

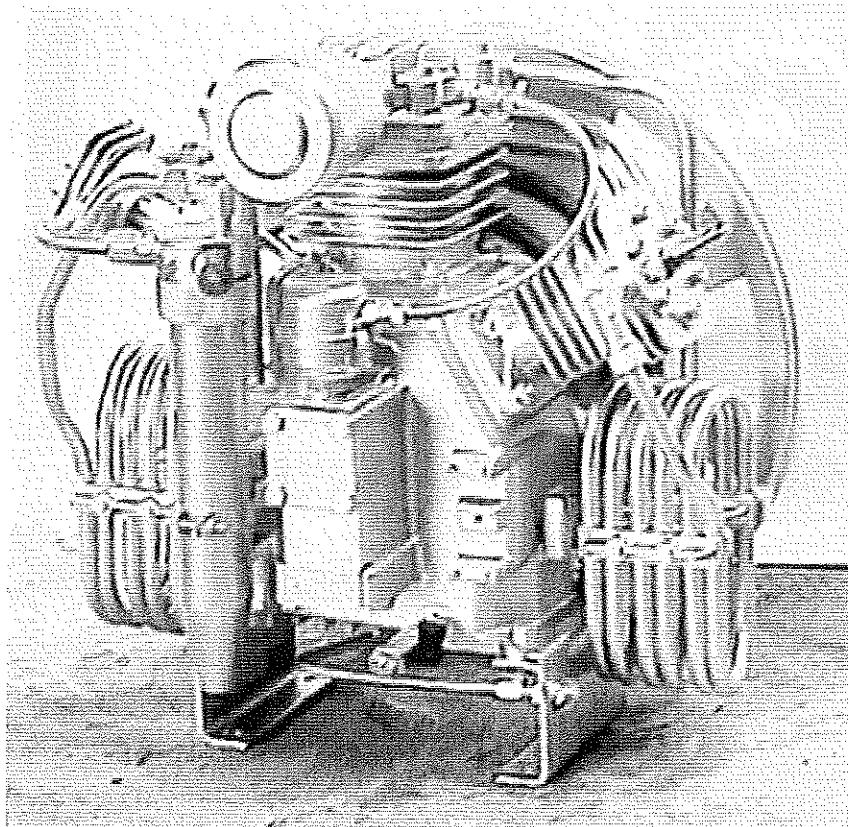


CompAir

CompAir UK Ltd



OPERATOR HANDBOOK
for
C5404, C5404H & C5405 Mk3
Aircooled Air Compressors



In any correspondence please quote: **JOB NUMBER:**
MACHINE NUMBERS:
PUBLICATION NUMBER: 98407/1079
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CUSTOMER ORDER NUMBER:



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COMPRESSOR LOG SHEET

COMPRESSOR		PRIME MOVER					INSTALLED AT		REF. NO.			
TYPE:		TYPE:		INSTALLED AT			OIL GRADE USED:		CHECK OIL LEVEL			
SPEED:		B.H.P.		DATE INSTALLED:			CHECK WATER IN/OUT TEMPERATURE		CHECK COOLING FAN BLADES			
SERIAL NO:		DRIVE:		DATE INSTALLED:			REMARKS SEE OVER FOR MORE		SIGNED			
DATE	TIME	*HOURS RUN	STAGE TEMP. °C	FINAL STAGE TEMP. °C	STAGE PRESSURES #(BAR - PSI)					FINAL AIR PRESSURE #(BAR - PSI)	SERVICE PLAN NUMBER	
					1	2	3	4	5			
		#50/100										
		500										
		1000										
		1500										
		2000										
		2500										
		3000										
		3500										
		4000										
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		9500										
		10000										
		10500										
		11000										
		11500										
		12000										
		12500										

*FILL IN HOURS RUN AS DETAILED ON SERVICE PLAN FOR PARTICULAR COMPRESSOR TYPE
 # DELETE AS NECESSARY - † FILL IN APPROPRIATE STAGE TRIP TEMPERATURE READING
 SERVICE ENGINEER TO SIGN & FILL IN ANY OTHER COMMENTS IN REMARKS COLUMN
 SERVICE TELEPHONE +44 (0) 1473 556027 - PARTS +44 (0) 1473 601282



5000 SERIES COMPRESSORS



The use of replacement parts or lubricating oils not supplied, recommended or approved by **CompAir UK Ltd Ipswich**, or the failure to maintain this equipment in accordance with the maintenance instructions, may invalidate the **WARRANTY**, cause equipment failure, create unsafe or hazardous conditions or result in damage to the equipment.

CompAir UK Ltd Ipswich cannot accept responsibility for damage, injury or failure caused by these situations.

USE ONLY




CompAir UK Ltd Ipswich

**GENUINE PARTS
AND
AUTHORISED SERVICE AGENTS**

1 ~ OWNERSHIP DATA

TECHNICAL DATA

It is recommended that details taken from the compressor and motor nameplates are recorded below.

		Compair UK Ltd Reavell House, White House Road Ipswich, Suffolk IP1 5PB United Kingdom	
C E	Sales Order N°		
Machine Type		Serial N°	
		Year of Manufacture	
Weight	kgs	Maximum Pressure	bar
When Applicable Notified		Motor Shaft Power	kW
Body Ref. Number 0038		Compressor Shaft Speed	rpm

CompAir UK Ltd Ipswich CONTACT DETAILS

Contact Name:	Sales Telephone: +44 (0) 1473 242000
Address: CompAir UK Ltd Reavell House 53-56 White House Road Ipswich IP1 5PB ENGLAND	Notes:
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For any comments or queries about the contents of this manual, please write to CompAir UK Ltd. at the above address, marked for the attention of Mr. Owen Dale, Technical Author.

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2 ~ FOREWORD

SPECIAL ATTENTION

The **STANDARD BUILD** of all CompAir UK Ltd (Ipswich Operations) products are not intended for use in either Explosive or Potentially Explosive Atmospheres as defined in Directive 95/9/EC.

An Explosive atmosphere is a mixture with air, under atmospheric conditions, of flammable gases, vapours, hazes or dusts in which, after ignition has occurred, combination propagates to the entire unburned mixture and may cause a hazard.

A Potential Explosive atmosphere is an atmosphere, which could become explosive due to local conditions.

CompAir UK Ltd Ipswich H5000 Series compressors are designed and manufactured to give optimum performance, with long life and reliability.

This Manual will help you to obtain the best performance from your compressor. It provides the information required to install, commission and operate the compressor and carry out regular maintenance schedules, which will ensure the maximum satisfactory service life.

Included within the Manual is a comprehensive Parts List to allow the user to order spare parts for servicing.

Servicing facilities and the supply of genuine replacement parts are provided through a world-wide network of CompAir companies and CompAir UK Ltd. distributors, backed by the **Service tel+44 (0)1473 242097 and Parts department tel (+44 (0) 1473 242000) Fax (+44 (0) 1473 743468 and Sales (+44 (0) 1473 242000 Fax (+44 (0) 1473 743482 at CompAir UK Ltd., Ipswich (UK)**

The information in this Manual was correct at the time of printing but modifications to parts and procedures may be made without notice which could affect the servicing requirements of the compressor. Before any servicing or maintenance work is undertaken the user is advised to contact the local CompAir Company or CompAir UK Ltd Distributor for revised or up-dated information.

In any communication concerning the compressor it is essential to quote the MODEL, SERIAL No. and any CONTRACT Ref.

It is important this Manual is retained with the compressor for reference and should remain with the compressor if it is sold or transferred to another user. Ensure that the new user is made fully aware of the need to study the Safety Section and any Warnings for safe operation given throughout the text.

Protect the environment by using only approved method of disposal of condensates lubricating oil etc.

- Please note:**
- a. Throughout the Manual all pressures quoted are gauge pressures.
 - b. Whilst recyclable materials are used as far as possible, please ensure when disposing of condensate, spent oil, used filter elements and any discarded parts or waste material of any kind make sure that there is no pollution to any natural water-course, drain system and that no burning waste takes place which could cause pollution of the atmosphere.

3 ~ CAUTION

Use only **CompAir UK Ltd Ipswich Genuine Parts** when carrying out routine maintenance or repair. The use of replacement parts or lubricating oils not supplied or recommended by **CompAir UK Ltd Ipswich** can lead to expensive failures, which will not be covered by warranty.

Substitution of parts not manufactured or approved by CompAir UK Ltd Ipswich can create a potential personnel hazard.

This is a High Pressure Compressor, for safe and reliable operation use only genuine CompAir UK Ltd Ipswich Parts

To ensure continued trouble free operation it is important that periodic servicing is carried out in accordance with the information given in this manual - refer to the "Maintenance Section".

