside with an air-water pistol.



3. Turn off water and blow from inside with air only.



4. Immerse in ISO-Propyl-Alcohol to remove the remaining water particles.


ISO-Propyl-Alcohol

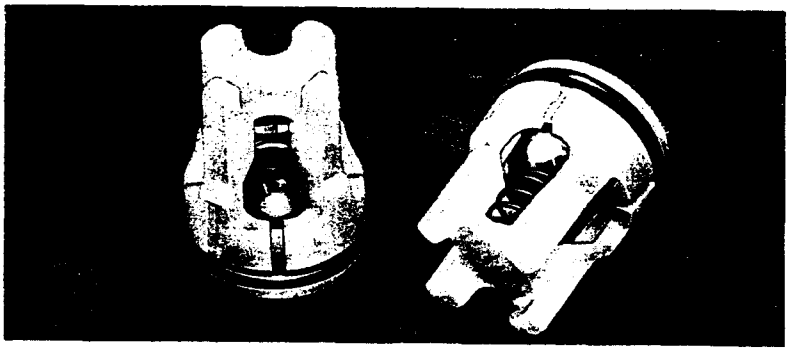
5. Pack element in air tight plastic bag for future use.

Subject to technical modifications!

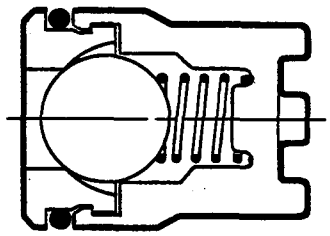
Fluid Controls, inc.

CARTRIDGE CHECK VALVES

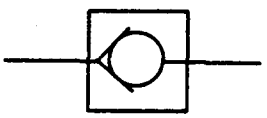
BALL CHECK — FOR OIL
TO 18 G.P.M. (68 L/MIN) 3000 P.S.I. (210 bar)
TO 50 G.P.M. (190 L/MIN) 5000 P.S.I. (345 bar)

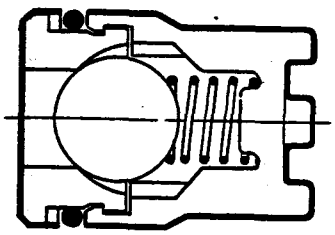


3C50
3C60



FREE FLOW →





3C80
3C90

FREE FLOW →

USE

Any check valve application where it is desirable to machine your own cavity and incorporate a cartridge check. For rated flows to 18 GPM and pressures to 3000 PSI.

FEATURES

Cartridge is compact — economical. Fits simple ¾" diameter cavity. Low pressure drop — same in all flow directions and positions. Rugged construction for long life.

SPECIFICATIONS

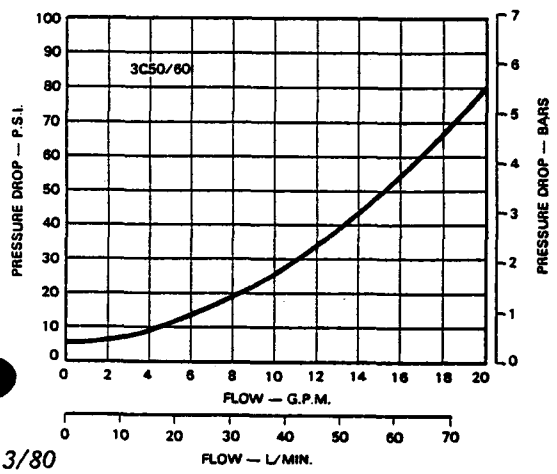
MATERIALS: Delrin and Steel

RATED FLOW: to 18 GPM (68 L/min)

RATED PRESSURE: 2000 PSI (140 bar) 3C60
3000 PSI (210 bar) 3C50

200°F Maximum (93.4°C)
5 PSI Crack Pressure Standard

Special model available for high pressure water applications.



USE

Any check valve application where it is desirable to machine your own cavity and incorporate a cartridge check. For rated flows to 50 GPM and pressures to 5000 PSI.

FEATURES

Cartridge is compact — economical. Fits simple 1 3/16" diameter cavity. Low pressure drop — same in all flow directions and positions. Rugged construction for long life.

SPECIFICATIONS

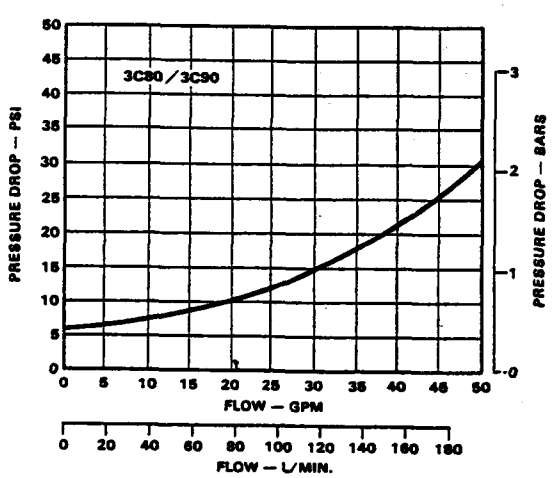
MATERIALS: Delrin and Steel

RATED FLOW: to 50 GPM (190 L/min)

RATED PRESSURE: 3000 PSI (210 bar) 3C80
5000 PSI (345 bar) 3C90

200°F Maximum (93.4°C)
5 PSI Crack Pressure Standard

Special model available for high pressure water applications.



CARTRIDGE CHECK VALVES

BALL CHECK — FOR OIL
TO 18 G.P.M. (68 L/MIN) 3000 P.S.I. (210 bar)
TO 50 G.P.M. (190 L/MIN) 5000 P.S.I. (345 bar)

Fluid Controls, inc.

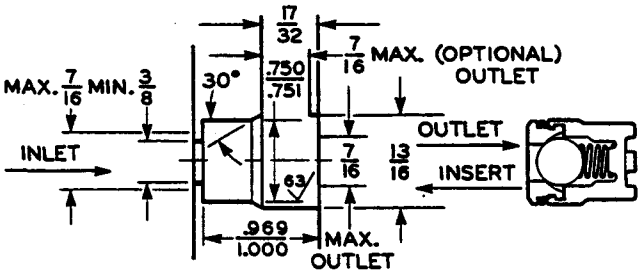
PART NUMBER EXAMPLE:

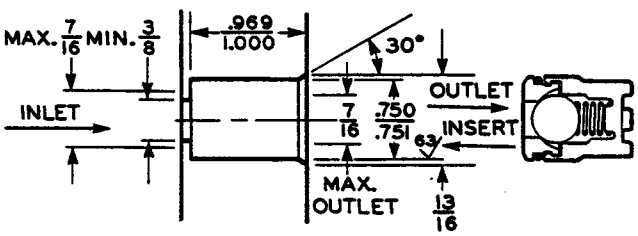
3C80 - S
① ②

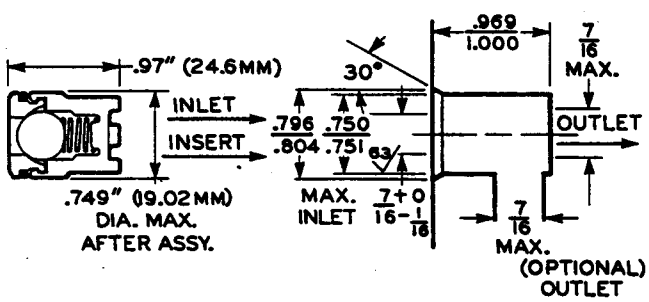
Note: Please obtain certified cavity and tool drawings before machining.

Where measurements are critical — request certified drawings.

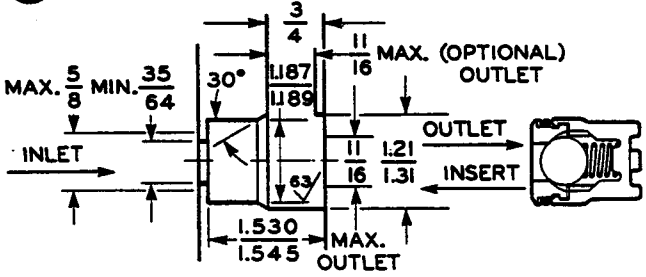
① 3C50 (STEEL SEAT) WEIGHT 1.0 oz.
① 3C60 (DELRIN SEAT) WEIGHT 0.33 oz.

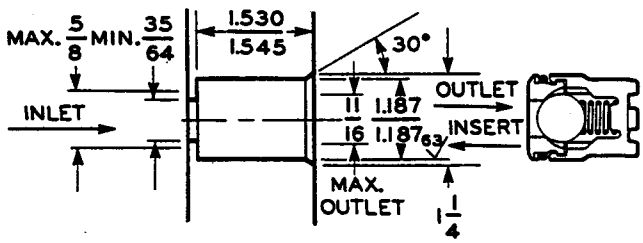






① 3C80 (Delrin Seat) Weight 1.3 oz. (36 Grams)
① 3C90 (Steel Seat) Weight 1.8 oz. (51 Grams)





② SEALS

S

Buna N For use with most Industrial Hydraulic Oils

SV

Viton A

Consult factory for absolute seal compatibility.

1. Description

The Denison R2V Pilot Relief Valve is a two-stage valve designed for a maximum operating pressure of 3000 psi (210 bars).

The valve is fully adjustable by means of knurled knob which can be fitted with lock and key or acorn nut with lead seal if tamperproof settings are required; see fig 7 and 8.

The R2V is available in two sizes:

(a) R2V-12 – ¾" nominal size, flow capacity 24 Imp gpm (115 l/min)

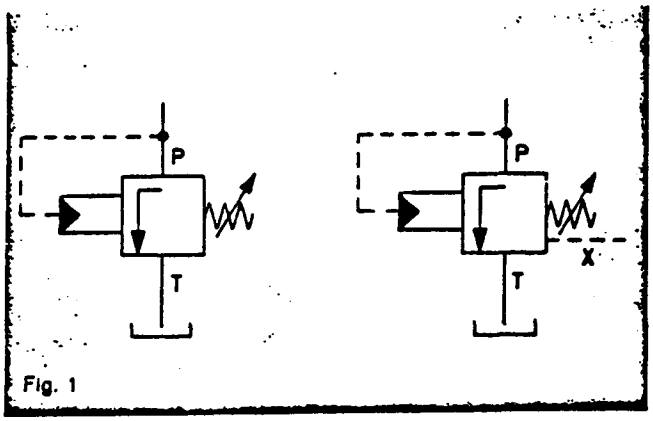


Fig. 1

(b) R2V-24 – 1½" nominal size, flow capacity 65 Imp gpm (300 l/min) both available for threaded body or subplate mounting, connections either BSP.PL or NPTF and may be installed in any position without affecting its performance. The R2V relief valve is very compact in size, relative to the flow and pressures controlled and produces a quiet smooth operation, fast response times and has a minimum pressure overshoot, due to a combination of a relatively high ratio of piston area to piston mass.

