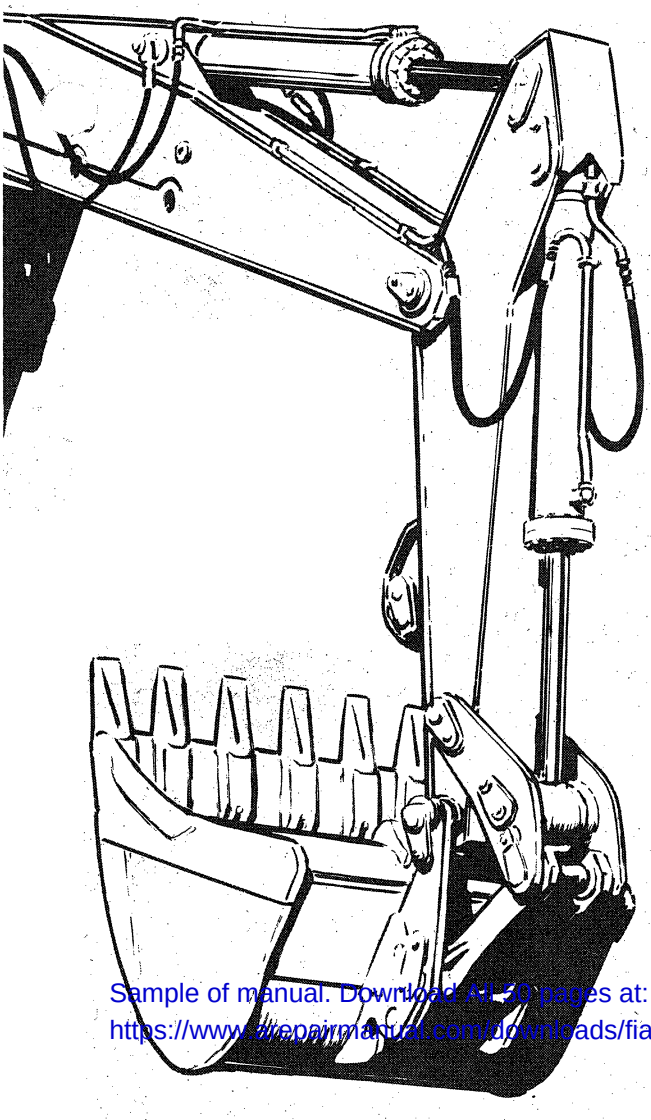
FIATALLIS

HYDRAULIC MOTORS



Service manual

60406205
Reprinted

AVOID ACCIDENTS

Most accidents, whether they occur in industry, on the farm, at home or on the highway, are caused by the failure of some individual to follow simple and fundamental safety rules or precautions. For this reason MOST ACCIDENTS CAN BE PREVENTED by recognizing the real cause and doing something about it before the accident occurs.

Regardless of the care used in the design and construction of any type of equipment there are many conditions that cannot be completely safeguarded against without interfering with reasonable accessibility and efficient operation.

A careful operator is the best insurance against an accident. The complete observance of one simple rule would prevent many thousand serious injuries each year. That rule is:

Never attempt to clean, oil or adjust a machine while it is in motion.

WARNING

On machines having hydraulically, mechanically, and/or cable controlled equipment (such as shovels, loaders, dozers, scrapers, etc.) be certain the equipment is lowered to the ground before servicing, adjusting and/or repairing. If it is necessary to have the hydraulically, mechanically, and/or cable controlled equipment partially or fully raised to gain access to certain items, be sure the equipment is suitably supported by means other than the hydraulic lift cylinders, cable and/or mechanical devices used for controlling the equipment.

HYDRAULIC MOTORS

Service manual

Form 604.06.205

WARNING

STUDY THE OPERATION AND MAINTENANCE INSTRUCTION MANUAL THROUGH BEFORE STARTING, OPERATING, MAINTAINING, FUELING OR SERVICING THIS MACHINE.

The Operation and Maintenance Instruction Manual provides the instructions and procedures for starting, operating, maintaining, fueling, shutdown and servicing that are necessary for properly conducting the procedures for overhaul of the related components outlined in this Service Manual.

This symbol is your safety alert sign. It MEANS ATTENTION! BECOME ALERT! YOUR SAFETY IS IN INVOLVED.

Read and heed all safety instructions carrying the signal words WARNING and DANGER.

Machine mounted safety signs have been color coded yellow with black border and lettering for WARNING and red with white border and lettering for DANGER points.

IMPORTANT

The information in this manual was current at the time of publication. It is our policy to constantly improve our product and to make available additional optional items. These changes may affect procedures outlined in this manual. If variances are observed, verify the information through your Dealer.

NOTE

Additional publications pertaining to this model and to all other FIAT ALLIS products are available through FIAT ALLIS dealers. Publications are generally available in several languages. Refer to Service Publications Index for all such publications; this index is available from FIAT ALLIS.

GENERAL

Study the Operation and Maintenance Instruction Manual before starting, operating, maintaining, fueling, or servicing machine.

Read and heed all machine-mounted safety signs before starting, operating, maintaining, fueling or servicing machine.

Machine-mounted safety signs have been color coded yellow with black borders and lettering for warning and red with white borders and lettering for danger points.

Do not allow unauthorized personnel to service or maintain this machine. Do not perform any work on equipment that is not authorized. Follow the Maintenance and Service procedures. Study the Operation and Maintenance Instruction Manual before starting, operating, maintaining, fueling or servicing this machine.

Always wear safety glasses with side shields.

Do not wear rings, wrist watches, jewelry, or loose or hanging apparel, such as ties, torn clothing, scarves, unbuttoned or unzipped jackets that can catch on moving parts. Wear proper safety equipment as authorized for the job. Examples: hard hats, safety shoes, heavy gloves, ear protectors, safety glasses or goggles, reflector vest, or respirators. Consult your employer for specific safety equipment requirements.

Do not use controls or hoses as handholds when climbing on or off machine. Hoses and controls are movable and do not provide a solid support. Controls may also be inadvertently moved causing accidental machine or equipment movement.

Do not jump on or off machine. Keep two hands and one foot, or two feet and one hand, in contact with steps and grab-rails and handles at all times.

Machine should not be serviced with anyone in the operator's seat unless they are qualified to operate the machine and are assisting in the servicing.

Keep operator's compartment, stepping points, grab-rails and handles clean of foreign objects, oil, grease, mud or snow accumulation to minimize the danger of slipping or stumbling. Clean mud or grease from shoes before attempting to mount or operate the machine.

Never attempt to operate the machine or its tools from any other position than seated in the operator's seat.

Keep operator's compartment clear of loose objects.

If movement of an attachment by means of the machine's hydraulic system is required for service or maintenance, do not raise or lower attachments from any position other than when seated in the operator's seat.

Before starting machine or moving attachment or tool, make sure to set brakes, sound horn and call for an all clear. Raise attachment slowly.

Always block with external support any linkage, parts, or machine according to local or national requirements.

Never allow anyone to walk under or be near unblocked raised equipment. Avoid working or walking under raised blocked equipment unless you are assured of your safety.

Never place head, body, limbs, fingers, feet or hands into an exposed portion between uncontrolled or unguarded scissor points of machine without first providing secure blocking.

Never lubricate, service or adjust a machine with the engine running, except as called for in the Operation and Maintenance Instruction Manuals. Do not wear loose clothing or jewelry near moving parts.

When servicing or maintenance requires access to areas that cannot be reached from the ground, use a ladder or step platform that meets local or national requirements to reach the service point. If such ladders or platform are not available, use the machine handholds and steps as provided. Perform all service or maintenance carefully.

Shop or field service platform and ladders used to maintain or service machinery should be constructed and maintened according to local or national requirements.

Never check or fill fuel tanks, storage batteries or use starter fluid near lighted smoking materials or open flame due to the presence of flammable fluid.

Brakes are inoperative when manually released for servicing. Provision must be made to maintain control of the machine by blocking or other means.

Always place the fuel nozzle against the side of the filler opening before starting and during fuel flow. To reduce the change of a static electricity spark, keep contact until after fuel flow is shut off.

Use only designated towing or pulling attachment points. Use care in making attachment. Be sure pins and locks as provided are secure before pulling. Stay clear of drawbars, cables or chains under load.

To move a disabled machine, use a trailer or low boy truck if available. If towing is necessary, provide warning signals as required by local rules and regulations and follow operation and maintenance instruction manual recommendations. Load and unload on a level area that gives full support to the trailer wheels. Use ramps of adequate strength, low angle and proper height. Keep trailer bed clean of clay, oil and all materials that become slippery. Tie machine down securely to truck or trailer bed and block tracks (or wheels) as required by the carrier.