Conditions of CompAir UK Ltd Ipswich warranty are stated in our Conditions of Sale. Details of warranty for a particular unit may be obtained from the local CompAir Company or authorised Distributor.

4 ~ SAFETY PROCEDURES

- **WARRANTY**

The Conditions of the CompAir UK Ltd Ipswich Warranty are set out in the Standard Conditions of Sale.

- **MAINTENANCE**

To ensure continued trouble free operation of the compressor it is important that periodic maintenance and servicing are carried out in accordance with the information given in the "Maintenance" section of this Manual. If any replacement or repair is needed use genuine CompAir UK Ltd Ipswich parts.

- * **WARNING**

The use of replacement parts or lubricating oils not supplied or approved by CompAir UK Ltd Ipswich may lead to failures in service which would not be covered by warranty.

Any unauthorised modifications or failure to maintain this equipment in accordance with maintenance instructions may make it unsafe. ***The use of replacement parts not supplied by CompAir UK Ltd Ipswich may create hazardous conditions over which CompAir UK Ltd Ipswich has no control.***

Such hazardous conditions may lead to accidents that can be life threatening, cause substantial bodily injury or result in damage to the equipment. ***CompAir UK Ltd Ipswich can bear no responsibility for equipment for which unapproved replacement parts are included.***

SPECIAL NOTE:

THE FOLLOWING HEALTH AND SAFETY PRECAUTIONS MUST BE READ IN CONJUNCTION WITH ANY OTHER MANUFACTURERS EQUIPMENT SUPPLIED.

could cause injury or death and are identified by the following:-

4.1 ~ GENERAL

CompAir UK Ltd Ipswich compressor safety relates to the document BS EN1012-1 Compressors and Vacuum Pumps - Safety requirements and the UK Pressure Systems Health & Safety Regulations S.I. No. 128.

- Most accidents which occur during the operation and maintenance of machinery result of failure to observe basic safety rules or precautions. Recognising a situation that is potentially hazardous can often prevent an accident.
- When handling, operating or carrying out maintenance on the unit, personnel must observe safe engineering practices and all relevant local regulations. The attention of users is drawn to the Health and Safety at Work Act 1974, and the regulations of the Institution of Electrical Engineers.
- CompAir UK Ltd cannot anticipate every possible circumstance, which might represent a potential hazard. The WARNINGS in this manual are therefore not all inclusive. If the user employs an operating procedure, an item of equipment or a method of working which is not specifically recommended by CompAir UK Ltd then they must ensure that the unit will not be damaged or made unsafe and that there is no risk to persons or property.
- Failure to observe these precautions given under "Safety Precautions" may be considered dangerous practice or misuse of the compressor
- Read and understand all WARNINGS, CAUTION AND MANDATORY LABELS on the unit before operating or carrying out maintenance or servicing.

4.2 ~ WARNINGS, CAUTIONS & NOTES

- *The following details for this Safety Section relate to the ESSENTIAL SAFETY REQUIREMENTS referred to in Directive 89/392/EEC, Amended 91/286/EEC.*



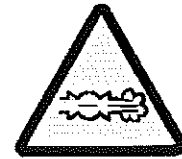
- Warnings call for attention to operation procedures involving specific hazards which



RISK OF DANGER



RISK OF ELECTRIC SHOCK



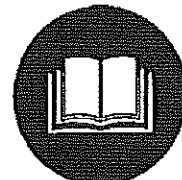
RISK OF HIGH PRESSURE



RISK OF HOT SURFACE



RISK OF GAS EXHAUST



CONSULT MANUAL

4.3 ~ GENERAL SAFETY PRECAUTIONS

- When using cleaning solvents, local Health and Safety Regulations must be complied with. Provide good ventilation and use suitable protection such as a breathing filter mask, safety glass, protective apron and gloves.
- Safety footwear should be compulsory in all workshops. Safety helmets must be worn if there is any risk of falling objects.
- If using compressed air for cleaning purposes, ensure safety regulations are

complied with and appropriate clothing worn.

- Never direct compressed air onto your skin or at other people. Never use compressed air to clean loose dirt from clothing.
- Before releasing compressed air through a hose make sure the free end is held securely so that it cannot whip and cause injury.
- Avoid injury by using a hoist to lift heavy loads. Check that all chains, hooks, shackles and slings are in good condition and are of the correct capacity. They must be tested and approved according to local safety regulations.
- Cables, chains or ropes should never be applied to lifting eyes. Always use an appropriate shackle or hook, properly positioned. Arrange lifting cables so that there are no sharp bends. Use a spreader bar to avoid side loads on hooks, eyes and shackles and never leave a heavy load unattended.
- When a load is on a hoist stay clear of the danger area beneath and around it. Keep lifting acceleration and speed within safe limits.

4.4 ~ INSTALLATION PRECAUTIONS

- Competent personnel under a qualified supervisor must only carry out installation work.
- A fused isolator switch must be fitted between the main power supply and the compressor.
- Precautions must be taken to ensure that no injury is caused to passers-by through loose clothing being sucked into compressor intake.
- Ensure that the discharge pipe from the compressor to the user pipework, receiver or storage is free to expand and that no flammable material is within the vicinity. If any such material is close-by take steps to preclude ignition.
- A manual shut-off valve should be fitted in the discharge line to allow the compressor to be isolated. Non return valves cannot be relied upon for isolating parts from a pressure system. A safety valve must be installed between any compressor unit and the isolating valve.
- A pressure-relieving device must be fitted to every pressure vessel, or equipment containing air or gas above atmospheric pressure. Never remove or tamper with safety devices, guards or insulation fitted. In order to limit the risk of Legionnaires Disease, CompAir UK LTD advise

caution with the use of cooling towers for water cooling the compressor. Closed circuit or direct mains cooling is preferred.

- Pipework or other parts with a surface temperature above 70°C, which may be accidentally touched in normal operation, must be guarded or insulated. Other high temperature pipework should be clearly marked and all pipework should be clearly marked.

4.5 ~ OPERATIONAL PRECAUTIONS

- Competent personnel under a qualified supervisor must only operate the compressor.

Do not operate compressor with any removable inspection cover removed e.g. crankcase doors, valve covers etc.

- Never remove or tamper with safety devices, guards or insulation materials.
- The compressor must only be operated at the supply voltage and frequency for which it is designed. Always isolate power before maintenance or servicing.
- When mains power is ON, lethal voltages are present in the electrical circuits and extreme caution is need when essential work is carried out on the electrical system. **ALWAYS CONSULT A QUALIFIED ELECTRICIAN BEFORE ANY SUCH ESSENTIAL WORK.**
- Do not open starter compartment to touch electrical components while voltage is applied unless it is necessary for measurement, test or adjustment. Such work should always be carried out by a qualified. Electrician with appropriate tools and protection against an electrical hazard.
- If the unit is equipped with a Remote Control device, attach warning notices stating "**THIS UNIT CAN BE STARTED REMOTELY**" in prominent locations, one on the outside of the unit, the other inside the control compartment.
- As a further safeguard, take adequate precautions that no one is working or checking the unit before attempting to switch on remotely controlled equipment. Attach a "**CHECK THAT ALL PERSONNEL ARE CLEAR OF UNIT BEFORE STARTING**" or similar notice.
- Compressed air and gas piping, together with cooling water piping and other parts, with surface temperature greater than 70°C and may

be accidentally touched, should be guarded or insulated.

- If there is any indication that the compressor is overheating it must be shutdown. (A high air or gas temperature switch is fitted as standard to guard against operating with excessive temperature). Beware of burns from hot oil and water when working on a unit recently shutdown.
- Do not operate the unit when guards provided for protection for all rotating and reciprocating parts have been removed for essential maintenance. Secure guards following any servicing or repair.
- Local noise regulations must be observed. Ear defenders are suggested by Noise at Work Regulations 1989 when the level is greater than 85 dB A at one meter. Be aware high noise levels can interfere with communication.

4.6 ~ MAINTENANCE & REPAIR PRECAUTIONS

- Competent persons under qualified supervisor must carry out maintenance repair and modifications.
- The compressor will have a preserving oil applied to interior surfaces (Oil lubricated models). Oil free models will have desiccant bags in valve covers and distance pieces.
- Handling components such as seals, gaskets and diaphragms should not present a personnel hazard. Preservation oils again should not present a personnel hazard if handled under normal handling practices.
- Whilst compressors are asbestos free, treat all damaged gaskets as asbestos - when the Asbestos at work regulations apply.
- Viton 'O' seals under normal operating conditions are safe.
- However, should there be a fire within the compressor or these seals are likely to exceed a temperature of 300°C the material will decompose.