Venting can be achieved by the use of remote relief valves (R1E02 range) directional control valves (D1D04 and D2D04 range) or electrical remote relief (SE 03) in conjunction with this valve.

The standard R2V relief valve is not suitable for a high back pressure on the tank port (exhaust) but a slight modification will allow up to approximately 2800 psi providing a differential of approximately 200 psi is maintained. Another modification is the use of a lighter main spring allowing for greater sensitivity at lower pressures.

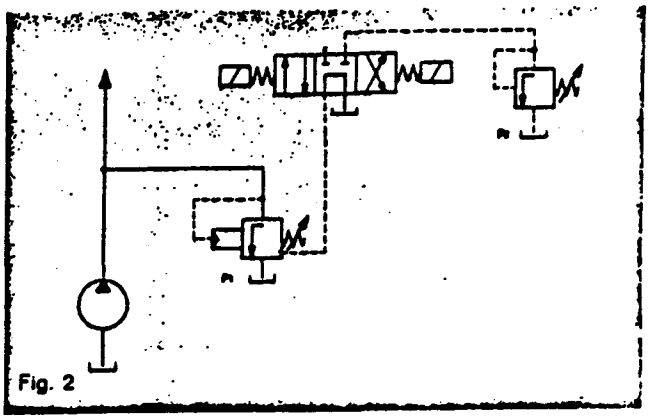


Fig. 2

2. Characteristics

Compact design, robust and reliable construction, using quality materials. Design is standardized on an international basis, all parts being interchangeable regardless of valve manufacturing source. Functional performance, tests are applied to

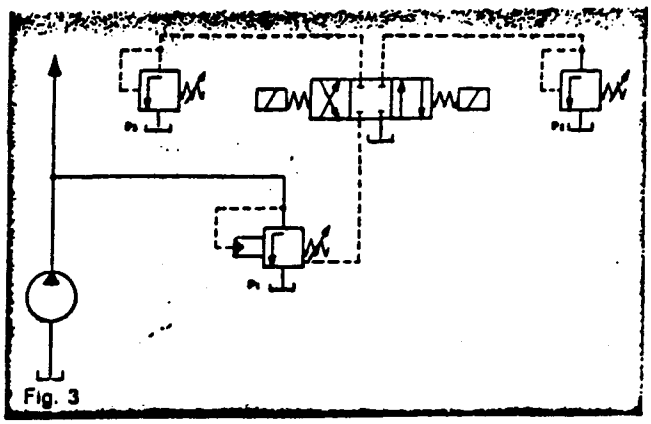


Fig. 3

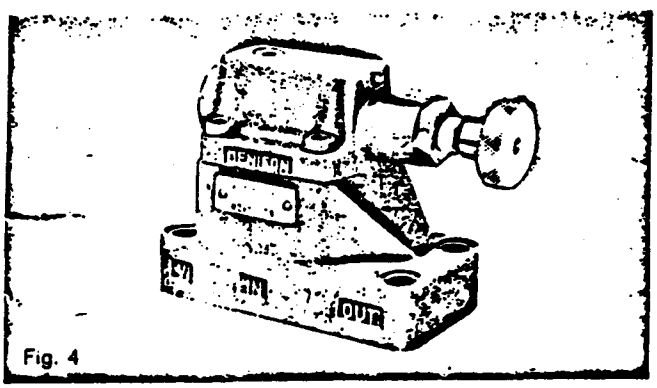


Fig. 4

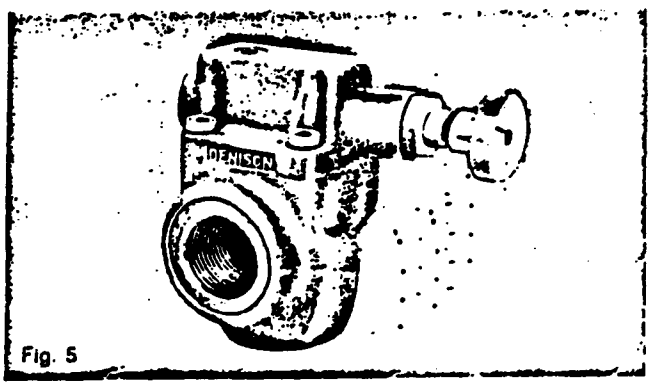


Fig. 5

each valve prior to shipment and all items are subject to stringent quality control procedures.

The R2V valve is designed for use with mineral oils, but fire resistant fluids can be used providing the appropriate seals are fitted (consult nearest Dension Agent).

3. Operation (fig. 6)

Oil from the pressure source enters the valve at port 'A' and is then transferred through orifice plug 'a' into chamber 'F' from here the pressurized oil enters chamber 'C' via drilling 'c' and orifice plug 'b' and acts directly onto control cone 6 which, in turn, is held on its seat by the pre-loading of control spring 7. The degree of preloading corresponds to the operating pressure of the valve, which is set by means of adjusting screw 8. Due to pressurized oil acting on both sides of the main spool, the valve is now hydraulically balanced.

The main spool is held on its seat by the main spring, this prevents instability with small fluctuations of pressure after venting and ensures rapid reseating when valve is brought on load.

When system pressure exceeds the force of pilot spring 7, the cone 6 lifts off its seat and allows oil to flow from chamber 'C' to chamber 'L' and subsequently to tank connection 'B' via drilling 'j'. This causes a pressure drop in chamber 'C'. This then unbalances the main piston which opens allowing flow from 'A' to 'B' whilst maintaining a pressure at 'A'. When pressure falls at 'A', the pressure also falls in chamber 'C' so that the repositioning force of spring 7 overcomes the force against the control cone 6. This action increases the pressure in 'F' to that of 'A' and causes the main spool to reseat which stops flow from 'A' to 'B'.

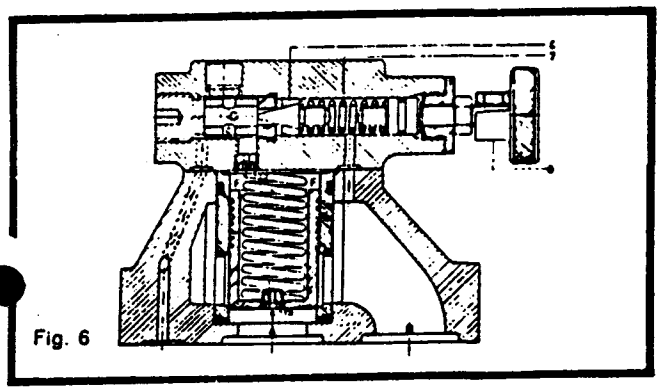


Fig. 6

4. Model Code

Model No. B / R 2 V - 12 - 3 1 3

Threads (Connections)
– NPTF (no letter)
B = BSP.PL

Pressure Control Valve

Design Series

Type of Valve
Relief Valve

Size (Nominal)
12 = ¾"
24 = 1½"

Maximum Working
Pressure of Valve
3 = 3000 psi (210 bars)

Mounting
1 = Threaded Body
3 = Subplate Body

Pressure Range
3 = 100–3000 psi (7–210 bars)

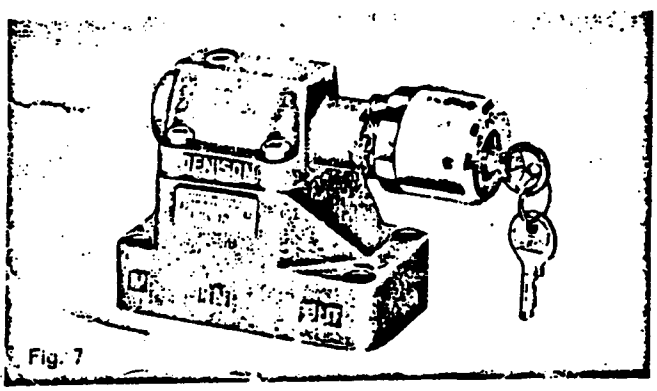


Fig. 7

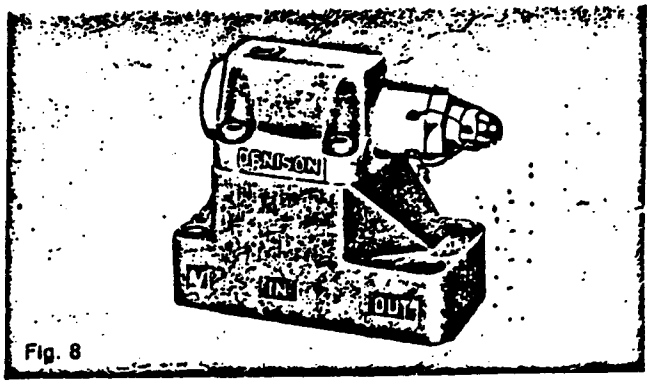
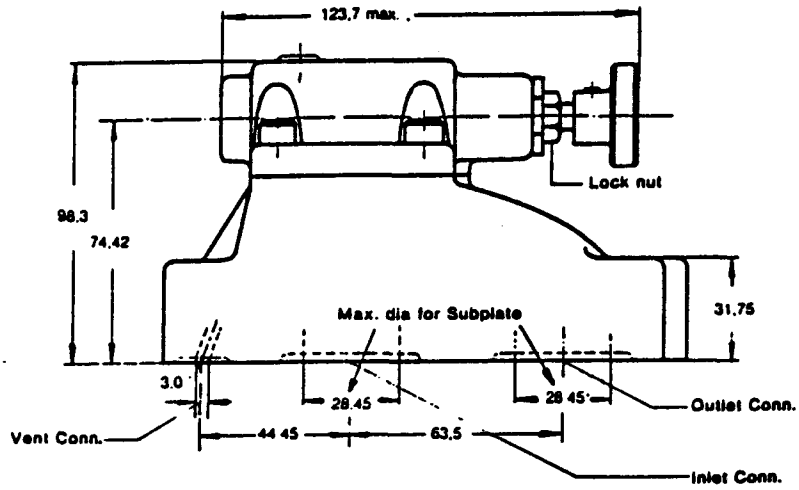
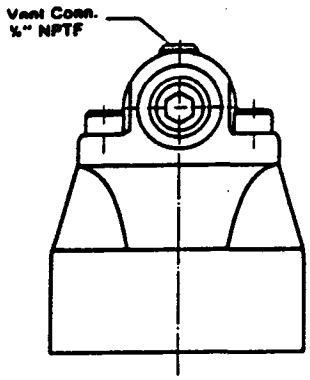
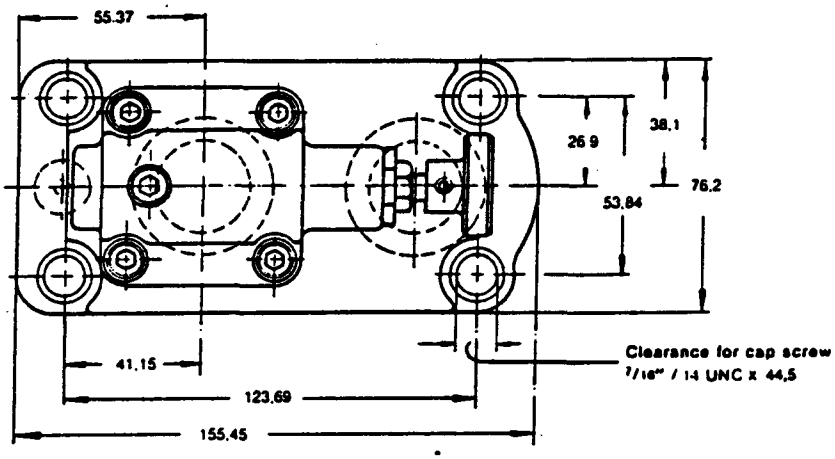