Never align holes with fingers or hands. Use the proper aligning tool.

Remove sharp edges and burrs from reworked parts.

Use only grounded auxiliary power source for heaters, chargers, pumps and similar equipment to reduce the hazards of electrical shock.

Lift and handle all heavy parts with a lifting device of propre capacity. Be sure parts are supported by proper slings and hooks. Use lifting eyes if provided. Watch out for people in the vicinity.

Never place gasoline or diesel fuel in an open pan. Never use gasoline or solvent or other flammable fluid to clean parts. Use authorized commercial, non-flam-

mable, non-toxic solvents.
When using compressed air for cleaning parts use safety glasses with side shields or goggles. Limit the pressure to 2 bar (30 psi) according to local or national requirements.
Do not smoke or permit any open flame or spark near when refueling, or handling highly flammable materials.
Do not use an open flame as a light source to look for leaks or for inspection anywhere on the machine.
Be sure all mechanic's tools are in good condition. DO NOT use tools with mushroomed heads. Always wear safety glasses with side shields.
Move carefully when under, in or near machine or implements. Wear required protective equipment, such as hard hat, safety glasses, safety shoes, ear protectors.
When making equipment checks that require of the engine, have an operator in the operator seat at all times with the mechanic in sight. Place the transmission in neutral and set the brakes and lock. Keep hands and clothing away from moving parts. Shut off engine and disengage the Power Take-Off Lever before attemting adjuustments or service.
Never use the bucket as a man lift.
The articulation point between frames will not clear a person. Stay clear when engine is running. Support, using device provided when servicing. Return support to carry position and secure before moving machine after servicing. See Operation and Maintenance Instruction Manual.
For field service, move machine to level ground if possible and block machine. If work is absolutely necessary on an incline, block machine and its attachments securely. Move the machine to level ground as soon as possible.
Guard against kinking chains or cables. Do not lift or pull through a kinked chain or cable. Always wear heavy gloves when handling chain or cable.
Be sure cables are anchored and the anchor point is strong enough to handle the expected load. Keep exposed personnel clear of anchor point and cable or chain. DO NOT PULL OR TOW UNLESS OPERATOR'S COMPARTMENTS OF MACHINES INVOLVED ARE PROPERLY GUARDED against accidental cable or chain backlash.
Keep maintenance area CLEAN and DRY. Remove water or oil slicks immediately.
DO NOT pile oily, greasy rags – they are a fire hazard. Store in a closed metal container.
Before starting machine or moving attachment check and adjust and lock operator's seat. Be sure all personnel in the area are clear before starting or moving machine and any of its attachments. Sound horn.
Rust inhibitors are volatile and flammable. Prepare parts in well-ventilated place. Keep open flame away – DO NOT SMOKE. Store container in a cool well-ventilated place secured against unauthorized personnel.
Do not carry loose objects in pockets that might fall unnoticed into open compartments.
Keep clutches and brakes on machine and attachments such as Power Control Units, winches and master clutches adjusted according to Operation and Maintenance Instruction Manuals of the manufacturer at all times. DO NOT adjust machine with engine running except ad specified.
Wear proper protective equipment such as safety goggles or safety glasses with side shields, hard hat, safety shoes, heavy gloves when metal or other particles are apt to fly or fall.
Wear welder's protective equipment such as dark safety glasses, helmets, protective clothing, gloves and safety shoes when welding. Wear dark safety glasses near welding. DO NOT LOOK AT ARC WITHOUT PROPER EYE PROTECTION.
Know your jacking equipment and its capacity. Be sure the jacking point used on the machine is appropriate for the load to be applied. Be sure the support for the jack at the machine and under the jack is appropriate and stable. Any equipment up on a jack is dangerous. Transfer load to appropriate blocking as a safety measure before proceeding with service or maintenance work according to local or national requirements.
Wire rope develops steel slivers. Use authorized protective equipment such as heavy gloves, safety glasses when handling.
Handle all parts with extreme care. Keep hands and fingers from between parts. Wear authorized protective equipment such as safety glasses, heavy gloves, safety shoes.
Inspect your seat belt at least twice a year for signs of fraying, wear, or other weakness that could lead to failure.
Where it is necessary to use diesel fuel as a lubricant make sure all smoking material and open flames are extinguished or that no sparks are near. Place all parts in a closed container of clear diesel fuel for use as needed.
To minimize dangers of fire and explosion, it is recommended that before any welding is done on a fuel tank, the tank be completely drained of fuel, fuel lines disconnected and the ends closed to protect them, and the tank be steam cleaned. All traces of fuel must be removed before welding is started. Flood the tank with carbon dioxide (CO_2) before and during welding. Caps must be removed and vents and other openings left open during welding.
Dry ice (solid carbon dioxide) is extremely cold and will freeze flesh on contact. Use care to prevent contact with skin, eyes, or other parts of the body to avoid personal injury.
When work is required under or between components, block with an external support capable of holding the components in place according to local or national requirements.

START UP

Do not run the engine of this machine in closed areas without proper ventilation to remove deadly exhaust gases.
Do not place head, body, limbs, feet, fingers, or hands near a rotating fan or belts. Be especially alert around a pusher fan.
STARTING FLUID IS FLAMMABLE. Follow the recommendations as outlined in the Operation and Maintenance Instruction Manual and as marked on the containers. Store containers in cool, well-ventilated place secure from unauthorized personnel. DO NOT PUNCTURE OR BURN CONTAINERS. Follw the recommendation of the manufacturer for storage and disposal.

ENGINE

Turn radiator cap slowly to relieve pressure before removing. Add coolant only with engine stopped or idling if hot. See Operation and Maintenance Instruction Manual.
Do not run engine when refueling and use care if engine is hot due to the incresed possibility of a fire if fuel is spilled.
Never attempt to check or adjust fan belts when engine is running.
Do not adjust engine fuel pump when the machine is in motion.
Never lubricate a machine with the engine running.
Avoid running engine with open unprotected air inlets. If such running in unavoidable for service reasons, placeprotective screen over all inlet openings before servicing engine.

ELECTRICAL

Be sure to connect the booster cables to the proper terminals (+ to +) and (− to −) at both ends. Avoid shorting clamps. Follow the Operation and Maintenance Instruction Manual procedure.
Always turn the master switch (key switch if so equipped) to the off position when maintaining or servicing machine.
BATTERY GAS IS HIGHLY FLAMMABLE. Leave battery box open to improve ventialtion when charging batteries. Never check charge by placing metal objects across the posts. Keep sparks or open flame away from batteries. Do not smoke near battery to guard against the possibility of an accidental explosion.
Check for fuel or battery electrolyte leaks before starting service or maintenance work. Eliminate leaks before proceeding.
Do not charge batteries in a closed area. Provide proper ventilation to guard against an accidental explosion from an accumulation of explosive gases given off in the charging process.
Disconnect batteries before working on electrical system or repair work of any kind.

HYDRAULIC

Fluid escaping under pressure from a very small hole can almost be invisible and can have sufficient force to penetrate the skin. Use a piece of cardboard or wood to search for suspected pressure leaks. DO NOT USE HANDS. If injured by escaping fluid, see a doctor at once. Serious infection or reaction can develop if proper medical treatment is not administered immediately.
Shutt off engine and be sure all pressure in system has been relieved before removing panels, housing, covers, and caps. See Operation and Maintenance Instruction Manual.
When making pressure checks use the correct gage for expected pressure. See Operation and Maintenance Instruction Manual or Service Manual for Guidance.

ATTACHMENTS

Keep head, body, limbs, feet, hands and fingers away from blade, bucket or ripper when in raised position. Use authorized blocking as a safety measure before proceeding with service or maintenance according to local or national requirements.
If movement of an attachment by means of the machine's hydraulic system is required for service or maintenance do not raise or lower attachments from any position other than when seated in the operator's seat.
Before starting machine or moving attachments or tools, make sure to set brakes, sound horn and call for an all clear. Raise attachment slowly.
Do not use machine to carry loose objects by means other than attachments for carrying such objects.
Never use any gas other than dry nitrogen to charge accumulators. See Operation and Maintenance Instruction Manual.
Keep clutches and brakes on machine and attachments as power control units, whiched and master clutches adjusted according to Operaltion and Maintenance Instruction Manuals of the manufacturer at all times. DO NOT adjust machine with engine running except as specified.