• **Degraded Viton gives off Hydrogen Fluoride fumes and if in contact with the skin an acid formed causes severe burns.**

- If Viton seals appear charred or gummy do not touch with unprotected hands: use neoprene or PVC gloves.

- Wash the area with limewater and avoid breathing any fumes. If contamination of the skin occurs washes with limewater and seeks medical advice.

Pre-Maintenance Operation

- 1. Isolate the compressor from the main electrical supply. Lock the isolator in the OFF position and remove fuses.

- 2. Attach a label "**WORK IN PROGRESS - DO NOT APPLY VOLTAGE**".

- 3. Close the isolating valve between the compression unit and user's pipework. Close the isolating valve in the cooling water inlet pipe. Attach a label "**WORK IN PROGRESS - DO NOT OPEN**".

- 4. Check that all pressurised gas trapped in the system is released to atmosphere or safely to gas storage. Check that all pressure gauges register zero.

- 5. Ensure that the cooling water system has been drained.

- 6. Check that the drain valve on the delivery manifold is clear and gas pressure has been released.

- 7. Check that all interstage drains are open to ensure any gas trapped between stages has been released.

- Stand clear of all valve covers when removing the securing screws.

- When removing valve covers for valve replacement, ensure a minimum of two threads is left engaged on the valve cover securing screws. Lever the valve cover until the 'O' seal is disengaged from the port in the cylinder head. Remove the securing screws and take out valve cover.

- **Use only lubricating oils and greases approved by CompAir UK LTD to avoid potential hazards especially the risk of explosion or fire and the possibility of decomposition or generation of hazardous gases.**

- Always clean oil spills from the surrounding floor before and after maintenance work.
- Make sure all instructions concerning operation and maintenance are strictly followed and that the complete unit, with all accessories and safety devices, is kept in good order.
- The accuracy of pressure gauges and temperature switches should be regularly checked at least 13 month intervals and thoroughly examined at least every 48 months. They must be renewed or service exchanged when acceptable tolerances are exceeded.
- Protection devices should be tested at each regular service interval and replaced or service exchanged if not functioning correctly. The maximum pressure for safety valves under fault conditions is 1.10 times the set pressure, the set pressure being a minimum of 1.05 times the maximum operating pressure to ensure seat tightness.
- Never use a light source with an open flame for inspection.
- Before dismantling any part of the compressor be sure that all heavy movable parts are secure.
- After completion of any maintenance or repair ensure that no tools, loose items or rags are left on or inside the compressor.
- Do not use any flammable liquid to clean valves, filter elements, cooler passages, pipe bores or any component carrying a flow of air or gas during normal operation. If chlorinated hydrocarbon substances are used for cleaning, safety precautions must be taken against toxic vapours, which may be released.
- When disposing of condensate, old oil, used filter elements and other parts and waste material of any kind make sure that there is no pollution to any drain or natural water course and that no burning of waste takes place which could cause pollution of the atmosphere.
- Keep the compressor clean at all times.
- Protect components and exposed openings by covering with a clean cloth or tape during repair or maintenance work.
- Protect the motor, intake, electrical and regulation components against the entry of moisture e.g. steam cleaning.
- Precautions must be taken when carrying out welding or any repair operation which generates flames or sparks. The adjacent components must be screened with non-flammable material and if oil present, the system must first be cleansed thoroughly by steam cleaning.
- Condensate (oil and water mixture from compression process) must be regarded as trade effluent and is therefore not suitable for discharge into a surface water sewer, soakaway or watercourse.

DO NOT USE CARBON TETRACHLORIDE.

- Precautions must be taken against using acids, alkalis and chemical detergents for cleaning machined parts. These materials cause irritation and are corrosive to the skin, eyes, nose and throat. Avoid splashes and wear suitable protective clothing and safety glasses. Do not breathe the mists. Ensure water and soap is readily available.

PROTECT THE ENVIRONMENT USE APPROVED METHODS OF DISPOSAL.

4.7 ~ PRECAUTIONS IN THE EVENT OF FIRE

- Use extreme caution when handling components that have been subjected to fire or very high temperature. Some components may contain fluoroelastomer materials, which decompose under these conditions to form highly corrosive residues. Skin contact can cause painful and penetrating burns resulting in permanent skin and tissue damage.

***This is a high pressure Compressor use only:
GENUINE
CompAir UK Ltd Ipswich
PARTS***

BARE SHAFT COMPRESSOR SECTION

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ASBESTOS GASKETS

BUILD LIST

5404,5404H & 5405 MK3

GENERAL DESCRIPTION

These machines are three cylinder, single acting, W configuration, air cooled compressors. The 5404/4H & 5 are fitted with a grooved and vaned driving flywheel to force air over the cylinders and coolers.

Air entering through the suction filter is increased in pressure as it passes through each stage of the compressor until it reaches the final specified delivery pressure. Heat exchangers, positioned in the air stream from a cooling fan, are provided after each stage together with a separator after the second stage heat exchanger.

LUBRICATION

All models are splash lubricated.

The specified lubricant must be used at all times to ensure safe and efficient operation with minimum wear and maximum protection against moist air corrosion.

Recommendations are the result of extensive research at Ipswich Works and all responsibility for the use of an oil other than that recommended is placed on the purchaser and his oil company. Only synthetic oils are recommended for these compressors.

THE NORMAL GUARANTEE MAY BE INVALIDATED SHOULD A FAILURE BE ATTRIBUTED, BY IPSWICH WORKS, TO THE USE OF A LUBRICANT NOT RECOMMENDED.

SYNTHETIC OILS

These are oils which are arrived at by chemical synthesis from petroleum feed stocks, although in some cases would be from vegetable and mineral oils, rather than by straight run distillation of crude. The manufacturing process allows the oils to be produced to close tolerances giving performance which is consistent from batch to batch.

COOLING

Cooling is provided by a vaned flywheel on each of the 5404/4H & 5 models. The cooling air passes over the coiled coolers and the finned cylinders and covers.

DRIVE

Drive is normally by vee belts from a suitable power source such as an electric motor or diesel/petrol engine.

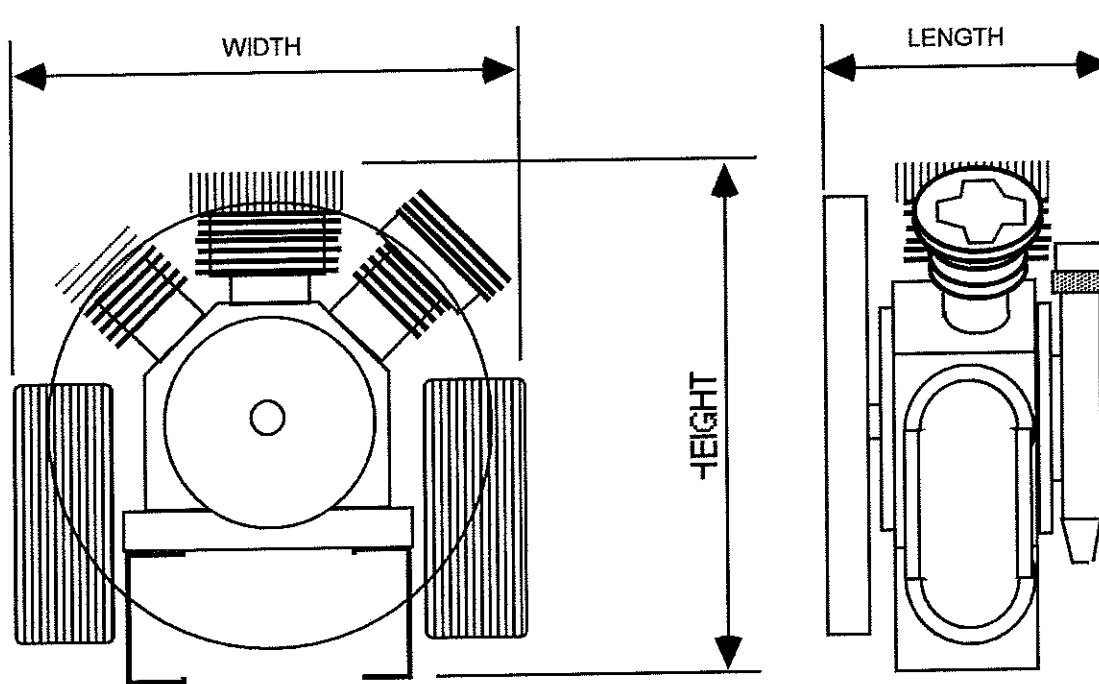
RUNNING GEAR

Main, big end and small end bearings are all replaceable. However, it is often simpler to replace the last two complete with a new connecting rod to avoid the risk of distorting the existing rod when removing the old outer bearing.