Fig. 8

Print 7/74/2000
Replace 10-E 404-A
Revision 7/74
bkb
Printed in Germany

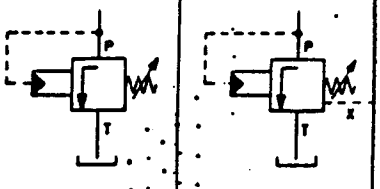






Flow/ l/min / Pressure/bar	42		84	
	Response Time/sec.	Overshoot bar	Response Time/sec.	Overshoot bar
69	0 · 16	21	0 · 22	34
210	0 · 14	7	--	Instbl. 30 bar band

Test conditions: Oil viscosity 43 c St
Oil temperature 50° C

Model No.	Operating Pressure Range (bar)						Symbol
	Inlet		Outlet		Setting Range		
	min	max	min	max	min	max	
R2V - 24 - 333	0	210	0	25	7	210	

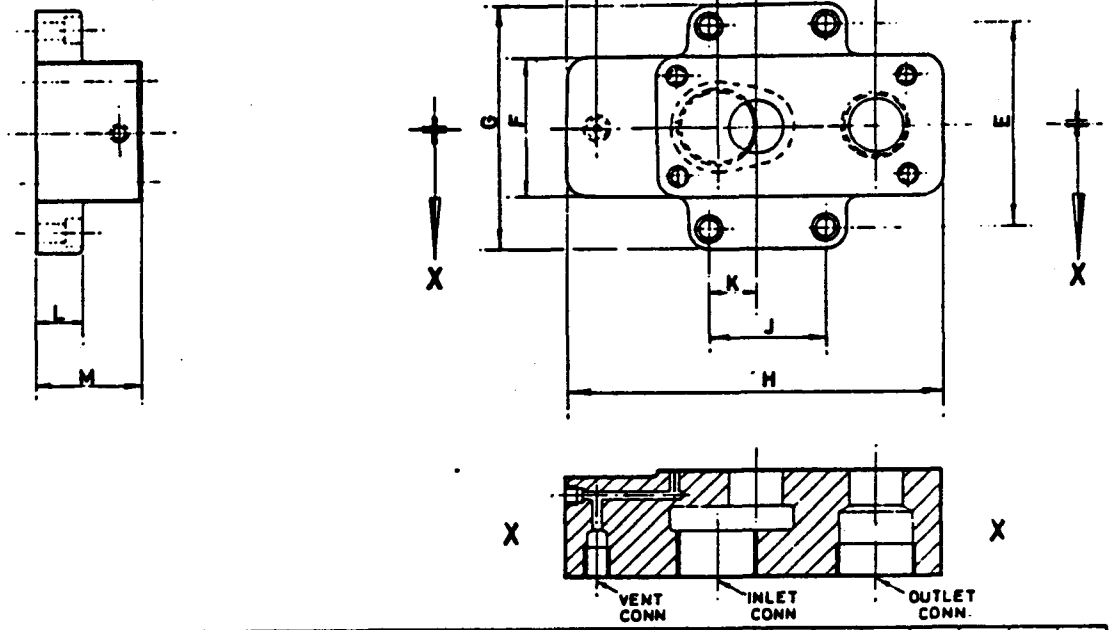
Item	Characteristics	Symbol of quantity	Symbol of SI unit	Technical data
1.	**General**			
1.1.	Type of unit & symbol	-	-	See page 1
1.2.	Model number	-	-	See model code
1.3.	Design	-	-	Poppet-type valve
1.4.	Type of mounting	-	-	Subplate mounted
1.5.	Type of port connections	-	-	Threads
1.6.	Port sizes (subplate)	-	-	Inlet: 1.1/4" BSP.PL., 1.1/4" NPT.F., 1.1/2" BSP.PL., 1.1/2" NPT.F. Outlet: 1.1/4" BSP.PL., 1.1/4" NPT.F., 1.1/2" BSP.PL., 1.1/2" NPT.F.
1.7.	Dimensions of unit	-	mm	See page 1
1.8.	Weight	-	kg	18,7
1.9.	Mounting position	-	-	Optional
1.10.	Direction of flow	-	-	Inlet ▸ Outlet
1.11.	Ambient temperature range	ϑ ϑ	°C °C	-25 min, +60 max.
1.12.	Suitability for special working conditions		-	
2.	**Hydraulic characteristics**			
2.1.	Operating pressure range			
2.1.1.	Inlet	min max	bar bar	See page 1
2.1.2.	Outlet	min max	bar bar	
2.3.	Pressure setting range	min max	bar bar	
2.4.	Fluid temperature range	ϑ ϑ	°C °C	-20 min. +90 max.
2.5.	Viscosity range	ν min ν max	cSt cSt	2,82 650
2.5.1.	Operating viscosity	ν_n	cSt	33,5
2.6.	Nominal flow	q_v	l/min	295

MODEL CODE

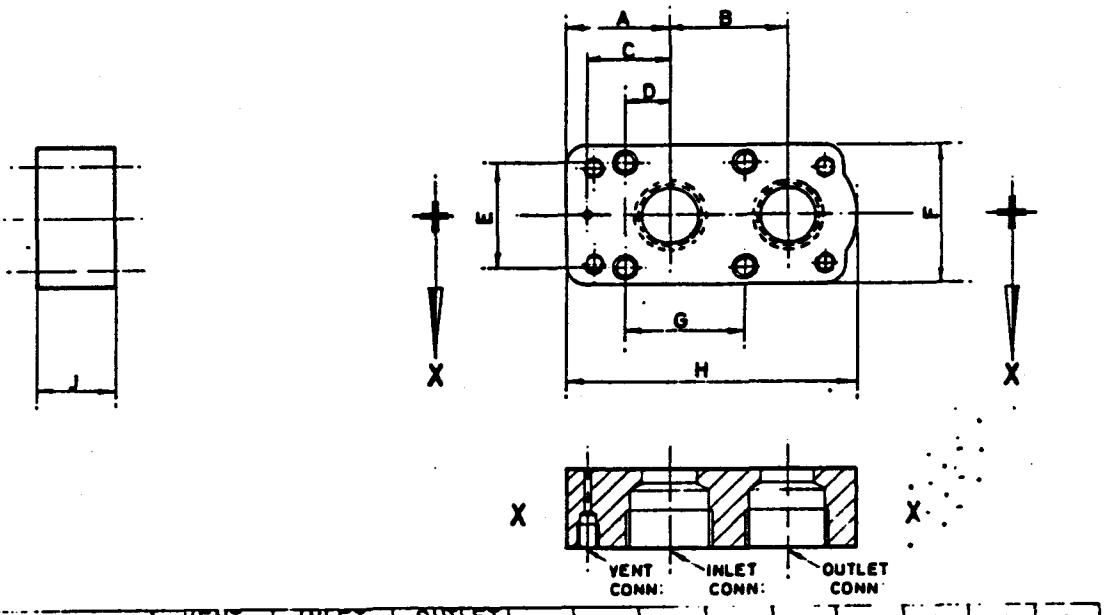
Model No.: R2V 24 - 3 3 3 0 00

- Series: R2V
- Nominal size 1.1/2": 24
- Max. pressure 210 bar: 3
- Subplate mounted: 3
- Pressure setting range: 3
  - 3 = 7—210 bar
- Connections: 0
  - 0 = none
- Accessories & modifications: 00
  - 00 = none
  - V 34 = stronger spring
  - V181 = lighter spring
  - V241 = solid ground spool (orifice plug omitted)
  - V302 = acorn nut with lead seal
  - V328 = adjusting screw with key lock