TIRES (APPLICABLE MACHINES)

Be sure tires are properly inflated to the manufacturer's specified pressure. Inspect for damage periodically. Stand to one side when changing inflation of tires. Check tires only when the machine is empty and tires are cool to avoid overinflation. Do not use reworked wheel parts. Improper welding, heating or brazing weakens them and can cause failure.
Never cur or weld on the rim of an inflated tire. Inflate a spare tire only enough to keep rim parts in place – a fully inflated tire might fly apart when it is non installed on a machine.
Use care if you must transport (haul) a fully inflated tire.
When servicing tires block the machine in front and back of all wheels. After jacking up, place blocking under machine to protect from falling according to local or national requirements.
Deflate tires before removing objects from the tread. Never inflate tires with flammable gases. Explosion and personal injury could result.

EXCAVATORS

The attachment is held in position by a trapped column of oil under high pressure. Always lower the attachment to a ground supported position and relieve all pressure before attempting maintenance or repair of any kind.

The outriggers (for wheel machines) support the machine on a trapped column of oil under high pressure. Always lower to a ground supported position and relieve all pressure before attempting maintenance or repair.

Never use make shift jacks when adjusting track tension. Follow procedures recommended in the Undercarriage Service Manual.

Never do service work or maintenance with the machine on a slope. Should this become necessary in an emergency, always block the tracks (all wheels, for wheel machines) to prevent accidental movement. Check the Operation and Maintenance Instruction Manual for proper procedure.

Scissor Points (Pinch Points), which result from relative motion between mechanical parts, are areas of the machine that can cause personal injury. Care must be taken to prevent motion by blocking or to avoid such areas when movement is possible.

Some examples of Scissors Points (Pinch Points) are telescoping booms, boom to cab, and dipperstick to boom.

Always place the hydrauilic lock safety lever in the lock position when shutting the machine down for any reason.

Always place the hinged hood and cover support in the place provided, before attempting any maintenance or service work in the engine compartment.

TABLE OF CONTENTS

A P P L I C A T I O N C H A R T

Excavator model	Motor type									
	SIMIT				HYDROMATIK			LINDE		
	MI 2A (°)	MI 4A	MI 2F	MI 4F	A2 F107	A2 F28	A6V 160Ha	BMF 140TFC	BMV 140TFC	
FE 12 - FE 14 Swing and propel						●				
FE 16 Swing						●				
FE 16 Propel		●		▲						
FE 18 Propel		●		▲						
FE 18 Swing			●							
FE 20 Propel		●		▲						
FE 20 Swing			●							
FE 24 Propel		●		▲						
FE 24 Swing			●							
FE 28 Propel		●		▲						
FE 28 Swing				●						
FE 40 Propel								●	▲	
FE 40 Swing								●		
FE 12R Propel					●					
FE 12R Swing						●				
FE 18R Propel							●			
FE 18R Swing			●							

● Standard version

▲ Optional version

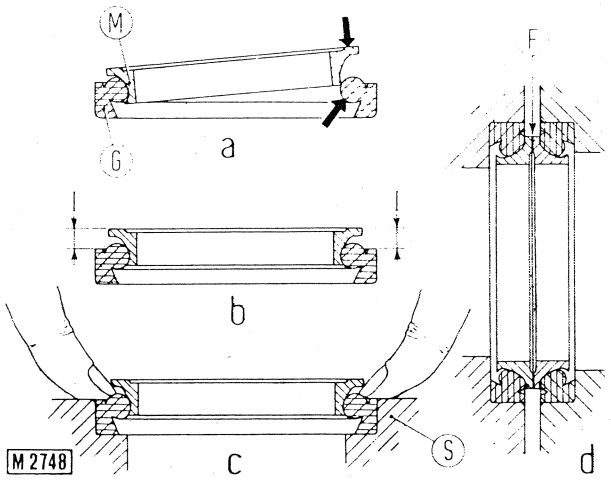
(°) Motor MI 2A has been installed on phased out models S9 - S11 - SR9.

1 - GENERAL

1.1 GENERAL FITTING NOTES

Installing floating ring seals

Thoroughly inspect metal rings M ensuring that their sealing surfaces are free from score marks, dents or signs of wear due to misalignment or flatness errors.
Both metal rings M with rubber seals G should be renewed even if only one is found to be defective.
Do not pair new and worn metal rings together, nor used rings of different pairs.
To install seals proceed as follows:
– remove all sharp corners and burrs and thoroughly clean rubber seal housings;
– thoroughly clean the rubber seals;
– couple each metal ring M to the associated rubber seal G as shown in a, pushing as indicated by the arrows;
– ensure that each metal ring is correctly seated. Dimention I (detail b) should be equal all round;



– place each seal assembly in position by manually pressing the rubber seal as shown in detail c;
– before pairing the seal assemblies (see detail d) clean sealing surfaces F using a lint-free cloth and smear a light film of thin oil on the contact surfaces.

Installing rotary shaft seals

To install rotary shaft seals proceed as follows:
– prior to installation soak the seals for at least half an hour in the same oil as that in which they will operate;
– thoroughly clean the shaft and ensure that the contact surface is free from damage;
– turn sealing lip towards the fluid; if of the thrower lip type, turn the grooves so that during shaft rotation the fluid is thrown back;
– smear the sealing lip with a thin film of lubricant (oil is better than grease);
– install the seal into the housing by pressing or using a flat ended punch; on no accounts use a hammer;
– avoid entry of the seal into the recess in a tilted position. After installations ensure that the seal is pressed fully home;
– to prevent sealing lip damage during installation, use some sort of protection between seal and shaft.

Installing O-Rings

Lubricate O-rings before installation and do not twist them when installing, otherwise leakage will result.

1.2 MEASUREMENT UNITS

The measurement units employed in this manual are those adopted by the International System (I.S.) instead of the mks system used previously.

Force:
decanewton (daN), replaces kilograms (kg)

Pressure:
bar substitutes kg/cm^2

Torque:
decanewton x metre (daN·m) replaces kg·m

Apply the following table to convert measurement units:

	multiply	by	to obtain
Force	kg	0,9807	daN
Pressure	kg/cm^2	0,9807	bar
Torque	kg·m	0,9807	daN·m

NOTE: For everyday repair requirements, the following equivalences can be considered valid:
kg = daN
kg/cm^2 = bar
kg·m = daN·m

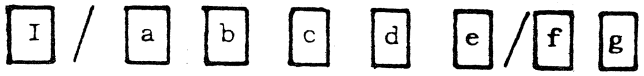
METRIC TO ENGLISH CONVERSIONS

The chart below is designed to assist the users not yet fully familiar with the metric system.

Quantity	S.I. Unit Multiplicant	Multiplier	Result
Length	mm	0.03937	in
	m	1.09361	yd
	km	0.62137	mile
Area	cm^2	0.15500	sq in
	m^2	1.19599	sq yd
Volume	cm^3	0.06102	cu in
	m^3	1.30795	cu yd
Capacity	L	0.26418	US gal
	L	0.21998	UK gal
Mass (Weight)/Force	g	0.03527	oz
	daN	2.24809	lb
	ton	1.10231	US ton
Torque	daN m	7.37572	lb ft
Pressure	bar	14.50377	psi
Temperature	°C	1.8 + 32	°F

1.3 STANDARD PART CLASSIFICATION TO DETERMINE TORQUE DATA

IMPORTANT: When a specific torque is not given the FIAT STANDARD TORQUE CHART should be used after fully indentifying the part.
Part may only be fully identified by the eight-digit code number, as follows:



I - Standard part code

Always represented by figure 1.
Such a number indicates that the part can be produced in various versions which differ in material and coating.

a-b-c-d-e - Standard part basic number

It always consists in five figures to identify the part in its dimensional characteristics.

f - Material code number

This number represents the material provided for a specific part.
Its meaning is indicated in the table below.

g - Coating code number

This number represents the coating provided for a specific part.

1.4 FIAT STANDARD TORQUE CHARTS

When a specific fastener torque is not given, the following charts may be used:

IMPORTANT

- Fasteners with nominal diameter up to 24 mm to be lubricated with engine oil, major diameter fasteners with tallow.

- Torques for cadmium plated fasteners are valid also for not coated parts.