VALVES

On all models 1st stage valves are of the reed type whilst the second and third stages each have a single valve combining suction and delivery functions. Both valves fitted to these stages are of the flat plate, low lift, multi-ported type. The valves also function as stage cylinder heads, incorporating inlet and outlet air connections.

TECHNICAL DATA



Three stage, three cylinder, single acting, air cooled compressors.

Model		5404	5405	5404H
Minimum working pressure	bar	85	85	138
Maximum working pressure	bar	350	350	414
Maximum speed	rpm	1300	1300	1050
Minimum speed	rpm	1000‡	1000‡	900‡
1st stage piston displacement at max speed	m ³ /h	12	19	9.7
Stage working pressures at max. pressure	1st stage bar	4.6	6.6	7.6
	2nd stage bar	48.2	54.4	69
Starting unloading diaphragm drain valves on second and third stages				
Normal operating parameters - see lubricant duties				
Maximum inlet pressure	bar	0.07	0.03	0.03
Cooling air flow rate	m ³ /h	2500	2500	2000
1st stage cylinder bore Ø	mm	70	88	70
2nd stage cylinder bore Ø	mm	36	36	36
3rd stage cylinder bore Ø	mm	14	14	11
Stroke	mm	40	40	40
Mean piston speed at maximum speed	m/s	1.73	1.73	1.4
Safety valve set pressure	1st stage bar	6	8.3	9.0
	2nd stage bar	54	68.9	80
Final stage supply + 10%		bar		
1st stage suction connection	Rp	1	1	1
Final delivery connection	Rc	80mm	8mm	8mm
Maximum vibration level (in any direction)	mm/s	40	40	40
Nett weight of bare compressor and pulley	kgf	36	39	39
Overall dimensions of above	Length	mm	361	361
	Width	mm	530	530
	Height	mm	505	505
Rotational inertia of flywheel pulley and compressor	Kgm ²	0.144	0.144	0.144

‡ Contact CompAir UK Ltd Ipswich Engineering Department if a lower speed is required.

LUBRICATION

Development in the field lubrication is continually changing and at the date of compilation of this publication the following information applies. At all times the responsibility for use of an oil other than the recommended grade is placed on the customer and his oil supplier, as our normal guarantee will be invalidated should be attributed, by us, to the lubricant used.

1. **THE RECOMMENDED LUBRICANTS FOR MACHINES MANUFACTURED BY COMPAIR UK LTD., ARE THOSE GRADES LISTED**
2. **THE ALTERNATIVES (NOT NECESSARILY EQUIVALENTS) TO THESE GRADES ARE THOSE SPECIFIED BY THE OIL COMPANIES SUPPLYING THE OIL AND NOT COMPAIR UK LTD .(UNLESS OTHERWISE STATED).**
3. **COMPAIR UK LTD., CANNOT BE HELD RESPONSIBLE FOR INCORRECT INFORMATION CONCERNING ALTERNATIVE LUBRICANTS.**
4. **AT ALL TIMES THE RESPONSIBILITY FOR USE OF AN OIL OTHER THAN THE RECOMMENDED GRADE IS PLACED ON THE CUSTOMER AND HIS OIL SUPPLIER, AS OUR NORMAL GUARANTEE WILL BE INVALIDATED SHOULD FAILURE BE ATTRIBUTED BY US TO THE LUBRICANT USED.**

OIL TYPES 5000 SERIES AIR-COOLED

Approved lubricants for use in the 5000 series air cooled reciprocating compressors have been evaluated for performance and compatibility with materials used in their construction. The type of oil recommended for all air cooled compressors is SYNTHETIC.

MINERAL OIL

*Mineral oil can be used on restricted duties except 5404H, this **must** be run on synthetic oil for all duties. For restricted duty details contact COMPAIR UK Ltd .*

SYNTHETIC OILS

Reavellite, Anderol 500, Shell Madrela AP100, Mobil Rarus 827 and Castrol SN 100

RUNNING IN

It is recommended all 5000 series air cooled compressors both new and overhauled be run in on synthetic oil.

ALTERNATIVE LUBRICANT - RUNNING IN ONLY

Mineral oil can be used for running in I.E. MOBIL RARUS 427 or SHELL CORENA P100 for a period of 100 hours, after which the machine should be drained, flushed through and filled with the recommended synthetic oil.

BREATHING AIR APPLICATIONS

ONLY REAVELLITE, Anderol 500 and Mobil Rarus 827 are suitable for this application.

RECOMMENDED OILS 5000 SERIES AIR-COOLED COMPRESSORS COMPRESSING AIR.

COMPRESSOR TYPE	AMBIENT TEMPERATURE °C	OIL RECOMMENDED SEE SPECIAL NOTES	SUMP CAPACITY(Litres)
5404/5404H/5405	0 to 45	Reavellite S (1)(2)(3)	1.6
5404/5404H/5405	-10 to 15	Reavellite W/Anderol 495	1.6

SPECIAL NOTES

- (1) MOBIL RARUS 427 can be used for some restricted duties contact COMPAIR UK Ltd for details.
- (2) If the Compressor is fitted with a sump heater the oil can be used down to -10°C.
- (3) The temperature range of compressors supplied prior to June 1991 is 15 to 45°C.

5404,5404H & 5405 MK3

INSTALLATION

1. GENERAL

Compressor must be installed in a level, well ventilated position clear of fumes, heat or high humidity to ensure efficient performance and also to prevent over-temperature problems. It is essential to ensure that fumes from engines, toxic gases or exhaust from nearby factories etc. cannot be drawn into the compressor intake. Poorly ventilated work areas should also be avoided. If sited in a large building there should be few problems, provided there is a reasonably air gap between the front and back of the compressor and any obstructions. If positioned in a small or confined building, clean cooling air must be directed or ducted towards the compressor fan ensuring that there is also no air flow short circuit. As all motor power is dissipated in heat to the cooling air, it is essential that expired cooling air has an unobstructed passage and exit. In a cold climate the compressor should be installed in a heated location. Allow sufficient space around the installation to enable safe maintenance working conditions. Suitable lifting equipment should be readily available.

2. MOUNTING

For permanent installation, seating must be flat, level and designed to support the weight and any out of balance forces. If necessary, use shims to ensure bedplate is not strained on final tightening down.

3. BELT DRIVE

Ensure that driving and driven pulley grooves are in line and shafts are parallel before and after fixing. Tensioning procedures follow normal practice.

4. CONNECTIONS. PIPEWORK AND FITTINGS

- 4.1 All piping and connections must be suitable for the pressures and capacities involved.
- 4.2 Ensure all port protection plugs and blanks are removed, all pipes, especially suction pipes, are free from jointing compound, pipe scale, swarf, dirt or other foreign matter before final pipe assembly.
- 4.3 A suction filter must always be fitted to prevent damage and excessive wear.
- 4.4 Safety valves are fitted as standard equipment.
- 4.5 Ensure compressor is installed to comply with local Electricity Authority stipulations and that necessary electrical work is carried out by a competent electrical engineer. Check electrical requirements of the machine with manufacturer before commencing installation wiring.

COMMISSIONING

COMMISSIONING OR STARTING A NEW OR OVERHAULED UNIT

IMPORTANT - Lubrication

The recommended lubricant is REAVELLITE. This has the advantage of significantly reducing carbon deposits, thus extending normally expected maintenance periods by 1.5 to 3 times. Likewise, oil changes fall into the same category. Wear rates are reduced and oil carry over can be down by 35%. Close tolerance manufacture also effects properties from batch to batch, resulting in consistent performance. The lubricant manufacturers have given assurance that REAVELLITE is non-toxic and suitable for use in breathing air compressors.

There are some materials, eg certain rubbers, paints, plastics and metals, which are not compatible with synthetic oils. Components on these compressors are synthetic oil compatible but a problem may exist with ancillary equipment. Consult equipment manufacturer to determine compatibility.

1. BEFORE STARTING

SETS ARE DESPATCHED WITHOUT THE FILTER CARTRIDGES FITTED. TO FIT THE CARTRIDGES FOLLOW INSTRUCTIONS GIVEN IN SERVICE PROCEDURE.

- 1.1 Check complete installation, including pipework and alignment of compressor with driving unit.
- 1.2 Remove dry type suction filter element, blow over with low pressure air and re-insert in casing.
- 1.3 Ensure silencer bore and pipework is clean and blank removed from suction pipe.
- 1.4 Ensure crankcase is filled to maximum level mark on dipstick with REAVELLITE synthetic oil. Do not overfill - over lubrication is harmful.
- 1.5 Remove valve head and examine cylinder bore. Add small quantity of oil to upper cylinders and ROTATE COMPRESSOR BY HAND to spread oil over cylinder faces.
- 1.6 If machine has been idle for six months or more, ENSURE THIRD STAGE PISTON IS WELL LUBRICATED WITH RECOMMENDED OIL.