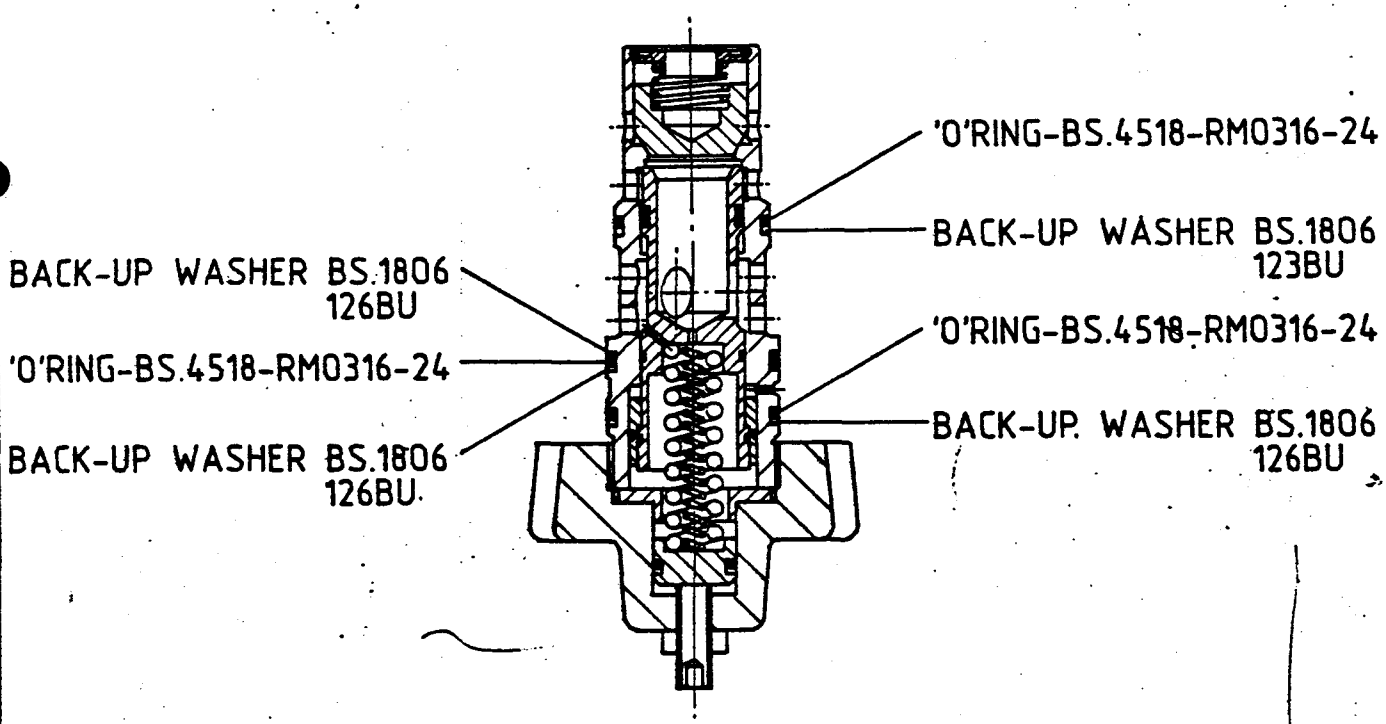
SUBPLATES FOR R2V



MODEL Nº	VENT CONN:	INLET CONN:	OUTLET CONN:	A	B	C	D	E	F	G	H	J	K	L	M
S16-35095	1/4" B.S.P. PL.	1 1/2" B.S.P. PL.	1 1/2" B.S.P. PL.	4"	2 1/2"	3 5/16"	13/16"	4 3/8"	3"	5 1/4"	7 7/8"	2 1/2"	31/32"	1"	2 1/4"
S16-35094	1/4" B.S.P. PL.	1 1/4" B.S.P. PL.	1 1/4" B.S.P. PL.	4"	2 1/2"	3 5/16"	13/16"	4 3/8"	3"	5 1/4"	7 7/8"	2 1/2"	31/32"	1"	2 1/4"



MODEL Nº	VENT CONN	INLET CONN	OUTLET CONN	A	B	C	D	E	F	G	H	J
S16-08149	1/4" N.P.T.F.	1 1/2" N.P.T.F.	1 1/2" N.P.T.F.	2 3/16"	2 1/2"	1 3/4"	31/32"	2 1/4"	3"	2 1/2"	6 1/8"	1 11/16"
S16-08148	1/4" N.P.T.F.	1 1/4" N.P.T.F.	1 1/4" N.P.T.F.	2 3/16"	2 1/2"	1 3/4"	31/32"	2 1/4"	3"	2 1/2"	6 1/8"	1 11/16"

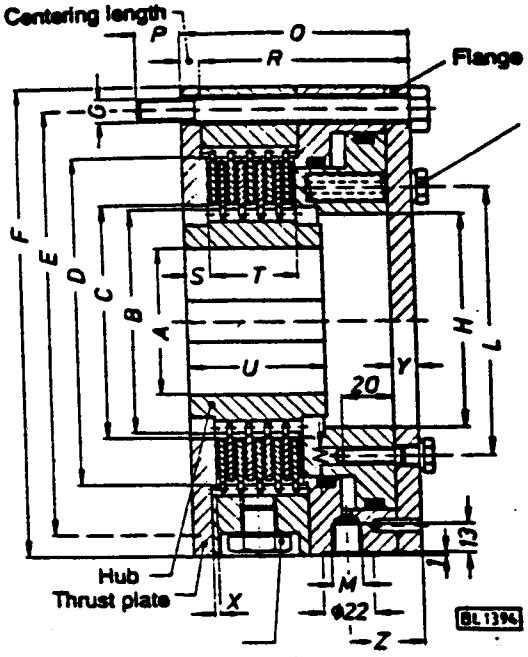


TITLE :-

LOAD CONTROL VALVE E2B 300 (STERLING)

SCHAT DAVITS LTD. LONDON.
TELEX - 21811
TEL. BOWMANSGREEN 22244

REF. Nº SPD 280



QTY	PART N°	DESCRIPTION.
8	3-022-615-23-005	OUTER PLATE
7	3-022-740-23-030	INNER PLATE
16	1-999-111-09-022	SPRING
16	1-999-111-06-021	SPRING
1	4235 / 861608024	QUADRING
1	4239 / 861608025	QUADRING

HYDRAULIC BRAKE 0-022-519-23 -002

(ORTLINGHAUS) BORE 30 MM

SCHAT-DAVIT Co Ltd.
60b HIGH STREET.
HARPENDEN.
HERTS. AL5 2FP. ENGLAND.
TEL: 05827 65295.
TELEX. 82447
TELEFAX: 05827 68409.

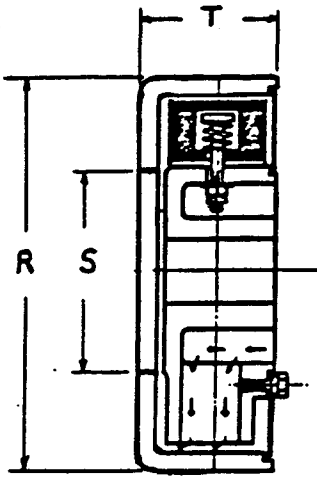
SPD N° 314

BROADBENT DRIVES
WETHERBY ENGINEERING CO. LTD., BRITANNIA MILLS, PORTLAND STREET, BRADFORD BD5 0DW
Tel. Bradford (0274) 307920/307945/721522 Telex 51515 TBSG Ref. BBD

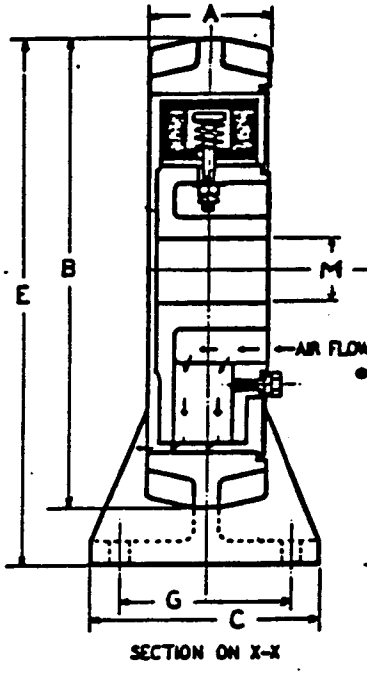
BROADBENT AUTOMATIC CENTRIFUGAL BRAKE

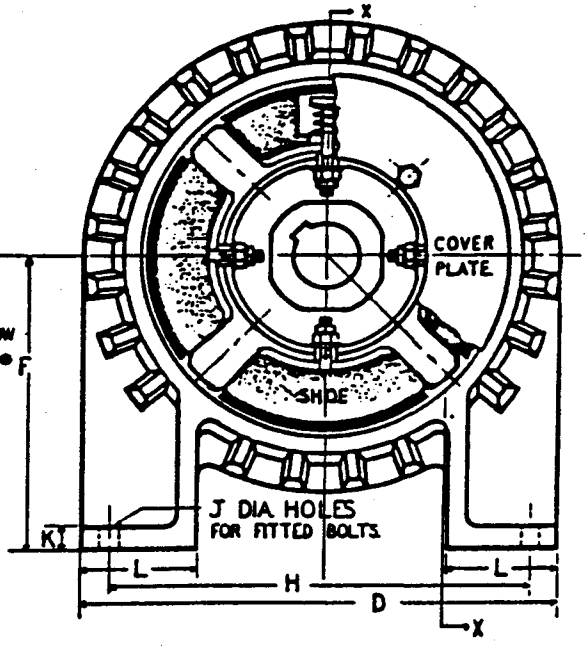
This automatic brake combines simplicity, reliability and efficiency. Working parts are confined to a stationary brake outer and a centre in the form of a spider carrying four spiral spring controlled shoes bonded with friction material on the outer face.

The springs hold back the shoes whilst lifting the load under power, but when lowering under gravity at a predetermined higher speed, the shoes are thrown radially outward and engage with the brake outer, thus controlling the lowering speed.



INTERNAL FLANGE MOUNTING





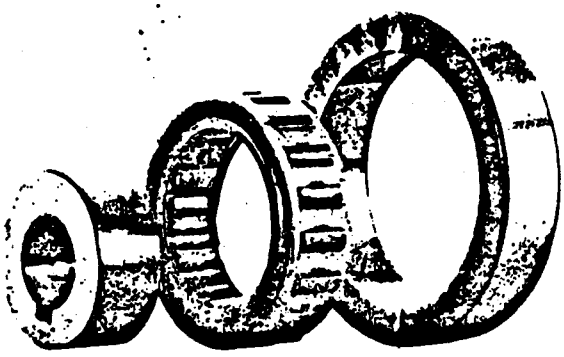
Centrifugal brakes are available for foot mounting or flange mounting.

DIMENSIONS IN MILLIMETRES

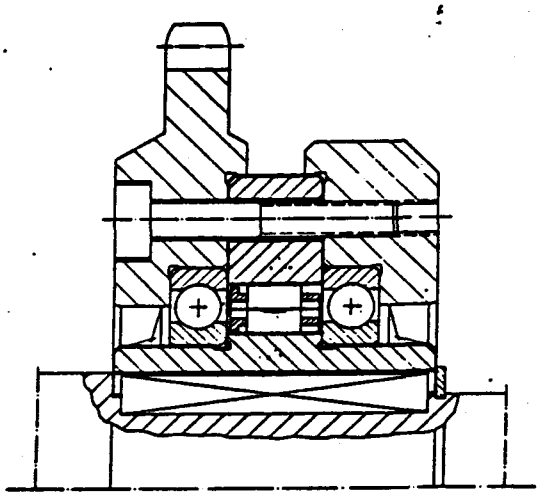
MODEL	A	B	C	D	E	F	G	H	J	K	L	MAX M / MIN	R	S	T
BC15	30	166	70	200	203	120	45	150	11	12	63	25 / 12	140	70	33
BC18	45	229	95	254	267	152	64	190	13	13	76	48 / 27	178	89	46
BC20	70	254	127	279	292	165	76	216	13	13	76	48 / 27	203	89	73
BC25	79	305	140	330	343	191	89	267	13	13	89	60 / 37	254	140	83
BC30	89	356	152	381	406	229	89	318	17	16	89	76 / 47	305	140	95
BC35	102	406	165	432	457	254	102	368	17	16	89	92 / 47	356	140	108
BC45	114	521	191	521	578	318	114	445	20	19	102	108 / 78	457	191	127
BC60	127	679	203	679	740	400	127	603	19	19	102	162 / 100	610	191	146

Specifications and illustrations.
The right of modification without notice is reserved.