- Nominal torque tolerance is ± 5%

- R80, R100, R120 strength classes are to be considered as follows:

10.9 replaces R100
12.9 replaces R120
} bolts and screws

10 replaces R 80
12 replaces R100
} nuts

- Coating abreviation meaning:

CDT = Cadmium plated
FOSF = Phosphatized
ZNT = Zinc plated

Material code (f)	FIAT	Strength class and type of material				
		UNI	DIN	SAE	BSI	BNA
0	R 40	4D - 4S - 4A		1	A	42
1	R 50	5S - 6S		3	P	56
2	R 80	8G		5	T	80
3	R 100	100	10K	8	V	100
4	Ottone	Ottone	Messing	Brass	Brass	Laiton
5	Alluminio	Alluminio	Aluminium	Aluminium	Aluminium	Aluminium
6	Rame	Rame	Kupfer	Copper	Copper	Cuivre
7	open to other metallic material					

NUTS TORQUE CHART - Unit of measure daNm(lbs ft)

Diameter and width of thread mm	Strenght class: 10 (R80)					Strength class 12 (R100)
				with polyamide ring		
	standard ZNT	standard CDT	jam type	standard	jam type	standard FOSF
M6x1	1,3 (96)	-	-	-	-	1,4 (10)
M8 x 1,25	3,2 (23)	-	*2,6 (19)	*3,9 (19)	*3,2 (23)	3,5 (26)
M10 x 1,25	-	-	*5,2 (38)	*8,2 (60)	*6,2 (48)	-
M10 x 1,5	6,5 (48)	7,2 (53)	*5 (37)	*7,7 (57)	*6 (44)	7 (52)
M12 x 1,25	-	13 (96)	*8,7 (64)	*14,5(107)	*10,2(75)	-
M12 x 1,75	11 (81)	-	*8,1 (60)	*12,9(95)	*9,6 (71)	12 (88)
M14 x 1,5	-	19,5(144)	*13 (96)	*21,6(159)	*15 (110)	-
M14 x 2	18 (133)	-	*12,5(92)	*20 (147)	*14,6(107)	19 (140)
M16 x 1,5	30 (221)	23,5(173)	°13 (96)	°26,8(198)	°16 (118)	30 (221)
M16 x 2	-	23 (170)	°12,5(92)	°26,5(195)	°16 (118)	-
M18 x 1,5	45 (332)	34,5(254)	°19 (140)	°39 (236)	°23,5(173)	45 (332)
M18 x 2,5	-	32 (236)	°17,5(129)	°36,5(269)	°22 (162)	-
M20 x 1,5	60 (442)	46 (339)	°23,5(173)	°51,7(381)	°29 (214)	60 (442)
M20 x 2,5	-	44,5(328)	°21,5(158)	°50 (369)	°27 (199)	-
M22 x 1,5	80 (590)	62 (457)	°32 (236)	-	-	80 (590)
M22 x 2,5	-	61 (450)	°29,5(217)	-	-	-
M24 x 2	100 (737)	78 (575)	°37 (273)	°85,8(633)	°45 (332)	100(737)
M24 x 3	-	76 (560)	°33 (243)	°84 (619)	°41 (302)	-
M27 x 2	95 (700)	-	-	-	-	95 (700)
M30 x 2	130 (959)	-	-	-	-	130(959)
M33 x 2	170 (1254)	-	-	-	-	160(1180)
M36 x 3	220 (1622)	-	-	-	-	220(1622)

* ZNT (Zinc plated) ° CDT (Cadmium plated)

BOLT AND SCREW TORQUE CHART

Diameter and width of thread mm	Stronght class: 10.9				Strenght class: 12.9	
	standard ZNT daNm (*/**) lbs ft(°/°°)	self locking ZNT daNm (*/**) lbs ft(°/°°)	standard CDT daNm (*/**) lbs ft(°/°°)	self locking CDT daNm (*/**) lbs ft (°/°°)	standard FOSF daNm(*/**) lbs ft(°/°°)	self locking FOSF daNm (*/**) lbs ft(°/°°)
M6 x 1	1,3 (9,5/6,5) 9.6(0.37/0.25)	-	-	-	1,4(12/8) 10(0.47/0.31)	-
M8 x 1,25	3,2(12,5/9) 23(0.5/0.35)	3,5(12/8) 26(0.47/0.31)	-	3 (13,5/9,5) 22(0.53/0.37)	3,5(16,5/11) 26(0.65/0.43)	3,8(16,5/11) 28(0.65/0.43)
M10 x 1,25	-	7,9(18/12,5) 58(0.70/0.50)	-	6,5(18/12,5) 48(0.70/0.50)	-	-
M10 x 1,5	6,5(16/11) 48(0.63/0.43)	7(15,5/10,5) 52(0.61/0.41)	-	6 (17/11,5) 44(0.66/0.45)	7 (21/14) 52(0.82/0.55)	7,8(21/14,5) 57(0.82/0.57)
M12 x 1,25	-	13,9(23/15,5) 102(0.90/0.61)	-	11,4(23/15,5) 84 (0.90/061)	-	-
M12 x 1,75	11(19,5/13,5) 81(0.76/0.53)	12(18,5/12,5) 88(0.73/0.50)	-	10,1(20,5/14) 74 (0.80/0.55)	12(26/17,5) 88(1.02/0.68)	13(26/17,5) 96(1.02/0.68)
M14 x 1,5	-	22(26,5/18) 162(1.04/0.70)	-	18(26,5/18) 132(1.04/0.70)	-	-
M14 x 2	18(23/16) 133(0.90/0.62)	19 (22/15) 140(0.86/0.59)	-	16,2(24/16,5) 119(0.94/0.65)	19 (30/20) 140(1.18/0.78)	21(30/20) 155(1.18/0.78)
M16 x 1,5	30(30/20) 221(1.18/0.78)	33 (29/19,5) 243(1.14/0.76)	25 (31/21) 184(1.22/0.82)	27 (31/21) 199(1.22/0.82)	33 (40/26,5) 243(1.57/1.04)	36 (40/26,5) 265(1.57/1.04)
M16 x 2	-	-	23(28,5/19,5) 170(1.12/0.76)	24,8(28/19,5) 183 (1.10/0.76)	-	-
M18 x 1,5	45 (34/23) 332(1.34/0.91)	48 (33,5/22) 354(1.21/0.86)	36 (35,5/24) 265(1.39/0.94)	39 (35,5/24) 288(1.39/0.94)	48(46/30,5) 354(1.81/1.20)	52(46,5/30,5) 383(1.83/1.20)
M18 x 2,5	-	-	31(30,5/21) 229(1.20/0.82)	33,5(30,5/21) 247(1.20/0.82)	-	-
M20 x 1,5	60 (38/25,5) 412(1.50/1.00)	65 (38/25) 479(1.50 /0.98)	50(39,5/26,5) 369(1.55/1.04)	-	65(52,5/34,5) 479(2.06/1.35)	70(53/35) 516(2.08/1.37)
M20 x 2,5	-	-	44 (35/44) 324(1,37/1,73)	-	-	-
M22 x 1,5	80 (42/28) 590(1.65/1.10)	90 (42,5/28) 664(1.67/1.10)	66(44/29,5) 487(1.73/1.16)	-	90(59/38,5) 664(2.32/1.51)	95 (59,5/39) 700(2.34/2.32)
M22 x 2,5	-	-	59(39/26,5) 435(1.53/1.04)	-	-	-
M24 x 2	100(44/29,5) 737(1.73/1.16)	110(44,5/29,5) 811(1.75/1.16)	83(45,5/31) 612(1.79/1.22)	-	110(62/40,5) 811(2.44/1.59)	120(62/41) 885(2.44/1.61)
M24 x 3	-	-	74 (41/28) 545(1.61/1.10)	-	-	-
M27 x 2	100 (54/36) 737(2.12/1.41)	-	-	-	100 (75/50) 811(2.95/1.96)	-
M30 x 2	140 (61/40,5) 1032(2.40/1.60)	-	-	-	150(85/56) 1106(3.34/2.20)	-
M33 x 2	190 (68/45) 1401(2.67/1.77)	-	-	-	200(95/63) 1475(3.74/2.48)	-
M36 x 3	240 (71/47) 1770(2.80/1.85)	-	-	-	250 (97/65) 1844(3.81/2.55)	-

(*/)Minimum thread length in mm, specified for cast iron with 255 N/mm^2 tensile strength-(/**)Minimum thread length in mm, specified for steel with 510 N/mm^2 tensile strength-(°/)Minimum tread length in inches, specified for cast iron with 37,000 psi tensile strength-(/°°)Minimum tread length in inches, specified for steel with 74,000 psi tensile strength.