2. START-UP PROCEDURE

- 2.1 Rotate the compressor once or twice by hand to ascertain free movement.
- 2.2 Operate starter and immediately check rotation - an attached label or plate indicates correct rotation. Check pressure gauges for stage air flow.
Solenoid valve will be closed as soon as the compressor has attained running speed. This should be reached in less than 2 seconds for direct-on-line starting and 8 seconds for Star Delta.
- 2.3 Moisture will be trapped within the system and there it is recommended that the system is purged out prior to charging cylinders. Open the vent valve and check that the charging pressure gauge reads 0, disconnect cylinder charging adaptors from their blanks on the panel and lay them in a clean position. Open the charge valve, close the vent valve and run the compressor for 30 minutes in this condition. Do not run the compressor for longer than 30 minutes without stopping and automatically draining.
To check the charging operation and pressure switch setting connect the charging hoses back onto their blanks on the charging panel. With the vent valve and charging valve open, start the compressor and allow the filtration pressure to build up to the PMV setting of 200-250 bar. Air will then escape from the vent valve. Partially close vent valve to slowly increase charging pressure and then note the charging pressure when the compressor stops. This should relate to the pressure of the cylinder being used. The maximum compressor pressure is 350 bar.
- 2.4 Check and adjust, if necessary, the air governor or pressure switch setting, as appropriate.
- 2.5 After 20 minutes operation, check valve heads. Intake pipe to valve heads should be hand warm and outlet pipes hot. This indicates valves are functioning correctly.
The set must be run for at least one hour before cylinder charging operations are undertaken in order to allow the filters to obtain their operational downpoint level. Check air purity.

OPERATION AND ROUTINE MAINTENANCE

1 OPERATION AND DAILY MAINTENANCE

Commissioning procedure should be used;

- a) For first commissioning run
- b) Following overhaul
- c) After standing idle for a long period

Crankcase oil needs to be changed after major overhaul. Starting procedure should be observed after valve overhaul. Keep exterior of the compressor clean, especially pipe connection and joints, as this will assist in detecting any leaks. Ensure finned final stage cooler coil is clean at all times.

2 STARTING UP

Check crankcase oil level on dipstick, top up, if necessary, with recommended oil. Check the filter cartridge is within its service life. Check the air cylinders are approved and certified for the desired operating pressure. Check the pressure switch setting relates to the pressure of the cylinders being charged. Hand unload compressor. Operate started, close unloader(s) and bring on to load. Check machine rotates anti-clockwise when viewed from the drive end.

3. RUNNING ON LOAD

Stop machine and crack all drain at 30 minute intervals to clear condensate.

4. STOPPING

Stop compressor from panel.

5. STANDING IDLE

Condensate drains will automatically be left open.

If machine is to stand idle for more than five weeks (or shorter period if ambient conditions are unfavourable) it is advisable to carry out recommended inhibition procedure.

MAINTENANCE SCHEDULE

WARNING :-

1. BEFORE PROCEEDING WITH MAINTENANCE ON THE COMPRESSOR IT MUST BE STOPPED AND ISOLATED ELECTRICALLY AND MECHANICALLY AND VISIBLE WARNING NOTICES DISPLAYED.
2. IN ADDITION ALL INTERNAL PRESSURE MUST BE RELEASED WITH THE UNIT ISOLATED FROM THE SUPPLY AND STORAGE RESERVOIR.

Note:-

An O&M manual must cater for a wide variety of operating duties, ambient conditions and methods of control. Periods given in this manual allow for the worst combination and are also based on preventative maintenance rather than operation until failure occurs.

GENERAL

It is useful to record pressure, temperatures, oil used etc., in a log against hours run, as this builds up a detailed record of machine condition. It can also give an indication of impending problems.

TORQUE WRENCH SETTINGS FOR NON-LUBRICATED FASTENERS

SEE BUILD LIST PAGE 29

DAILY

Check oil level in crankcase and top up if necessary.

Check stage pressures and temperatures.

Ensure finned cooler is clean and free from any build-up of dirt.

WEEKLY

Check for oil or air leaks, rectify if necessary.

Check correct operation of all controls.

Check all nuts, screws and fittings for tightness.

RECOMMENDED MAINTENANCE

SYNTHETIC OIL ACTION REQUIRED	RUNNING HOURS (X1000)						
	0.05	0.5	1	1.5	2	2.5	3
Change OIL	X	X	X	X	X	X	X
Change plates & springs all valves				X			X
Change valves							X
Fit new piston rings 3rd Stage			X		X		
Fit new plunger/liner assembly							X
Check belt tension	X	X	X	X	X	X	X
Clean unloader valves, re-lap seats & replace diaphragms as necessary				X			X
Complete check & overhaul, hydraulic test coolers						X	

Note:- * Change after first 50 hours, after major overhaul and annually if less than 500 hours use.

MAINTENANCE

1. After First 15 hours running time
Ensure that alignment and belt tensioning is correct.
2. After First 50 hours running time
Change oil in crankcase. When changing oil drain whilst warm, (°) then slowly pour fresh oil into filler neck. Wait five minutes, then start compressor and run for five minutes. Stop machine and top-up crankcase. Examine valves. For tightening torques, see SECTION TWO.
3. The next oil change will be after 500 hours running time or annually.
4. Periodically
Remove and renew disposable suction filter.
5. Every 500 Hours running time or 16 weeks.
Drain crankcase and refill with recommended oil.
Check belt alignment and tension are correct.
6. Every 1000 Hours running time (or 32 weeks)
Drain crankcase oil after compressor has been running and oil is still warm. Refill with recommended oil. Re-check level after oil has had time to settle.
Fit new 3rd stage piston rings.
Check belt alignment and tension are correct.
7. Every 1500 Hours running time
Change crankcase oil and refill with recommended oil. Oil must be changed annually even if running hours do not amount to service time.
Refurbish or replace all valves.
Change valve plates and springs on all valves.
Check belt alignment and tension are correct.
Clean unloader valves and re-lap seats & replace diaphragms as necessary.
8. Every 2000 Hours
Drain crankcase oil after compressor has been running and oil is still warm. Refill with recommended oil. Re-check level after oil has had time to settle.
Fit new 3rd stage piston rings.
Check belt alignment and tension are correct.
9. Every 2500 Hours
Drain crankcase and refill with recommended oil.
Check belt alignment and tension are correct.
Complete check and overhaul. Hydraulically test all cooler assemblies.
10. Every 3000 Hours running time
Drain crankcase oil after compressor has been running and oil is still warm. Refill with recommended oil. Re-check level after oil has had time to settle.
The compressor should be given a full mechanical check.
Check pressure gauges, for correct reading.
Replace all valves.
Fit new 3rd stage plunger and liner assembly.
Check belt alignment and tension are correct.
Clean unloader valves and re-lap seats & replace diaphragms as necessary.

* *When draining crankcase, always remove lower drain plug.*

DISMANTLING AND REASSEMBLY OF VALVES

GENERAL

Keep a spare oiled and maintained set of valves in store for quick compressor servicing. valves may have only a thin carbon layer and be slightly moist with oil. Valve removal is a simple procedure but the following guidelines should be observed.

NOTE:-

Unless replacement of the springs and plates is intended, the order in which these components are removed should be carefully noted so that the valves may be reassembled with the same seating faces in contact.

CLEANING AND INSPECTION - ALL STAGES

The valve components should be degreased using a suitable solvent and stiff brush. Carbon deposits may be removed by gently scraping .

WARNING:- ***Great care should be taken when removing carbon deposits to ensure that the seating faces of the valve components are not damaged.***

These faces should be clean and bright over their whole area, with no evidence of uneven contact. Renew any plates which are indented, cracked, warped, or have wear grooves which exceed 1/10th of the plate thickness.

If the seats show severe wear or indentations the complete valve assembly must be renewed. The remaining components should be checked for cracks, distortion or other damage liable to impair valve operation.

VALVE REMOVAL 2nd & 3rd STAGE

Disconnect suction and delivery piping.

Remove securing bolts and valve from cylinder.

VALVE REMOVAL 1st STAGE

Disconnect nylon tube and delivery pipe.

Remove securing bolts and valve from cylinder.

VALVE DISMANTLING AND ASSEMBLY

SECOND STAGE VALVE

Second Stage Valve see BUILD LIST ref 85 - 89 for drawing (page 20).