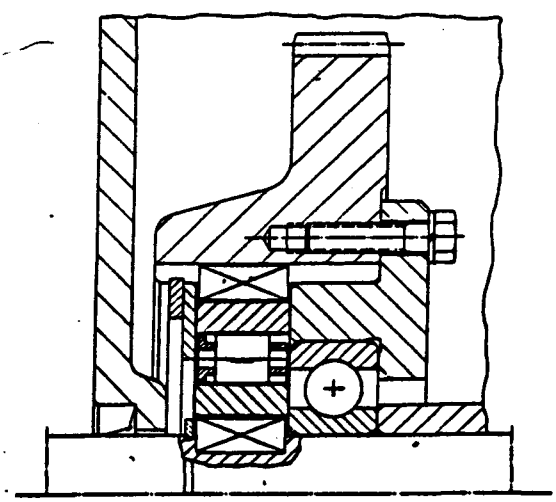
Standard inner and outer races for Borg-Warner Freewheels



Borg-Warner Freewheel
with inner race G and outer race B.



Borg-Warner freewheel with narrow race G and key race A fitted to a gear



Borg-Warner freewheel with double bearing race J and flange race C fitted to a sprocket gear

Standard inner and outer races of different designs are available for four standard Borg-Warner freewheels. The races are made from carburized hardened and ground steel. The first illustration shows a Borg-Warner freewheel with a standard inner race Type J (double bearing race) and an outer race Type C (flange race). The assembly is sealed with one end cover acting as a drive gear. The second illustration shows a Borg-Warner freewheel with a standard inner race Type G (narrow race) and an outer race Type A (keyed race).

The maximum torque transmitted using these races depends on the capacity of the key and not the capacity of the freewheel unit which is higher.

Special inner and outer races can be supplied to meet your special applications on receipt of your precise requirements.

The advantage of using separate inner and outer races is two-fold. Firstly these hardened races can be fitted to non-hardened shafts and housings, and secondly can be replaced after normal wear without having to make up a complete housing or shaft, which would be the case where the sprags are running directly on a hardened shaft or housing.

BORG-WARNER - STIEBER GMBH HEIDELBERG

Inner and Outer Races for Borg-Warner Freewheels

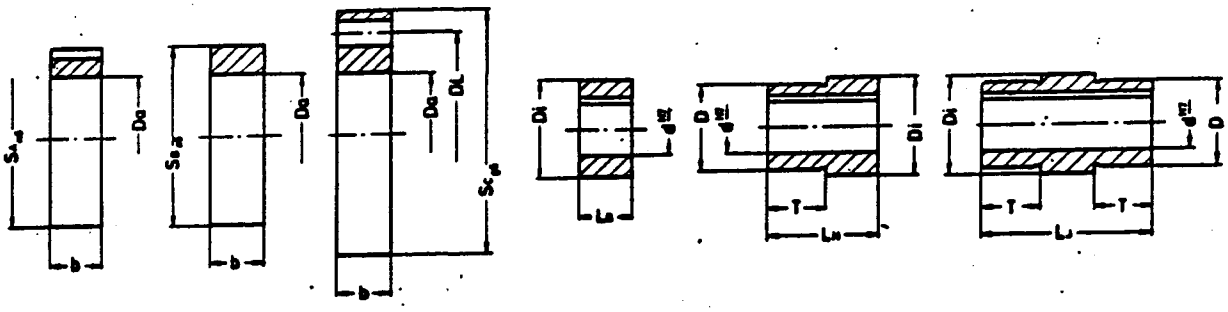
BORG WARNER

Outer Races

A = Slot race B = Press race C = Flange race

Inner Races

G = Narrow race H = Half bearing race J = Double bearing race



Keyway to DIN 6885 Sheet 1

Type	Part No.	Outer race dimensions							Used with
		b	$S_A\Phi_{n6}$	$S_B\Phi_{s6}$	$S_C\Phi_{s6}$	$D_L\Phi$	No and Dia. of Holes	Da Φ	
		mm	mm	mm	mm		Φ mm	mm	
BW 167 A	556004	16	90	90				71.42	BW 13214
BW 167 B	556005	16						71.42	BW 13217
BW 167 C	556006	16			110	95	8 x 9	71.42	BW 13167
BW 168 A	556101	21	110	110				88.86	BW 13243
BW 168 B	556102	21						88.86	
BW 168 C	556104	21			140	120	8 x 11	88.86	BWC 13168
BW 230 A	556204	16	72	72				54.76	BWX 133392
BW 230 B	556205	16						54.76	
BW 230 C	556203	16			95	78	8 x 7	54.76	BWC 13230
BW 235 A	556301	16	150	150				119.90	BW 13261
BW 235 B	556305	16						119.90	
BW 235 C	556303	16			190	170	8 x 11	119.90	

Keyway to DIN 6885 Sheet 1

Type	Part No. d Φ H7 in mm			Inner race dimensions						Used with
				L_G	L_R	L_J	DΦ	T	DIΦ	
	25	30	35	mm	mm	mm	mm	mm	mm	
BW 167 G	556010	556013	556015	16	35		50		54.76	BW 13214
BW 167 H	556020	556023	556025				50	19	54.76	BW 13217
BW 167 J	556031	556033	556035			54	50	19	54.76	BW 13167
	40	45	50							
BW 168 G	556110	556112	556114	21	42		65		72.20	BW 13243
BW 168 H	556120	556123	556124				65	21	72.20	BWC 13168
BW 168 J	556131	556133	556134			63	65	21	72.20	
	10	15	20							
BW 230 G	556210	556212	556215	16	33		35		38.10	BWX 133392
BW 230 H	556220	556222	556224				35	17	38.10	BWC 13230
BW 230 J	556230	556232	556234			50	35	17	38.10	
	55	60	75							
BW 235 G	556310	556312	556314	16	43		100		103.24	BW 13261
BW 235 H	556320	556322	556324				100	27	103.24	
BW 235 J	556330	556332	556334			70	100	27	103.24	

Design subject to modification.

When ordering or inquiring state the type and size of the outer race together with the type of race, for example – when using a freewheel type BWX 133392; for an outer race type "C" having a diameter S_C of 95 mm state part-no. "556203".

To obtain keyway dimensions of race "A" use outer diameter SAn6 to select appropriate keyway from DIN 6885.

When ordering or inquiring state the type and bore size of inner race, together with the type of race, for example – when using a freewheel type BWC 13230; for an inner race type "J" having a 20 mm bore, please state part-number "556234".

Tolerance of ball-race diameter "D" according to ball-bearing types 60 and 160 to DIN 625.

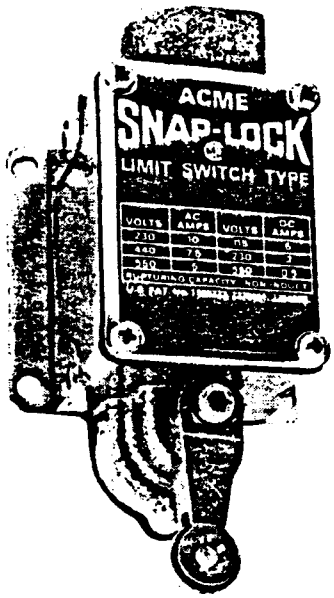
The maximum torque transmitted using these races depends on the capacity of the key and not on the capacity of the freewheel unit which is higher.

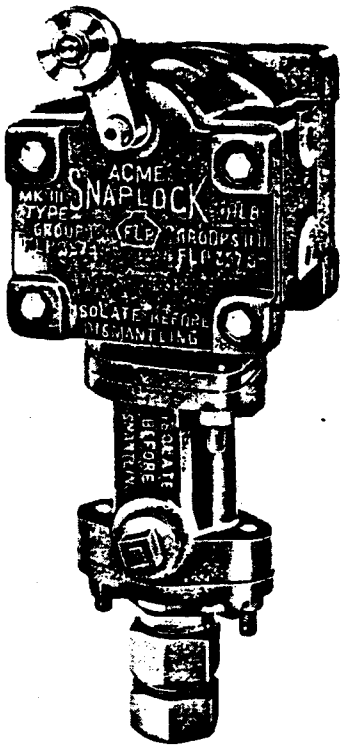
BORG-WARNER-STIEBER GMBH HEIDELBERG

SIGMA

Snaplock Heavy Duty Limit Switches

Series 600 and 610 (HLB)





Snaplock switches are lever operated heavy duty switches used minaly in control applications. They are offered in industrial and flameproof versions and have a number of electrical and mechanical variants. They are electrically rated at up to 10 Amps continuous capacity at 550 Volts ac or dc.

Industrial

Snaplock Model 600 series industrial switches are housed in rugged aluminimum die cast casings to withstand heavy duty environments. Model 600 switches are offered in four types – standard, Admiralty pattern, pedal switch and tandem. The switches are all single-pole except the tandem switch which comprises two standard units mounted back to back and operated by a single lever to form a double-pole switch.

Standard switches are offered in three electrical variants – spring return, neutral position or centre connection – and with three optional mounting facilities.

The mechanical and electrical mechanisms are housed in separate compartments isolated from each other by an inner wall. Both sides are easily accessible for maintenance or replacement and are effectively sealed with heavy duty gaskets against the ingress of water, oil and dust.

Over 100 different shapes and size of lever are offered all of which are adjustable for position over 165°.

Flameproof

Snaplock model 610 flameproof and explosive dust tight switches are housed in Meehanite iron castings and have full certification for use in hazardous environments. Model 610 flameproof switches are available in a range of electrical variants which include replaceable single-pole, double-pole and safety cartridges and replaceable single-pole contact assemblies for spring return, neutral position and stayput operation.

Mechanical variants concern the cable entry arrangements. A range of cable entry glands will allow the connection of a variety of cables in either single or double cable entry versions.

Model 610 flameproof switches are fitted with sealing chambers with an interposing plug and socket arrangement between the main housing and the sealing chamber. Explosive dust tight switches have no sealing chamber but are wired directly onto the switch block terminals and are fitted with a conduit entry plate.
The range of over 100 different operating levers are all adjustable for position over the whole 360°.