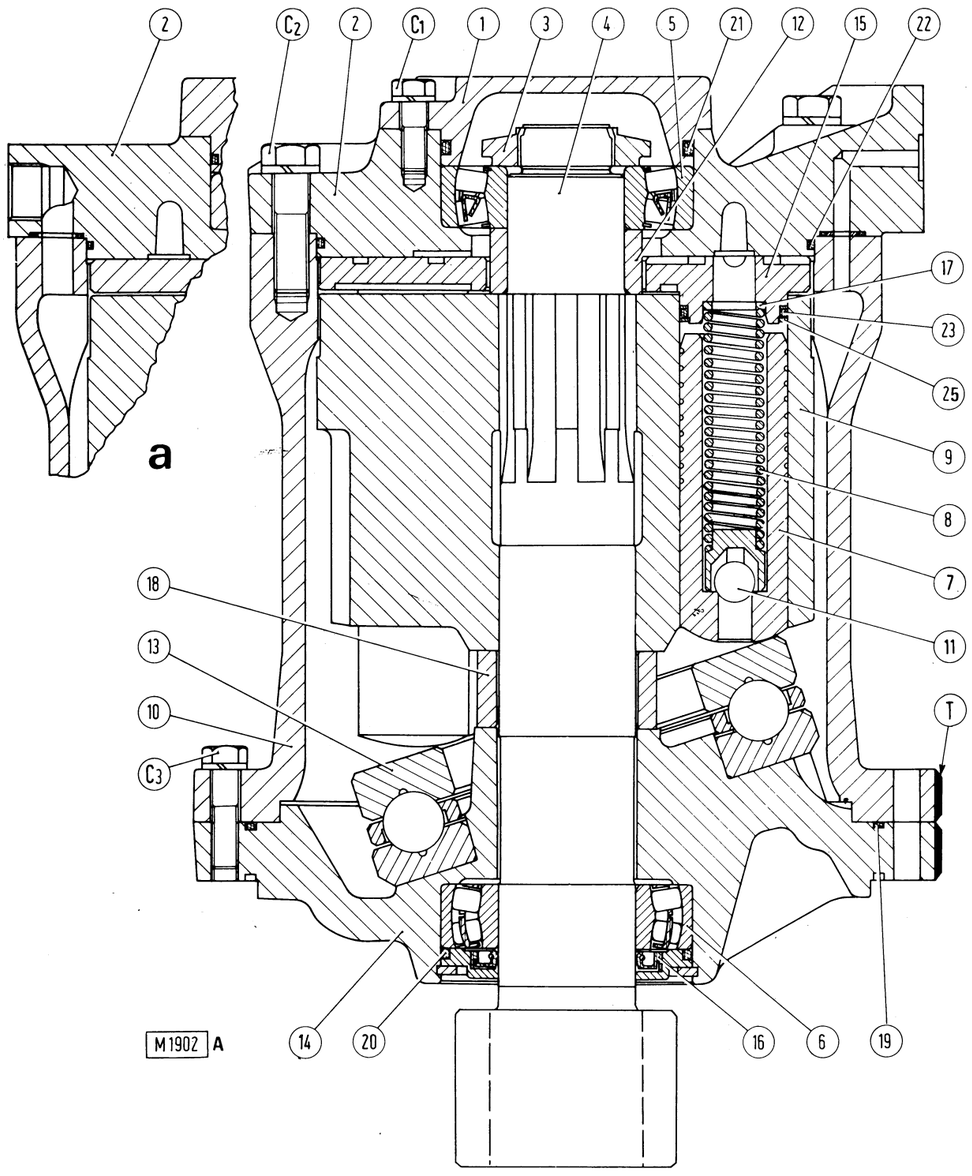


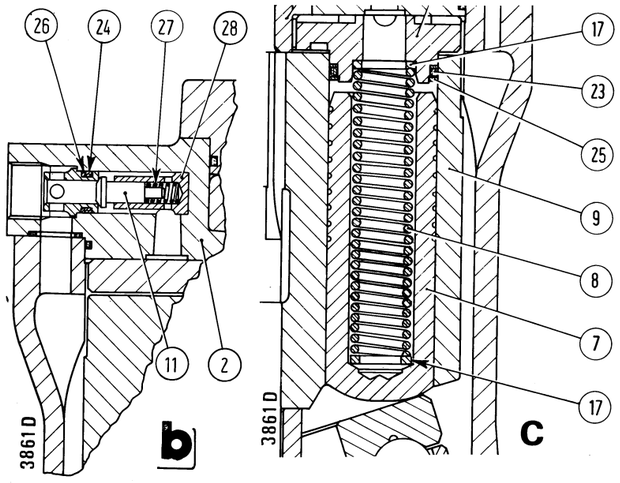
Fig. 2-1 - Section through hydraulic motor (MI2A - MI4A with piston 7) (pre-mod configuration).

a. Detail of leak-back port on rear end plate (2) (motors MI2A-MI4A, pre-mod configuration).

b. Detail of leak-back and make up valve port on rear end plate (2) (motor MI4A post-mod configuration, to be matched to modification c).

c. Detail of piston (7) without make-up valve (motors MI2A and MI4A post-mod configuration).

C_1. Cover (1) capscrews - C_2. Capscrews securing rear end plate to housing (10) - C_3. Capscrews securing housing (10) to front end plate (14) - T. Timing marks - 1. Cover - 2. Rear end plate - 3. Nut - 4. Pinion shaft - 5, 6. Roller bearings - 7. Piston - 8. Springs - 9. Cylinder block - 10. Motor housing - 11. Make-up valve - 12. Spacer - 13. Ball bearing - 14. Front end plate - 15. Timing plate - 16. Lip seal - 17. Spring plates - 18. Spacer - 19, 20, 21, 22, 23 and 24. O-rings - 25, 26. Anti-extrusion rings - 27. Make-up valve spring - 28. Make-up valve plunger seat - 29. Bushing.



2. SIMIT HYDRAULIC MOTORS
DISASSEMBLY – OVERHAUL – ASSEMBLY

2.1 MOTORS TYPE MI2A-MI4A

Motors MI4A and MI2A differ in the cubic capacity only.

Place the motor on overhaul stand 75290086 (A,fig.2-2) by means of support 75292992 (B) and proceed as follows:

- remove capscrews (C_1,fig.2-1) securing cover (1) to rear end plate (2), then remove cover;

- remove nut (3), screws (C_2) securing rear end plate (2) to housing (10) and remove end plate (2) with bearing (5) from motor housing using puller 75295466 (C,fig.2-2) mounted as shown in illustration;

- remove bearing (5,fig.2-1) from rear end plate (2) by means of punch 75295489;

- remove spacer (12), timing plate (15) and spring plates(17);

- remove capscrews (C_3) securing housing (1,fig.2-4) to front end plate and lift off motor housing using lifting chain 75291517 (A);

- remove springs (3,fig.2-3) and pistons (1,fig.2-5) providing some identification for both pistons and cylinder block for correct reassembly;

- withdraw cylinder block (2,fig. 2-6) using puller and remove spacer (18,fig.2-1);

- remove upper race and cage of bearing (13) and separate the front end plate (14) from the pinion shaft (4) using universal extractor (fig.2-7);

- use block 75292990 and universal extractor to remove the lower bearing race (1,fig.2-8);

- remove the roller bearing (6,fig.2-1) if required.

Ensure that:

- contact surfaces of timing plate (15,fig.2-1) and of rear end plate (2) are not scratched as this might compromise sealing; scratches can be eliminated by using abrasive compound and surface plate;

- shaft (4) is not scored at the seal (16) location;

- cylinder block and pistons are not scored or chipped and pistons slide freely in their bores;

- upper race of bearing (13) and piston ends (7,fig.2-1) are not dented.

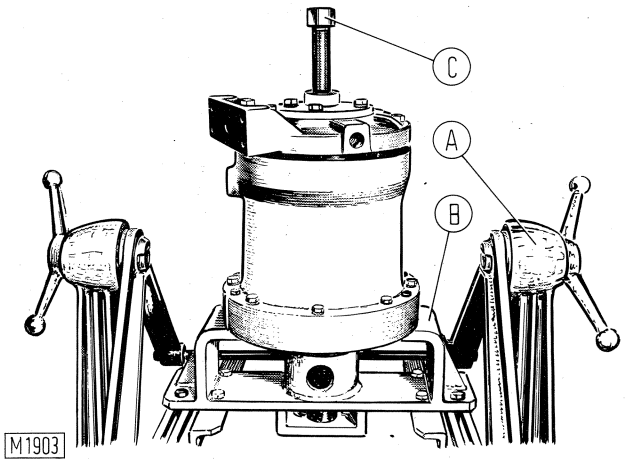


Fig. 2-2 - Disassembly of rear end plate.
A. Overhaul stand 75290086 - B. Support 75292992 - C. Puller 75295466.