To dismantle – invert valve and unscrew and remove the two screws (a) and lift off the lower half of valve. All internal components, i.e. 'O' ring (c), suction valve/backing plates (f), suction spring plates (g), delivery valve/backing plates (d) and delivery spring plates (e) can then be removed.

To assemble – Place upper half and lower half of valve body on clean, flat surface with their mating faces uppermost. Into the upper half fit the 'O' ring (c) into groove and first valve/backing plate (d) into recess. Place valve springs (e) onto backing plate having first positioned them as follows:–

Hold the springs together with the concave faces facing each other and then rotate one of them until their outer edges touch all round the circumference and there is a constant gap around the inner edge.

Place second valve/backing plate (g) on valve springs.

Into the lower half fit first valve/backing plate (f). Fit valve springs (g) having first positioned them as follows:–

Hold the springs together with the concave faces together and then rotate one of them until their outside edges touch all round the circumference and there is a constant gap around the inner edge.

Place second valve/backing plate (f) on valve springs.

With a steel rule or similar item placed over suction valve components to prevent them falling out, invert lower half of valve and fit to upper half ensuring that dowels fit into their location holes and clamping screw holes align. Withdraw rule and check that the valve halves are touching. Fit screws (a) and tighten to correct torque. Check freedom of operation of suction and delivery valve plates.

THIRD STAGE VALVE

Third Stage Valve see BUILD LIST ref 90 - 94 for drawing (page 22).

To dismantle – invert valve and remove screws (a). Lift valve base from valve seat to gain access to the suction components, i.e. valve/backing plates (d), valve springs (e) and centre plate (f). Remove 'O' ring (c) from groove in valve base.

Lift valve seat to gain access to the delivery valve components, i.e. valve/backing plates (d), valve springs (e) and centre plate (f). Remove 'O' ring (b) from groove in valve top.

To assemble – Invert top section of valve and place on clean, flat surface. Fit 'O' ring (b) to groove and the following delivery valve components into the recess; first valve/backing plate (d), valve spring (e) with concave face downwards; centre plate (f); valve spring (e) with concave face upwards; and second valve/backing plate (d).

Fit valve seat on top section of valve ensuring that dowels in top section of valve (not shown) locate holes in seat and that clamping screw holes align.

Place valve base on clean, flat surface. Fit 'O' ring (c) to groove and the following suction valve components into the recess; first valve/backing plate (d); spring plate (e) with concave face downwards; centre plate (f); spring plate (e) with concave face upwards; and second valve/backing plate (d).

Holding valve seat and top section of valve firmly together to prevent displacement of delivery valve parts, fit assembly onto valve base ensuring dowels in base locate in holes in valve seat and that the clamping screw holes align. Fit clamping screw (a) and tighten to correct torque.

VALVE REASSEMBLY IN COMPRESSOR

Ensure all mating faces are clean and undamaged. Inspect 'O' ring on top of cylinder liner and replace if necessary.

Place valve on cylinder and ensure correct orientation

Fit suction and delivery unions and hand tighten only.

Fit the securing bolts and tighten to correct torque.

Tighten suction and delivery unions.

FAULT GUIDE

WARNING :-

1. BEFORE PROCEEDING WITH MAINTENANCE ON THE COMPRESSOR IT MUST BE STOPPED AND ISOLATED ELECTRICALLY AND MECHANICALLY AND VISIBLE WARNING NOTICES DISPLAYED.
2. IN ADDITION ALL INTERNAL PRESSURE MUST BE RELEASED WITH THE UNIT ISOLATED FROM THE STORAGE RESERVOIR.

NOTE:- A Safety valve opening indicates excessive pressure and under **NO CIRCUMSTANCES** must a safety valve be screwed down to accommodate excessive pressure. **THIS IS DANGEROUS.** If safety valve opens or appears faulty, shut down compressor immediately and investigate.

If fault appears immediately or shortly after a service, first examine those parts disturbed during the service.

The following is a list covering the probable causes of operational faults, together with their suggested remedies.

Fault	Probable Cause	Recommendation(s)
FINAL STAGE SAFETY VALVE BLOWING	Restriction in non-return valve, pressure switch fault, pipeline blockage.	Existing Installation: Check functioning and setting of all control valves, clean pipeline filters and service elements. Check operation of pressure switch. New Installations: Ensure all protective plugs are removed from ports and control valves are set correctly. Ascertain pipework is of adequate dimensions with minimum of bends, check joint gaskets for correct positioning and size. Check operation of pressure switch.
OTHER STAGE SAFETY VALVE BLOWING	Leaking suction valve in following stage	Remove & check condition of suspect valve, clean and/or replace plates & springs.
COMPRESSOR RUNS LONGER TO ACHIEVE SYSTEM PRESSURE	Piston ring wear.	Check components, renew rings and liners as necessary. Check blowby on crankcase breather pipe.
OVERHEATING	Incorrect grade of lubricant. Dirty coolers, especially finned ones. Clean. Fan blades damaged or loose.	Drain, clean and refill with correct lubricant. Check condition of valves and gas passageways. Check, replace or tighten.

5404,5404H & 5405 MK3

BUILD LISTS

5404 MK3

5404H

5405 MK3

5404,5404H & 5405 MK3

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3rd STAGE CONCENTRIC VALVE.....	090
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TORQUE WRENCH SETTINGS.....	Append

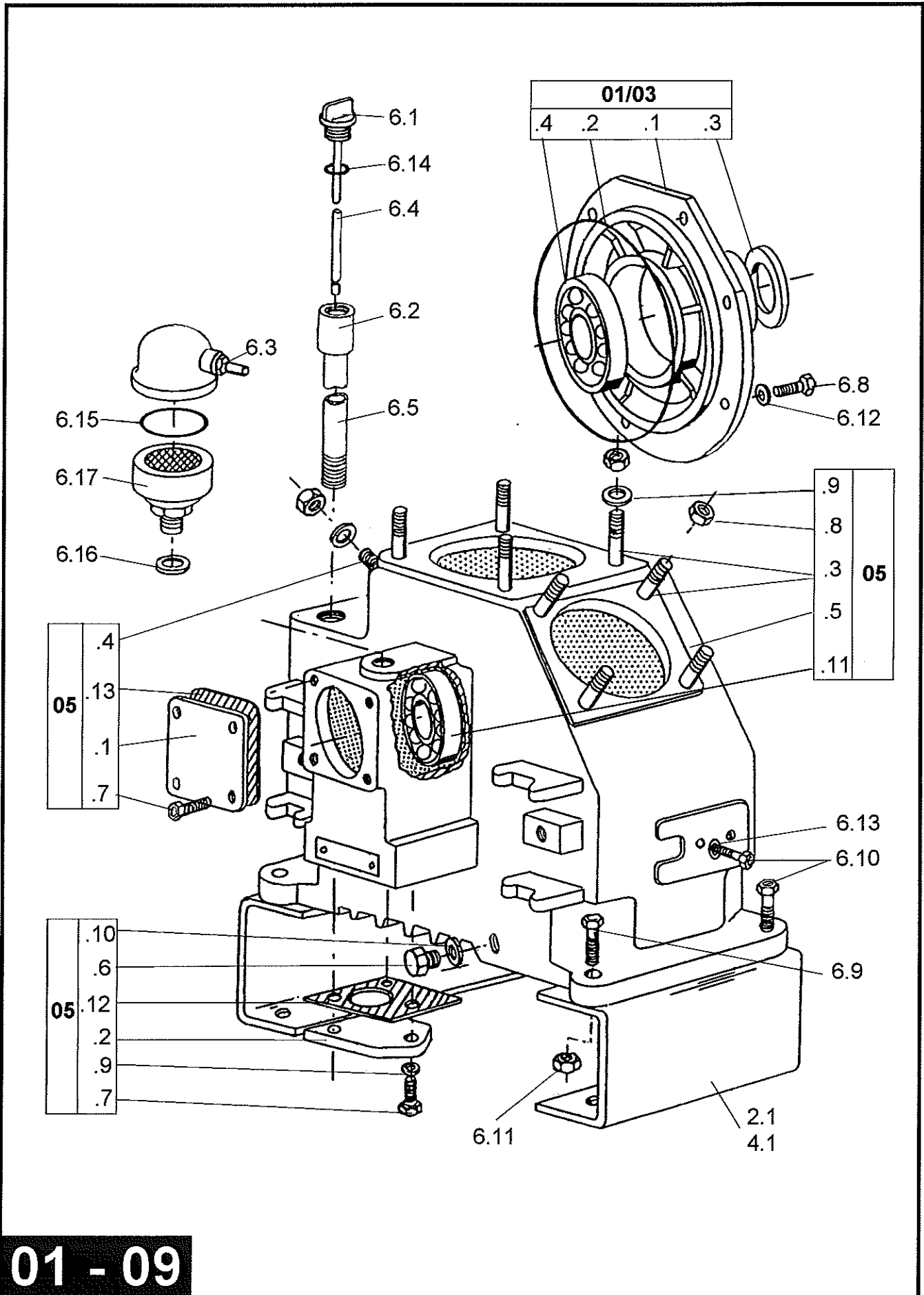
Due to our policy of continuous improvement we reserve the right to alter, modify and update without prior notice.