Flameproof Switch Selection

The type of hazardous environment for which Model 610 flameproof switches have been designed is covered by official certification of various types as are the switches themselves. It is therefore extremely important to select the correct switch for the application. The local Factory Inspector will provide assistance and guidance on the required approval for any given application and Sigma will be pleased to provide further information on the switches on request.

Special Switches

In addition to the standard switches the Snaplock flameproof range also includes a number of special switches designed to fulfil specific customer requirements. These are basically variants of the standard switches and include foot switches, tandem switches, two step switches etc. Customers requiring more detailed information or assistance should contact Sigma Ltd either at Letchworth or through their local sales engineer, agent or distributor.

Electrical Features

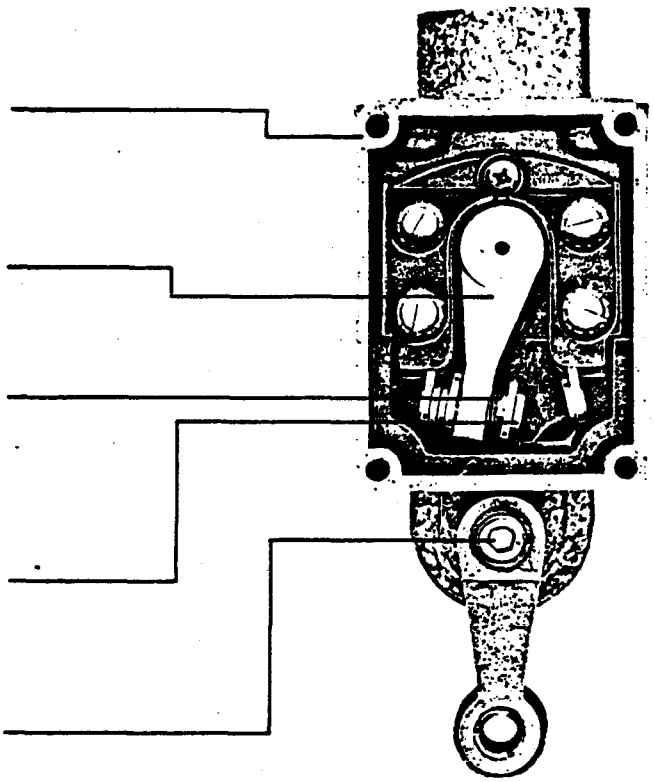
Cover plate, insulator and gasket (removed for photograph) provide effective protection and sealing. Large and easily accessible stainless steel terminal screws make wiring connections a simple matter.

Replaceable self-locating contact arm and contact block available in service kit form.

Single pole – double break – double throw – either circuit normally open with other closed, or maintaining in either position, or neutral (central) position – both circuits open.

Rapid snap-action – silver contacts wipe at make and break.

Serrations provide lever positioning adjustment by 7.5° increments either way. Loosen plug – remove lever – replace lever in desired position – tighten plug.



Mechanical Features

Cover plate and gasket (removed for photograph) ensure effective sealing. Separate compartments for mechanical and electrical sides divided by inner wall of the switch.

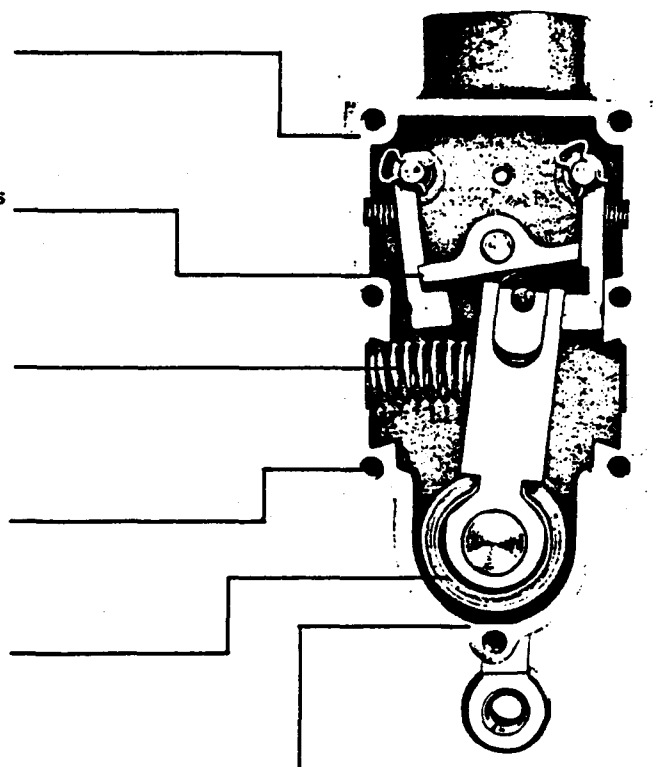
Definite locking maintained by hardened steel latches with knife-edges for accurate repetitive tripping.

Return spring transferable for normal closing either side or removable for maintained contact. Neutral position switch has a spring each side to return lever to central position – both circuits open.

Two-screw side mounting or optional back plate mountings in two styles.

Overtravel spring – the number of leaves can be reduced for softer action.

Robust aluminium diecast case (standard). 'Mazak' case for NCB and similar requirements to order.

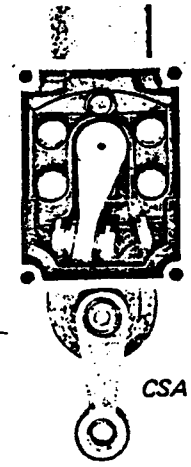


Snaplock Heavy Duty Industrial Limit Switches

Model 600 Series

Water-, Oil- and Dust-proof to IP66: 20 mm. Conduit or Admiralty Cable Gland

Standard



CSA approved.

Single pole, double-break, double-throw having 1 normally closed and 1 normally open circuit. Supplied to operate clockwise (viewed from lever end of operating shaft) unless ordered otherwise; the return spring may be used on either side of the lever arm to re-set the switch automatically when operating with one circuit normally open and the other closed. Removal of the return spring provides a circuit maintained in either position. In the latter case the switch is re-set (or contact is made in the opposite position) solely by external movement of the operating lever.

Admiralty pattern NATO part no. 435 6212

Switch as above but with special stainless steel No. 3 gland supplied only with aluminium alloy LM6 case (Admiralty approved non-corrosive).

Levers

Switches are normally supplied without operating levers, the choice of lever for the application concerned being ordered separately from a range of thirty styles and one hundred different sizes. See page 14 for details.

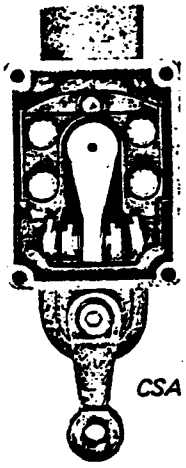
Mountings

Two-screw side mounting or backplate mounting in two styles as shown in the installation specification on page 8.

Aluminium or 'Mazak' cases

The standard Series 600 Snap-Lock switch and its variants shown on this page are normally supplied with robust diecast aluminium cases, however, they can be supplied with 'Mazak' cases, to order, for National Coal Board and other applications.

Neutral position

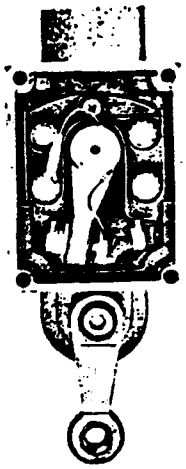


CSA approved

Single pole, double-break, double circuit, neutral position. A special return spring on each side of the lever arm returns the lever to the central (neutral) position – (both circuits open). The return springs are removable for certain circuit requirements, e.g., by removing one return spring the switch is converted to stay-put on side without spring and neutral position (normally open) on opposite side. By removing both springs the switch is stay-put in all three positions.

Otherwise as for the 'standard' switch.

Centre connection



Standard or neutral position Snaplock switches can be supplied with a connection from a terminal to the moving contacts to order.

Centre connection to a N.C. terminal gives 1 N.C., 2 N.O. common contacts.

Centre connection to a N.O. terminal gives 1 N.O., 2 N.C. common contacts.

Otherwise as for the 'standard' switch.

Switch type and part numbers

Standard – 1 N.O., 1 N.C.	*Aluminium*	*Mazak*
With two-screw side mounting	560010	560510
With backplate mounting Style 1	560046	560546
With backplate mounting Style 2	560082	560582
Neutral Position		
With two-screw side mounting	560118	560618
With backplate mounting Style 1	560154	560654
With backplate mounting Style 2	560190	560690
Admiralty pattern NATO part no. 435 6212		
Standard switch with stainless steel No. 3 cable gland, side screw mounting	560325	–
With backplate mounting (not covered by Admiralty pattern No.)		
Style 1	560326	–
Style 2	560327	–

Additional ordering information

Add 'SR' if switches are required to operate counter-clockwise viewed from the lever end of the operating shaft.

Add 'WS' if return spring is not required, i.e., for 'stay-put' operation.

State lever required – for details see page 14.

Snaplock Heavy Duty Industrial Limit Switches–Electrical Specification

Model 600 Series

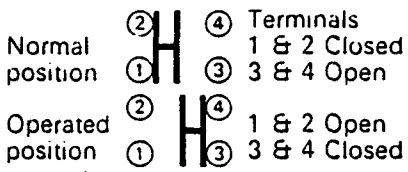
Current Ratings

	Amperes A.C. Circuits						Amperes D.C. Circuits					
Volts	220		440		550		115		230		550	
Circuit	Single	Double	Single	Double	Single	Double	Single	Double	Single	Double	Single	Double
Surge	20 00	20 00	20 00	20 00	20·00	20·00	—	—	—	—	—	—
Continuous capacity	10 00	10 00	10·00	10 00	10 00	10 00	10 00	10 00	10 00	10 00	10 00	10 00
Rupturing capacity (non-inductive)	10 00	10 00	7 50	7·50	5·00	5 00	5 00	5·00	2 00	1 00	0 50	0 25
Rupturing capacity (inductive)	10·00	10 00	7·50	7 50	5·00	5·00	5·00	1·00	1 00	0 50	0·25	0 13

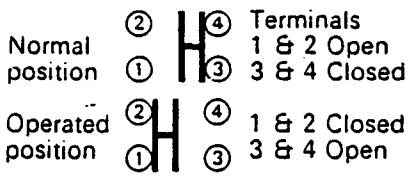
Circuit Arrangements

Standard switch – 1N.O., 1N.C.