Renew all gaskets and reassemble as follows:

- install O-ring (19,fig.2-1) on the front end plate;

- install shaft (4) into the front end plate; be careful not to damage lip seal (16). Place the assembly on the stand using support 75292992 (B,fig.2-2);

- lock the pinion shaft by tightening the capscrew on the motor support bracket;

- install bearing (13,fig.2-1), spacer (18) and insert cylinder block (9);

- insert pistons with their make-up valves (11) into their bores checking that each piston slides freely, then insert springs (8);

- using lifting chain 75291517 (A,fig.2-4) install housing (1) on front end plate making sure the marks (T) on housing and on end plate are in alignment;

- tighten screws (C_3,fig.2-1) to the specified torque;

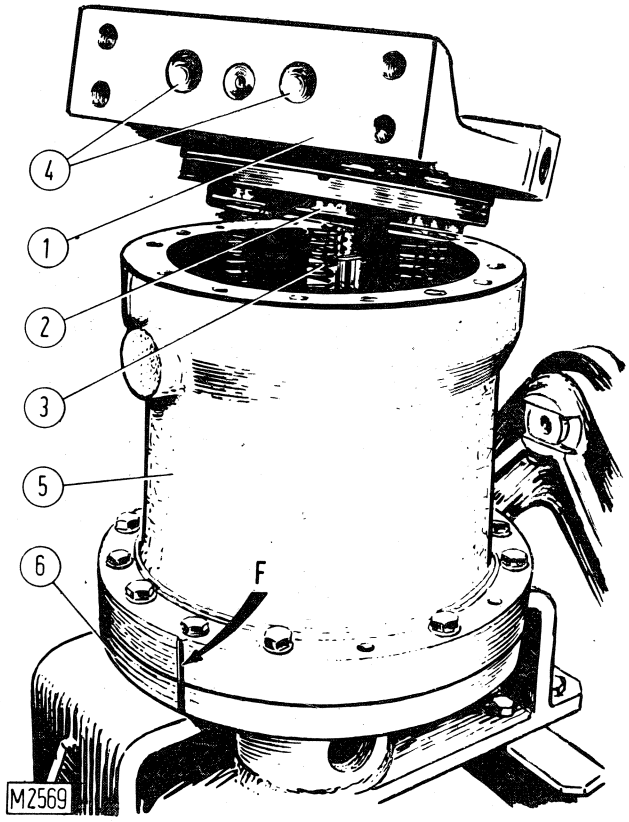


Fig. 2-3 - View of rear end plate (1) and timing plate (2).
F. Timing marks on front end plate (6) and on housing (5) (T.D.C.) - 3. Piston return springs - 4. Motor feed/drain ports - 5. Housing - 6. Front end plate.

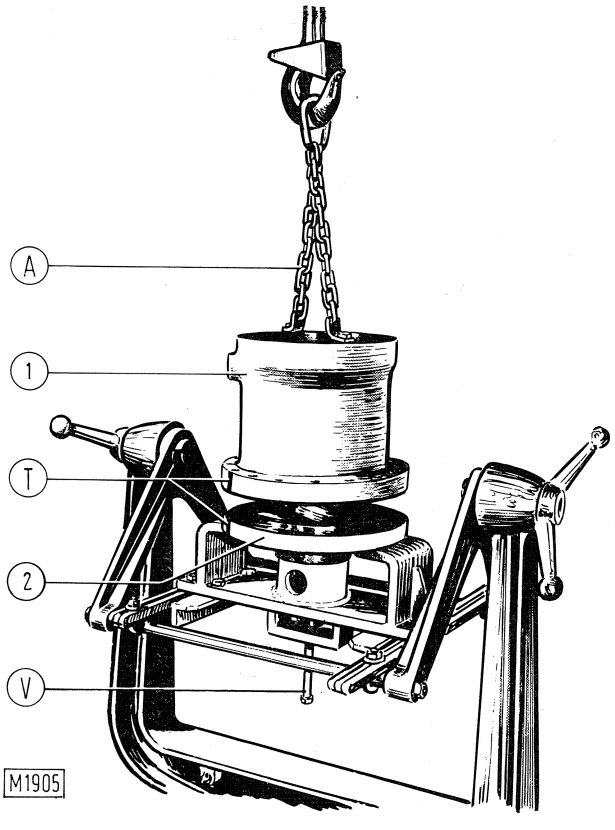


Fig. 2-4 - Removal-installation of motor housing (1).
A. Lifting chain 75291517 - T. Timing marks on housing and on front end plate - V. Pinion shaft locking screw - 1. Housing - 2. Front end plate.

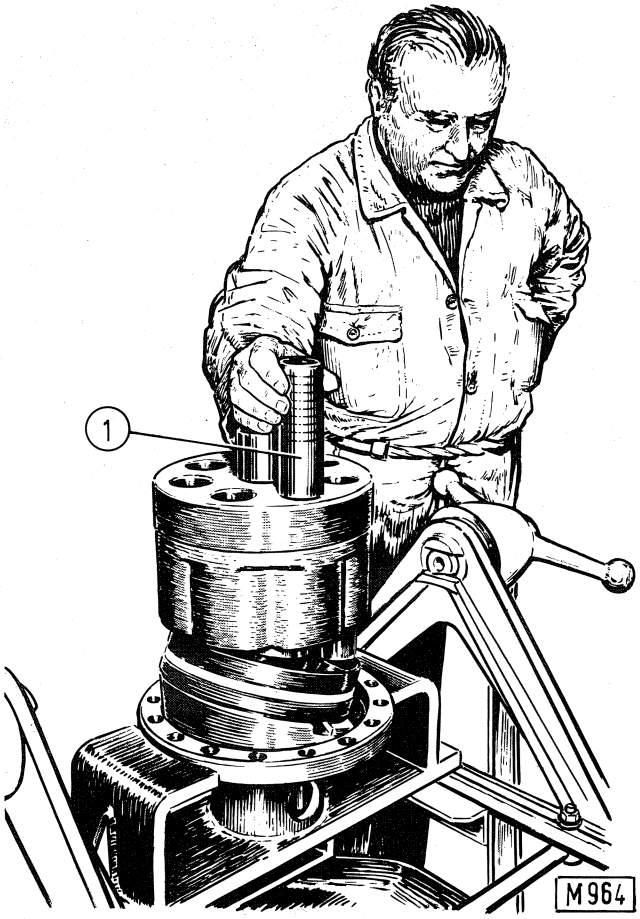


Fig. 2-5 - Removal-installation of pistons.

1. Piston.

- install the timing plate ensuring spring plates (17,fig.2-1), O-rings (23) and anti-extrusion rings (24) are correctly positioned;

- tighten guide pin of press 75296078 (A) on the threaded end of the pinion shaft (1,fig.2-9);

- install rear end plate (1,fig. 2-3) so that the vertical line equally distant from the feed and drain oil ports (4) is in line with the TDC marks (F) stamped on housing (5) and on front end plate (6). Before removing the press, tighten capscrews (C_2,fig.2-1) to the specified torque;

- remove the press and install spacer (12);

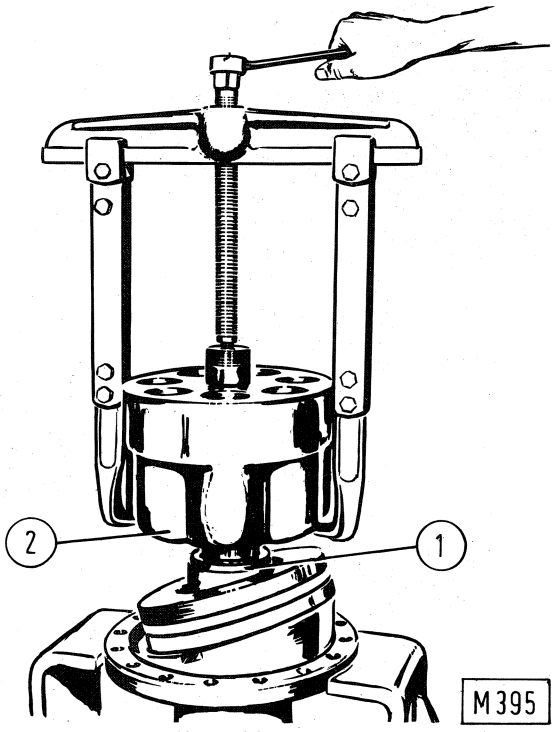


Fig. 2-6 - Removal of cylinder block

1. Spacer - 2. Cylinder block.

-install bearing (5) using punch 75295490 and tighten nut (3) to the specified torque, then lock it by swaging the edge (fig.2-10);

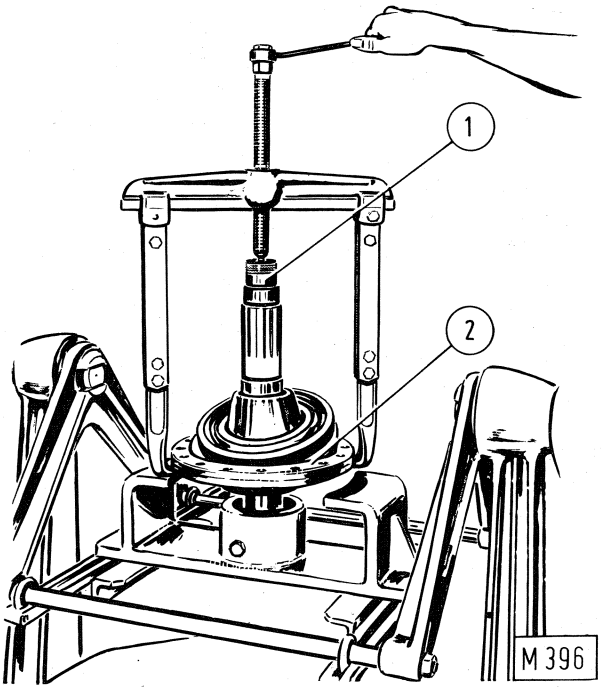


Fig. 2-7 - Removal of front end plate (2) from shaft (1).