CRANKCASE PARTS

ITEM REF	DESCRIPTION	PART N°	N° OFF			STG
			5404	5404H	5405	
01	BEARING HOUSING D/E Parts:-	D100154.100*	1	1	1	
.1	Bearing Housing	D100154#	1	1	1	001
.2	'O' Ring	95602.98	1	1	1	001
.3	Oil Seal	95605.57	1	1	1	001
.4	Bearing	98076.1019	1	1	1	001
02.1	BRACKET	C200836	2	2	2	002
05	CRANKCASE Parts:-	E60169.50*	1	1	1	
.1	End Cover	C200563	1	1	1	005
.2	Cover Plate	C201336	1	0	1	005
.3	Stud M8 x 25	D100171.8.41	8	4	8	005
.4	Stud M8 x 70	D100171.8.86	4	4	4	005
.5	Crankcase	E60169#	1	1	1	005
.6	Plug	PS1068.3	1	1	1	005
.7	Setscrew M8 x 16	95000.254	7	7	7	005
.8	Nut M8	95111.5	12	12	12	005
.9	Washer Plain M8	95148.14	11	11	11	005
.10	Washer Fibre	95640.7	1	1	1	005
.11	Bearing	98076.1018	1	1	1	005
.12	Joint	98502.1016	1	1	1	005
.13	Joint	98502.1017	1	1	1	005
06.1	PLUG OIL FILLER	C200562.1	1	1	1	006
06.2	SOCKET OIL FILLER	C200562.3	1	1	1	006
06.3	COUPLING	C200658	1	1	1	006
06.4	DIPSTICK	C202562	1	1	1	006
06.5	PIPE OIL FILLER	C73666.4.176	1	1	1	006
06.6	RIVET ROKUT	PS2189.1	2	2	2	006
06.7	NAMEPLATE SERIAL	RP513	1	1	1	006
06.8	SETSCREW M8 X 20	95000.255	6	6	6	006
06.9	SETSCREW M8 X 25	95000.256	3	3	3	006
06.10	SETSCREW M8 X 30	95000.257	5	5	5	006
06.11	NUT M8	95111.5	4	4	4	006
06.12	WASHER M8	95148.14	6	6	6	006
06.13	WASHER SPRING M8	95179.6	4	4	4	006
06.14	'O' RING	95602.40	1	1	1	006
06.15	'O' RING	95602.58	1	1	1	006
06.16	WASHER FIBRE	95640.9	1	1	1	006
06.17	BREATHER	98262.1035	1	1	1	006
Option	OIL FEED ASSEMBLY Parts:-	D100562.100*	1#	0	1#	ex
07.1	OIL PUMP REGULATOR ASSY Parts:-	C200635	0	1	0	007
1.1	BODY	C200629	0	1	0	
1.2	Sight Glass Assy	C201218	0	1	0	
1.2.1	Sight Glass Fitting	C200628	0	1	0	
1.2.2	Plug Protection	PS2023.15	0	2	0	
1.2.3	'O' Ring	95602.8	0	2	0	
1.2.4	Sight Glass	98281.1001	0	1	0	
1.2.5	Washer Copper 1/8" BSP	98660.1152	0	1	0	
1.3	CAPSCREW M6 X 25	95018.174	0	2	0	
1.4	'O' RING	95602.7	0	1	0	
1.5	OIL PRESSURE REGULATOR	98650.1162	0	1	0	
07.2	Oil Pipe with Filter Assy	C200991	0	1	0	007
2.1	Coupling Ø6 x 1/8 "BSP	98156.1123	0	1	0	
2.2	Coupling Nut M12 x Ø6	98156.1687	0	1	0	
2.3	Compression Ring Ø6	98156.1709	0	1	0	
07.3	Oil Return Pipe Assy	C202555	0	1	0	007
3.1	Pipe Std Ø6 x 1.5 x 550mm	M3130.0603	0	1	0	
3.2	Coupling Ø6 x 1/8 "BSP	98156.1123	0	1	0	
3.3	Tube Coupling	98156.2090	0	1	0	
08.1	STUD M8 X 70	D100171.8.186	0	4	0	008
08.2	SETSCREW M8 X 25	95000.256	0	3	0	008
08.3	OIL PUMP	C203193	0	1	0	008

Note:- * Denotes spares item only # Not available as single spares item < Can be found on other pages

CRANKCASE 5405 & 5405E STANDARD MACHINES

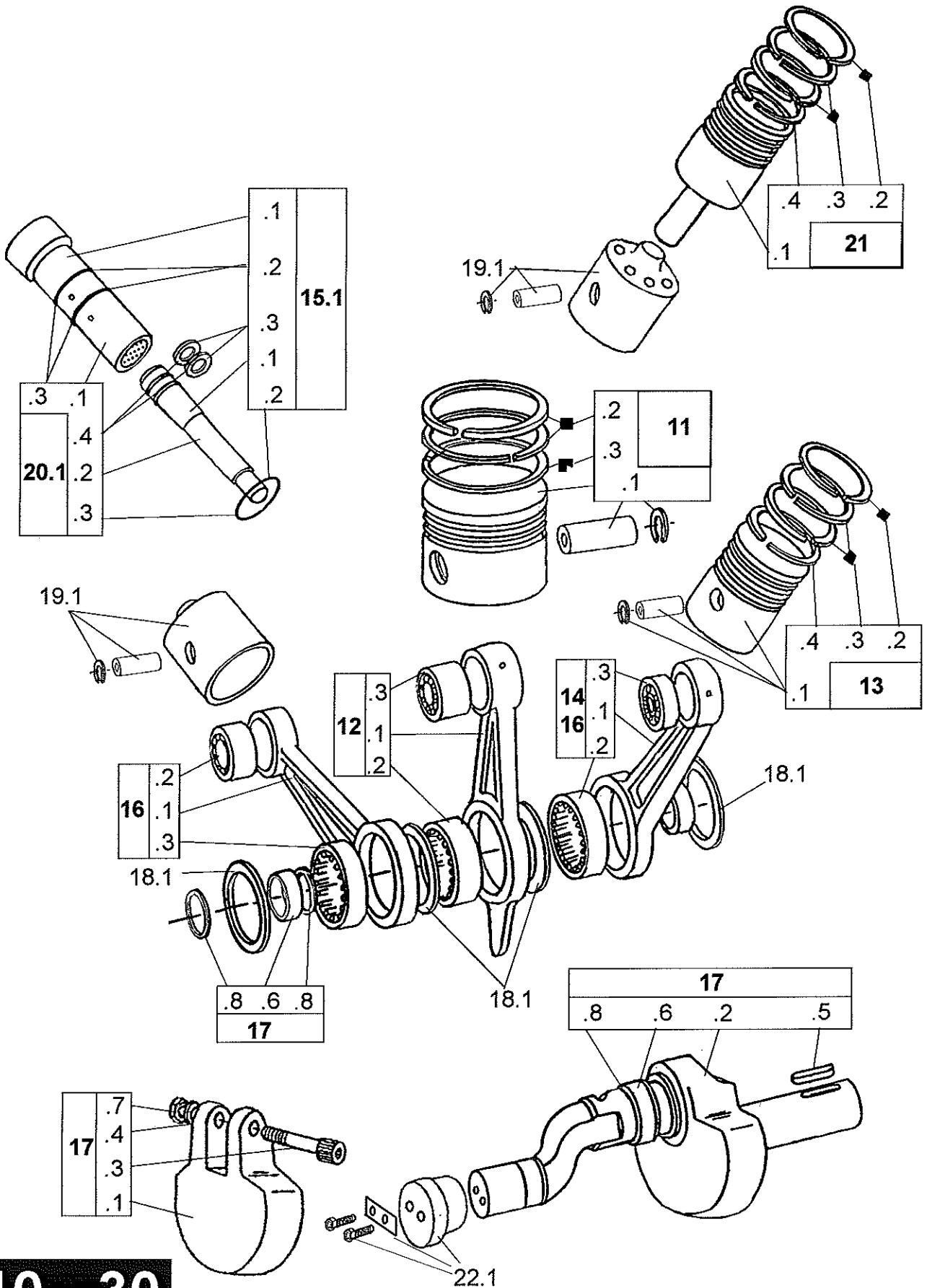


01 - 09

CRANKCASE PARTS cont.