Clockwise operation

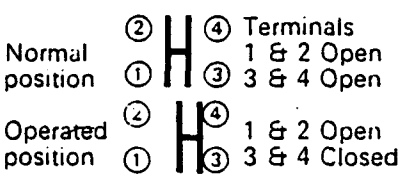


Counter-clockwise operation

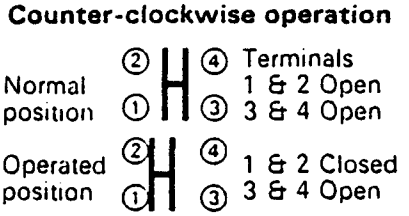


Neutral position switch

Clockwise operation



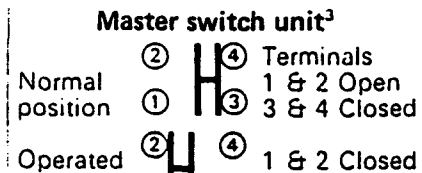
Counter-clockwise operation



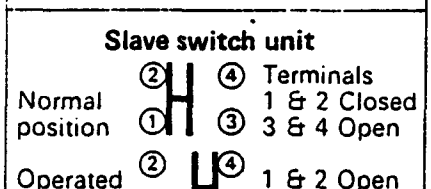
Tandem switch – 2N.O., 2N.C.

Counter-clockwise operation

Master switch unit[3]

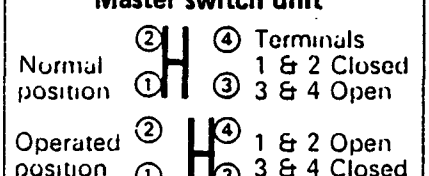


Slave switch unit

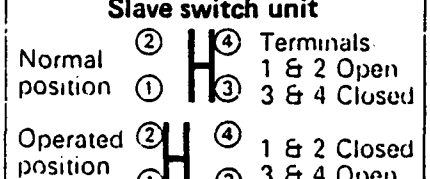


Clockwise operation

Master switch unit[3]



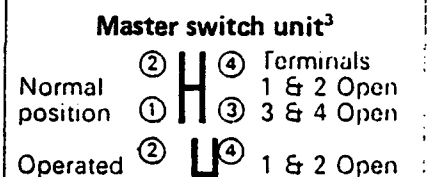
Slave switch unit



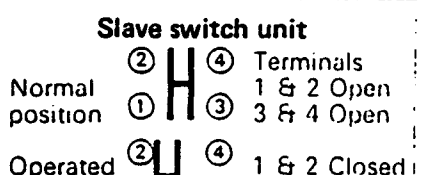
Tandem-Neutral position

Clockwise operation

Master switch unit[3]

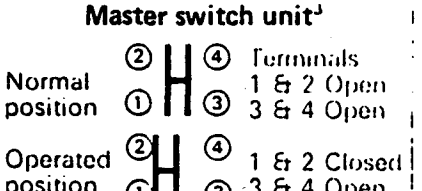


Slave switch unit

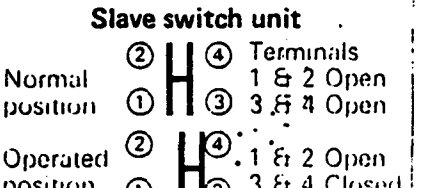


Counter-clockwise operation

Master switch unit[3]



Slave switch unit



Notes

Clockwise or counter-clockwise operation is the direction of movement of the operating lever viewed from the lever end of the operating shaft.

[1] The Standard switch is supplied to operate clockwise unless ordered otherwise.

[2] The Tandem switch is supplied to operate counter-clockwise unless ordered otherwise.

[3] The Master switch unit carries the operating lever.

-Operating Specification

Model 600 Series

Lever Travel and Operating Torque

Standard switches (1 N.O., 1 N.C.)

Lever travel

To trip switch	10.5° (See note 1)
Return travel to re-set	7° ± 1°
Overtravel	28° (minimum)

(Travel is CW or CCW depending on position of return spring).

Lever position

Adjustable in increments of 7.5° (see note 2).

Operating torque

With standard return spring	1.64 Nm
Without return spring	0.59 Nm
Full overtravel	4.52 Nm

Neutral position switches

(Both circuits open in centre position)

Lever travel

To trip switch	7° (See note 1)
Return travel to reset	5° ± 1°
Overtravel	28° (minimum)

(Travel is CW or CCW).

Lever position

Adjustable in increments of 7.5° (see note 2).

Operating torque

With standard N.P. return springs	3.5 Nm
Without return springs	0.51 Nm

Note 1

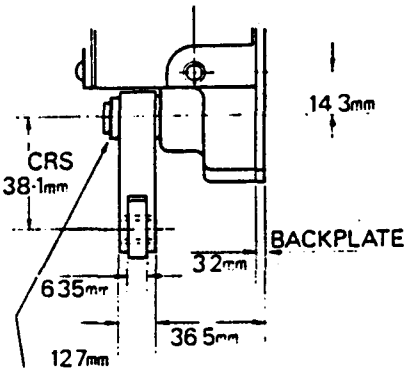
Manufacturing tolerances provide an allowable variation of plus or minus 1° in lever tripping travel between different switches in the same series. Allowable variation in repetitive tripping of the same switch is 0.025 mm.

Note 2

Adjustment available using standard levers is through 165° on Series 600 Switches and through 360° on Series 610 Flameproof and Dust-tight switches.

Lever Positioning

Lever positioning details are given here but please note that switches are normally supplied without levers. See page 14 for details.



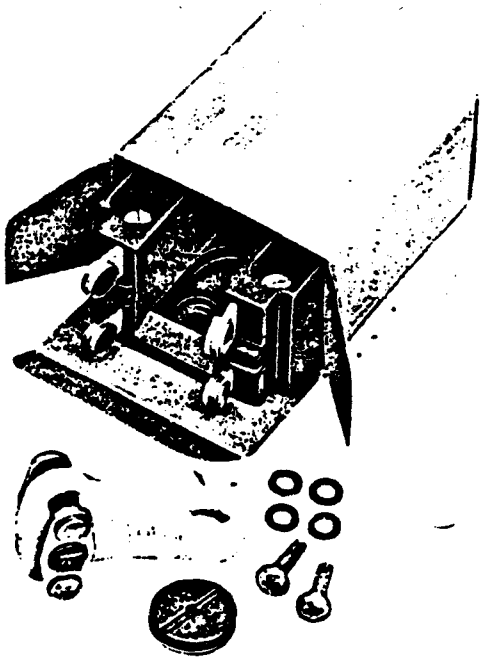
12·7mm DIA SHAFT WITH 48 SERRATIONS LOOSEN PLUG. REMOVE LEVER. RE-SET TO DESIRED POSITION

Electrical Servicing Kit for Snaplock Industrial Limit Switches

There are only two assemblies on the electrical side of a Snaplock limit switch; a one piece, moulded contact block and the contact arm itself. As they are interchangeable on all models replacement is a simple matter. Electrical servicing kits are available consisting of these items complete with holding nut and fixing screws.

Part Number

Servicing kit	540300



Snaplock Heavy Duty Industrial Limit Switches–Installation Specification

Model 600 Series

Water—, Oil— and Dust-proof to IEC 144 class IP66

Standard switch (side screw mounting).

Levers

Although the diagram shows a lever in position, switches are supplied without levers fitted. For details of levers available see page 14.

Lever travel and operating torque

The diagram shows lever travel for a standard arrangement, 1 N.O., 1 N.C. For neutral position lever travel and operating torque see page 7.

Return spring position

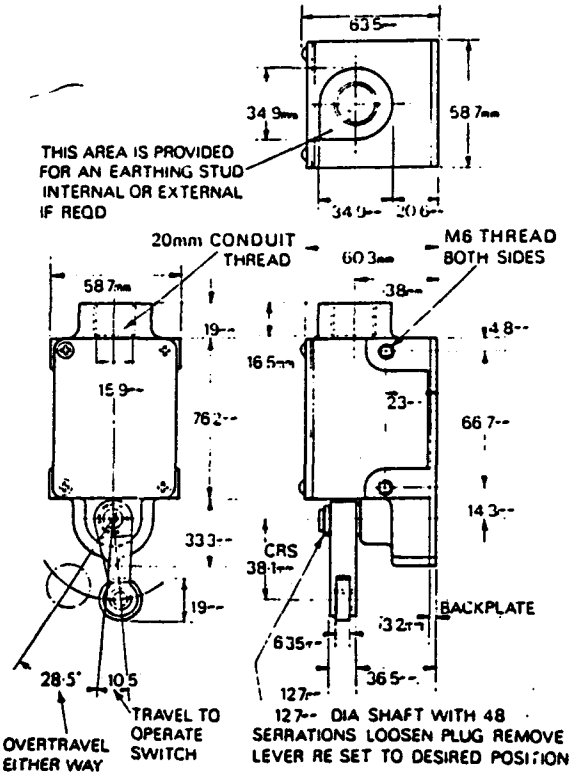
Unless specified otherwise when ordering, the standard switch is supplied to operate clockwise (viewed from lever end of operating shaft). The return spring can be transferred to the other side to provide counter-clockwise operation or can be removed altogether to provide maintained contact either side. The neutral position switch has a spring each side to return the lever to the central (neutral) position – both circuits open.

Ambient temperature capacity

Max. ambient operating temperature 75°C (170°F).

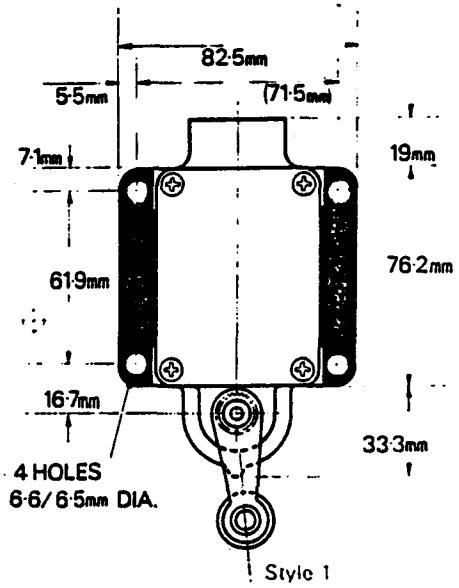
Weight

28 oz (794 gm).