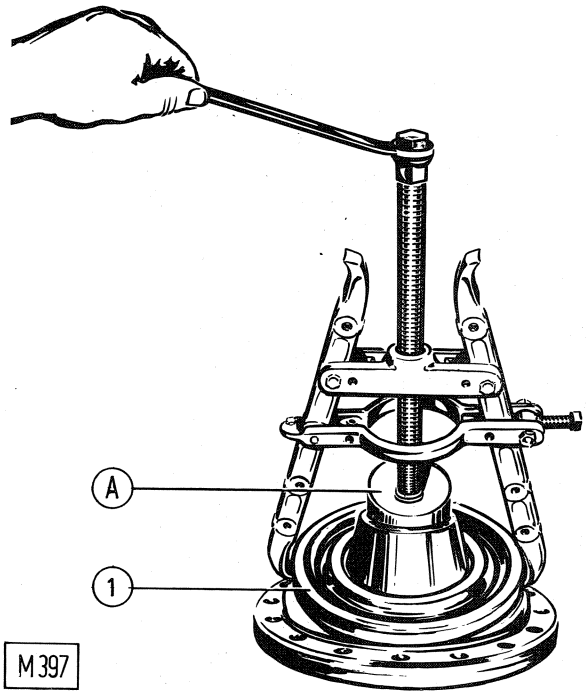


Fig. 2-8 - Removal of lower bearing race.

A. Block 75292990 - 1. Lower bearing race.

- install cover (1,fig.2-1) and gradually tighten capscrews (C_1).

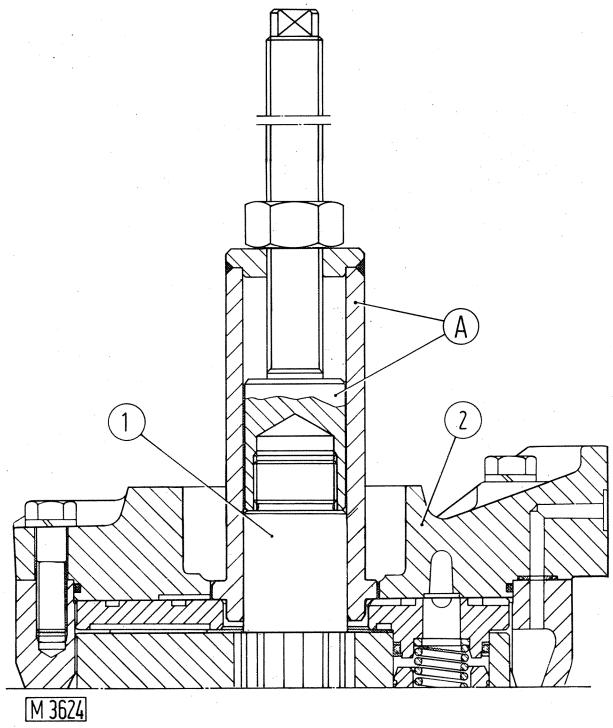


Fig. 2-9 - Schematic assembly of timing plate and rear end plate using press 75296078 (A).

1. Shaft - 2. Rear end plate.

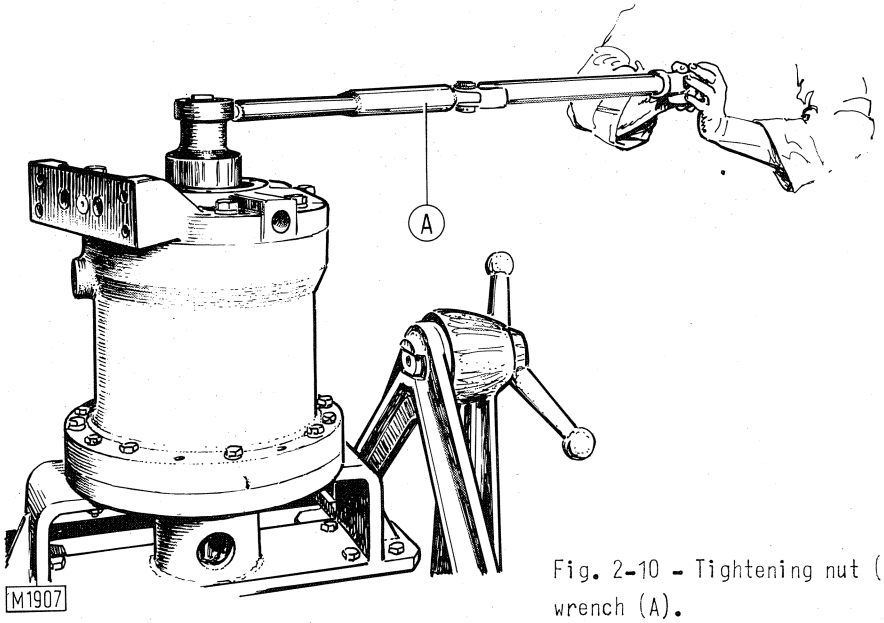


Fig. 2-10 - Tightening nut (3, fig. 2-1) using torque wrench (A).

2.2 MOTORS TYPE MI2F-MI4F

Motors MI2F and MI4F differ in the cubic capacity only.

Place the motor on overhaul stand 75290086 (B,fig.2-12) by means of support 75292992 (A) and proceed as follows:

- mark the mutual positions of brake drum, driven disc carrier spacer and rear end plate;

- remove capscrews (C_1,fig.2-12) securing retaining flange (1);

- remove flange and shims (S_1, fig. 2-11);

- remove cover (2,fig.2-12) with dished springs (23,fig.2-11) and relevant plates (25) (to operate on springs (23) remove capscrew (C_3));

- remove retaining ring (24) using pliers 75300240;

- remove capscrews (C_2) securing drum (2), spacer (5) and rear end plate to the motor housing;

- using lifting chain 75291517 (A,fig.2-13) remove drum (1) with piston (4,fig.2-11);

- withdraw piston from drum.

NOTE - It is possible to remove the brake drum (2,fig.2-11) complete with cover (3), piston (4) and dished springs (23) by proceeding as follows:

- remove screws (C_1), remove the flange and the shims (S_1);

- remove capscrews (C_2) securing brake drum (2) to motor housing;

- using lifting chain 75291517 (A,fig.2-14) and a hoist, remove the brake drum assy;

- remove pressure plate (13,fig. 2-11) and disc carrier spacer (5);

- remove fixed discs (6) and drive discs (7);

- remove nut (15) and withdraw drive disc support gear (12) from pinion shaft;

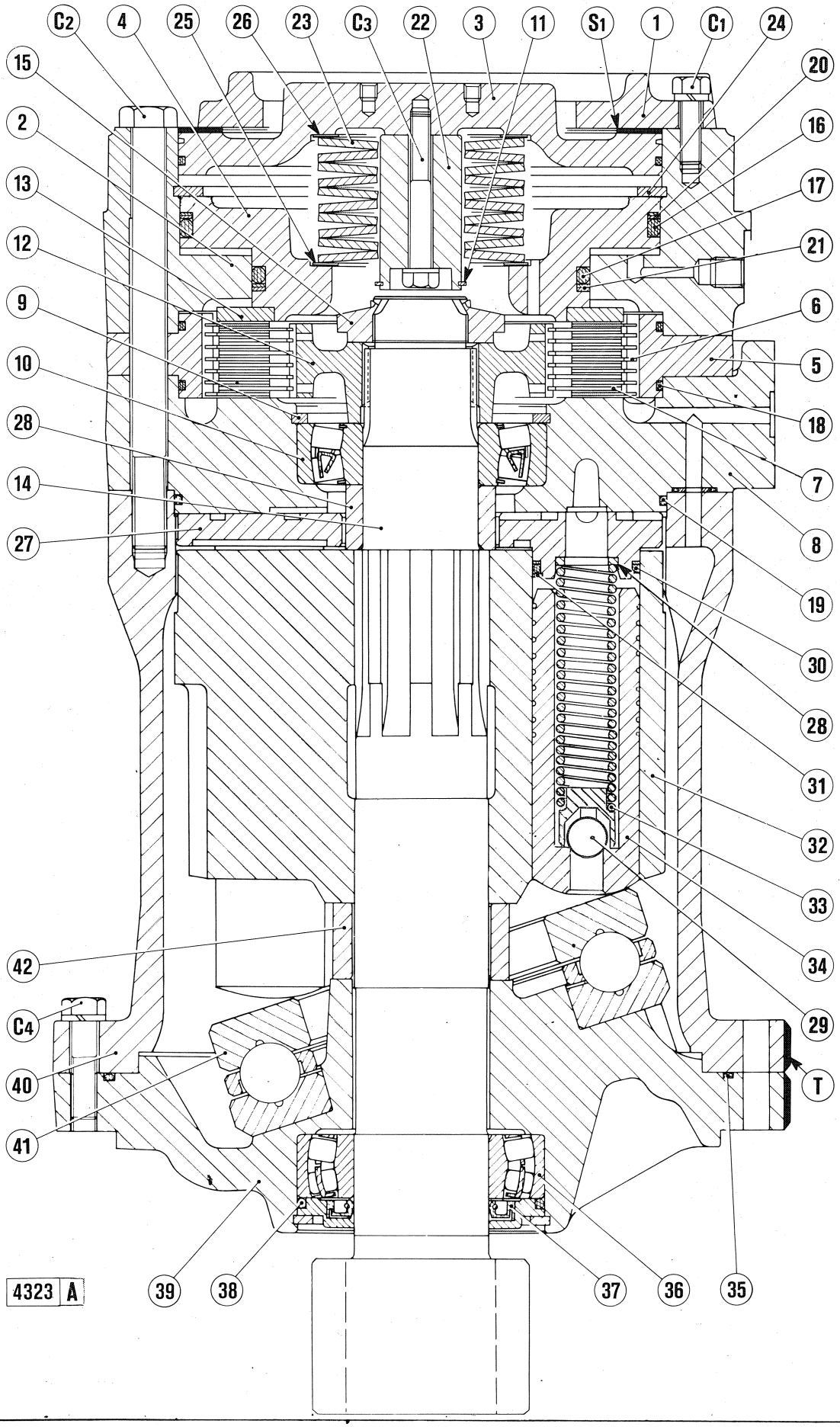
- remove rear end plate (8) using puller 75295466 with bracket 75286096.

From here onwards, dismantling operations are the same as those given in corresponding paragraph for hydraulic motors without lockup brake MI2A and MI4A.

In addition to the inspections recommended for hydraulic motor without lockup brake, inspect fixed discs (6,fig.2-11) and drive discs (7) for wear (wear limits are indicated in table) and check O-rings (16 and 17) for condition.

Reassemble hydraulic motor as described for the motor without lockup brake (MI2A-MI4A) up to the installation of the timing plate using press 75296078. From this point onwards, proceed as follows:

- locate rear end plate (3,fig. 2-13) so that the vertical line equally distant from the feed and drain oil ports is in line with the mark (T,fig.2-13) on the housing and on the front end plate and secure it against the housing;


C2
4
25
26
23
C3
22
3
11
S1
1
C1
24
15
2
13
12
9
10
28
14
27
20
16
17
21
6
5
18
7
8
19
30
28
31
32
33
34
29
T
42
C4
40
41
39
38
37
36
35
4323 A

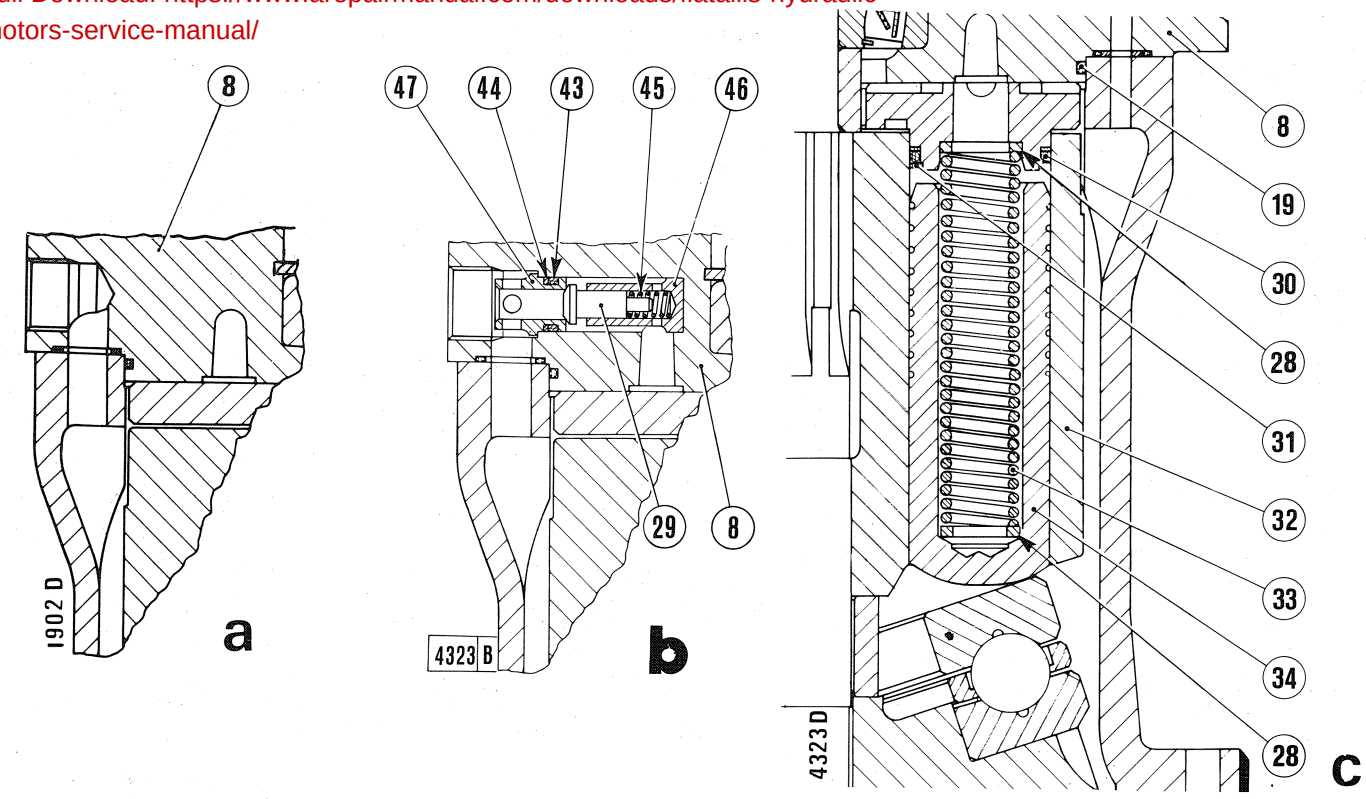


Fig. 2-11 - Section through hydraulic motor (MI2F or MI4F) with piston (34) (pre-mod configuration).

a. Detail of leak-back port on rear end plate (8) (motors MI2F-MI4F pre-mod configuration).

b. Detail of leak-back and make-up valve port on rear end plate (8) (motors MI4F, post-mod configuration to be matched to modification c).

c. Detail of piston (34) without make-up valve (motors MI2F and MI4F post-mod configuration).

C_1. Cover (1) retaining flange capscrews - C_2. Capscrews securing brake drum/disc carrier spacer/rear end plate to housing - C_3. Dished spring support spacer (22) capscrews - C_4. Capscrews securing housing (40) to front end plate (39) - S_1. Dished spring shims - T. Timing marks - 1. Cover retaining flange - 2. Brake drum - 3. Cover - 4. Brake release piston - 5. Disc carrier spacer - 6. Fixed discs - 7. Drive discs - 8. Rear end plate - 9. Bearing (10) retaining ring - 10. Roller bearing - 11. Dished spring retaining ring - 12. Drive disc support gear - 13. Pressure plate - 14. Pinion shaft - 15. Nut - 16, 17, 18, 19. O-rings - 20, 21. Anti-extrusion rings - 22. Dished spring support spacer - 23. Dished springs - 24. Brake release piston (4) retaining ring - 25, 26. Dished spring plates - 27. Timing plate - 28. Spacer - 29 - Make-up valve - 30, 35, 38. O-rings - 31. Anti-extrusione ring - 32. Piston carrier body - 33. Springs - 34. Piston - 36. Roller bearing - 37. Lip seal - 39. Front end plate - 40. Motor housing - 41. Ball bearing - 42. Spacer - 43. O-ring - 44. Anti-extrusion ring - 45. Make-up valve spring - 46. Make-up valve plunger seat - 47. Bushing.