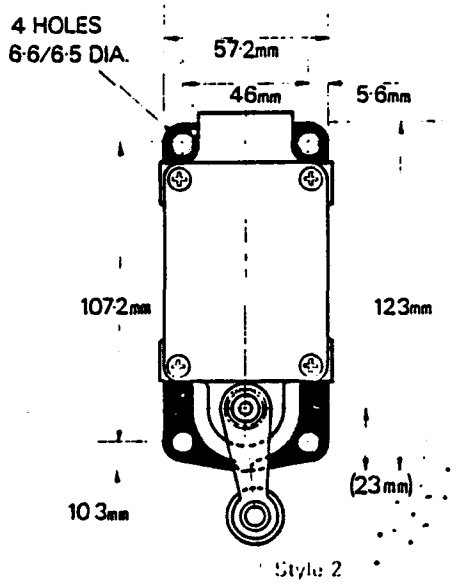


Standard switch (back plate mounting)

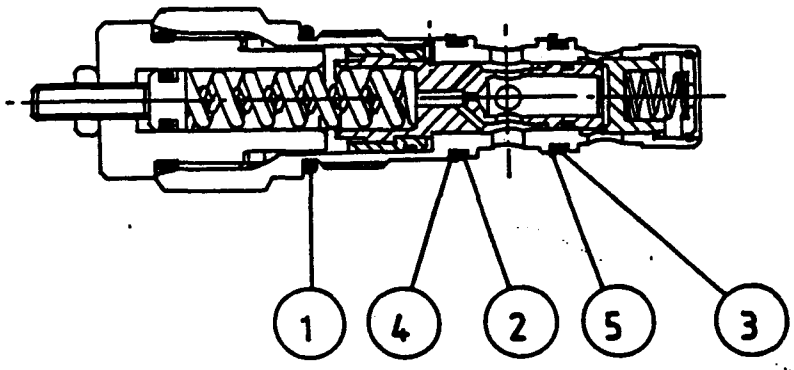
Backplate mountings can be supplied in styles 1 or 2; in all other respects the switches are the same as standard side screw mounting switches.
All switches have M6 tapped side holes.



Style 1



Style 2



THE SEALS SHOULD BE OILED BEFORE ASSEMBLY & CARE TAKEN WHEN ASSEMBLING THE RUBBER "BACK-UP" WASHER THAT IT IS NOT TWISTED.

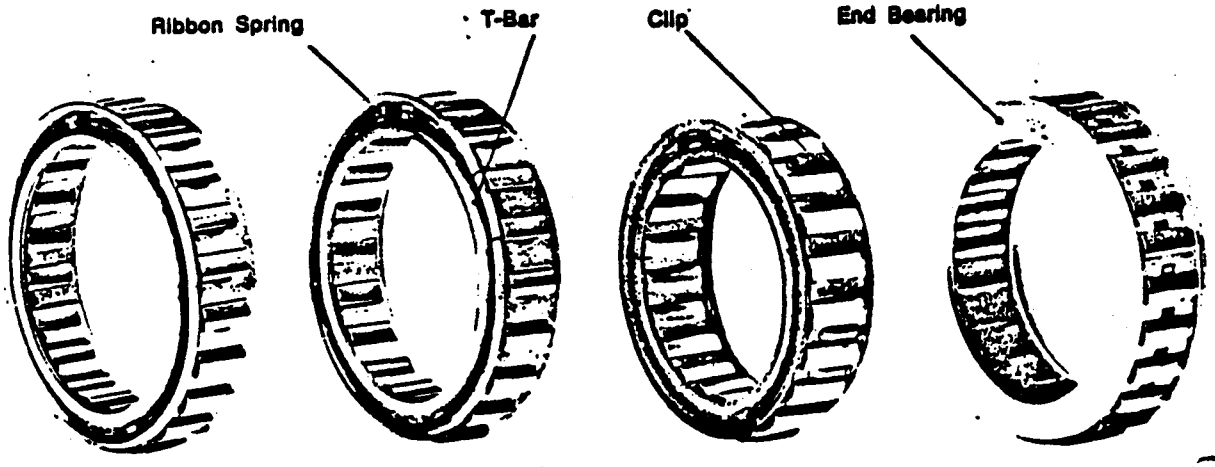
ITEM N°	PART N°	DESCRIPTION.	N° OFF PER	
			VALVE	KIT
1	4-3014	'O' RING.	1	10
2	4-1021	'O' RING.	1	10
3	4-1020	'O' RING.	1	10
4	4-4021	BACK-UP WASHER.	1	10
5	4-4020	BACK-UP WASHER.	1	10

SEAL KIT NUMBER SK3-0008 CONTAINS SUFFICIENT EXTERNAL SEALS FOR 10 VALVES.

LOAD CONTROL VALVE E2B 60 (STERLING HYDRAULICS)

SCHAT-DAVIT Co Ltd.
60b HIGH STREET.
HARPENDEN.
HERTS. AL5 2FP. ENGLAND.
TEL: 05827 65295.
TELEX. 82447
TELEFAX: 05827 68409.

SPD No. 303.



Borg-Warner freewheels are not supplied with bearings, and some form of bearing support must be incorporated in the design of the mechanism in order that the inner and outer races run concentrically.

They are particularly suitable in designs where high torques combined with space restriction requirements apply.

The Borg-Warner freewheels are supplied as one assembly completely ready for fitting directly into the mechanism. There are no individual loose parts, therefore there is no loss of fitting time either on initial assembly or when fitting replacements.

For ease of assembly it is recommended that both the inner and outer races are lightly chamfered, but this must not reduce the axial space b (mm). When fitting, the freewheel should be rotated slightly in the freewheeling direction and on no account backwards.

Where drag strips are used the axial space must be of sufficient length, and if necessary can be exceeded by 1 mm. To give axial positioning circlips or unhardened side plates are quite sufficient. Where very quick assembly is required lead-on tubes are a distinct advantage.

It is essential that for the successful operation of Borg-Warner freewheels production of the inner and outer races should adhere to the following conditions.

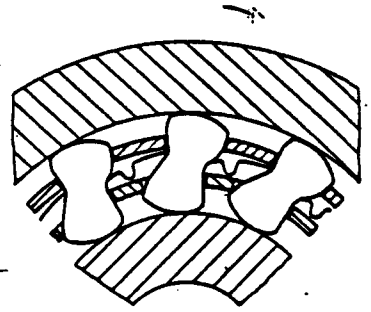
1) Tolerance of the inner and outer diameters Di and Da equals ± .0005".
   For the types with end bearing BWX 136621, BWX 136324 and BW 13222 the tolerances for the outer diameter of the inner race must be – .0002" + .0003". It is also recommended for special applications – e.g. automotive industry and aircraft industry, these tolerances apply.
2) Surface hardness 60 minimum Rockwell C.
3) Steels with a good core characteristic 35–45 Rockwell C.
4) Case depth of finished race .032/.034".
5) Surface finish 20 RMS.
6) Sprag space tolerance between respective races ± .003".

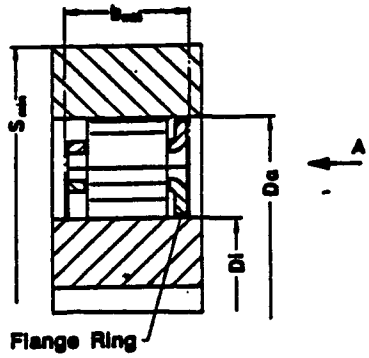
For projects where large quantities of freewheels are required we can design and produce freewheels to meet special operating conditions and application requirements.

We supply Borg-Warner freewheels to the aviation industry for use in both aircraft and helicopters, which meet all required stringent specifications for such applications. We request the maximum information in order that we can give the best possible technical answer for such applications.

Furthermore, we also supply freewheels to the marine industry, for high torque and high speed applications.

BORG-WARNER - STIEBER GMBH HEIDELBERG





Centering Flange Ring

TYPE	Part No.	±0.02 DiΦ	±0.02 DaΦ	bmin	Smin	SPRAGS Special (1)	SPRAGS Normal	SPRAGS Type	Drag strip	Clips or T Bar	End Bearings	Rotation Direction (2)	Torque	Weight
		mm	mm	mm	mm	NUMBER OFF			NUMBER OFF				lb./ft.	oz.
BWX 13 3590	553590	22,20	38,96	10	50	–	12	disengage	–	–	–	right	55	1
BW 13 143A	550143	27,76	44,43	14	58	–	14	engage	–	–	–	right	100	2
BWX 13 4079	554079	27,76	44,43	14	58	14	–	engage	–	–	–	right	100	2
BWX 13 4380	554380	31,75	48,41	13,5	63	12	–	disengage	3	1	–	right	108	3
BWX 13 3392	553392	38,10	54,76	16	71	–	18	disengage	–	–	–	left	240	3
BWC 13 230	550230	38,10	54,76	16	71	–	18	disengage	2	1	–	left	240	3
BWX 13 4408	554408	38,10	54,76	16	71	18	–	disengage	–	–	–	left	240	3
BW 13 244	550244	41,29	57,94	14	75	–	14	disengage	2	1	–	right	141	3
BWX 13 3339	553339	49,72	66,39	15,5	85	–	22	disengage	2	4	–	right	268	3
BW 13 214	550214	54,76	71,42	16	92	–	14	disengage	2	–	–	right	275	3
BW 13 217	550217	54,76	71,42	16	92	–	20	disengage	2	1	–	right	385	4
BW 13 167	550167	54,76	71,42	16	92	–	22	engage	–	–	–	right	430	4
BWX 13 3780	553780	54,76	71,42	16	92	22	–	engage	–	–	–	right	430	4
BWX 13 4567	554567	57,76	74,42	13,5	95	–	13	engage	2	4	–	left	380	3
BWX 13 6621	586621	57,76	74,42	18,5	95	–	16	engage	–	–	2	–	325	3
BWX 13 6324	586324	57,76	74,42	15,5	95	–	26	engage	–	–	2	–	520	3
BW 13 243	550243	72,20	88,86	13,5	115	–	24	disengage	3	4	–	right	470	4
BWC 13 168	550168	72,20	88,86	21	115	–	30	engage	–	–	–	left	1110	8
BW 13 222	550222	87,29	103,96	22	135	–	16	engage	–	–	2	–	625	9
BWC 13 261	550261	103,24	119,90	16	154	–	36	disengage	4	6	–	left	1330	9
BW 13 236	550236	117,40	136,40	16	175	–	30	disengage	5	6	–	left	1520	9
BWX 13 3403	553403	123,90	142,90	25,5	185	–	44	engage	–	–	–	right	4250	16

Design subject to modification.

The torques shown in the chart can be exceeded up to 1.7 for short periods.

[1]) These sprags are produced from very special material with high wear-resistant characteristics, and considerably increase the life of the freewheel.

[2]) The direction of rotation is taken as viewed from A. However opposite direction of rotation can be obtained by rotating the freewheel through 180° but the centering flange must be fully covered without interruption by both the inner and outer race surfaces.

BW