ITEM REF	DESCRIPTION	PART N°	N° OFF			STG
			5404	5404H	5405	
01	BEARING HOUSING D/E Parts:-	D100154.100*	1	1	1	
.1	Bearing Housing	D100154#	1	1	1	001
.2	'O' Ring	95602.98	1	1	1	001
.3	Oil Seal	95605.57	1	1	1	001
.4	Bearing	98076.1019	1	1	1	001
02.1	BRACKET	C200836	2	2	2	002
05	CRANKCASE Parts:-	E60169.50*	1	1	1	1
.1	End Cover	C200563	1	1	1	005
.2	Cover Plate	C201336	1	0	1	005
.3	Stud M8 x 25	D100171.8.41	8	4	8	005
.4	Stud M8 x 70	D100171.8.86	4	4	4	005
.5	Crankcase	E60169#	1	1	1	005
.6	Plug	PS1068.3	1	1	1	005
.7	Setscrew M8 x 16	95000.254	7	7	7	005
.8	Nut M8	95111.5	12	12	12	005
.9	Washer Plain M8	95148.14	11	11	11	005
.10	Washer Fibre	95640.7	1	1	1	005
.11	Bearing	98076.1018	1	1	1	005
.12	Joint	98502.1016	1	1	1	005
.13	Joint	98502.1017	1	1	1	005
06.1	PLUG OIL FILLER	C200562.1	1	1	1	006
06.2	SOCKET OIL FILLER	C200562.3	1	1	1	006
06.3	COUPLING	C200658	1	1	1	006
06.4	DIPSTICK	C202562	1	1	1	006
06.5	PIPE OIL FILLER	C73666.4.176	1	1	1	006
06.6	RIVET ROKUT	PS2189.1	2	2	2	006
06.7	NAMEPLATE SERIAL	RP513	1	1	1	006
06.8	SETSCREW M8 X 20	95000.255	6	6	6	006
06.9	SETSCREW M8 X 25	95000.256	3	3	3	006
06.10	SETSCREW M8 X 30	95000.257	5	5	5	006
06.11	NUT M8	95111.5	4	4	4	006
06.12	WASHER M8	95148.14	6	6	6	006
06.13	WASHER SPRING M8	95179.6	4	4	4	006
06.14	'O' RING	95602.40	1	1	1	006
06.15	'O' RING	95602.58	1	1	1	006
06.16	WASHER FIBRE	95640.9	1	1	1	006
06.17	BREATHER	98262.1035	1	1	1	006
Option	OIL FEED ASSEMBLY Parts:-	D100562.100*	1¥	0	1¥	ex

RUNNING GEAR 5404 & 5404H STANDARD MACHINES

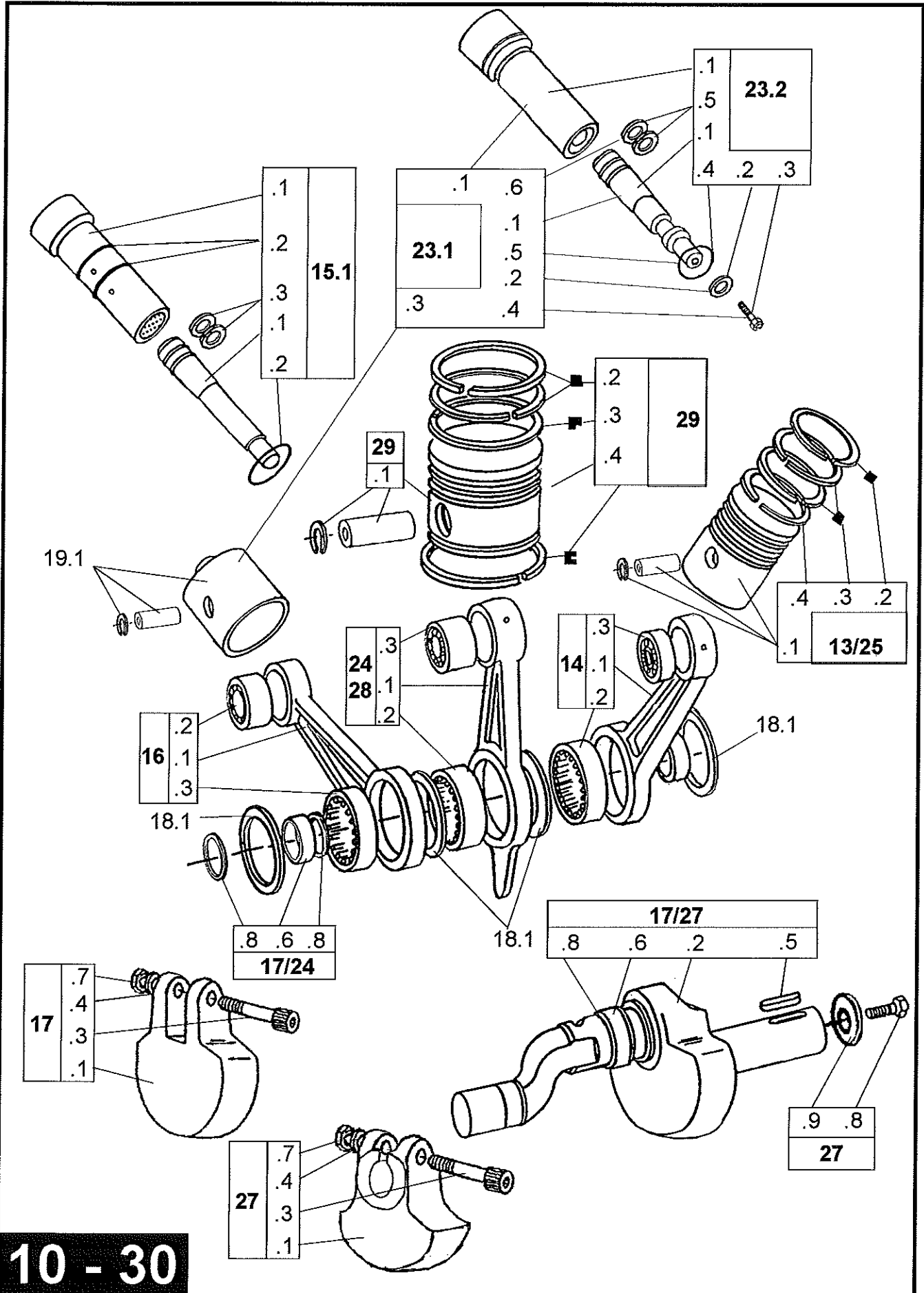


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RUNNING GEAR PARTS

ITEM REF	DESCRIPTION	PART N°	N° OFF			STG
			5404	5404H	5405	
11	PISTON ASSY 1st STAGE Parts:-	C200565*	1	1	0	
	Circlip with Piston	95650.20	2	2	0	
.1	Piston with gudgeon pin	98438.1004#	1	1	0	011
.2	Piston Ring	98477.1016#	2	2	0	011
.3	Oil Control Ring	98477.1038#	1	1	0	011
a	Piston Ring Set	98477.1099*	1	1	0	
12	CONN ROD ASSY 1st STAGE Parts:-	C202041.50*	1	1	0	
.1	Conn Rod	C202041#	1	1	0	012
.2	Bearing BE	98076.1021	1	1	0	012
.3	Bearing S/E	98076.1022	1	1	0	012
13	PISTON ASSY 2nd STAGE Parts:-	C200566*	1	0	1	
	Circlips with Piston	95650.12	2	0	2	
.1	Piston with gudgeon pin	98438.1002#	1	0	1	013
.2	Piston Ring	98477.1002#	1	0	1	013
.3	Piston Ring	98477.1013#	2	0	1	013
.4	Oil Control Ring	98477.1122#	1	0	1	013
a	Piston Ring Set	98477.1101*	1	0	1	
14	CONN ROD ASSY 2nd STAGE Parts:-	C201061*	1	0	1	
.1	Conn Rod	C200533#	1	0	1	014
.2	Bearing B/E	98076.1021	1	0	1	014
.3	Bearing S/E (was 98076.1114 on 5405E)	98076.1023	1	0	1	014
15.1	PLUNGER/LINER ASSY 3rd STAGE	C201235	1	0	1	015
.1.1	Plunger/Liner	C202554	1	0	1	
.1.2	'O' Ring	95602.18	3	0	3	
.1.3	Polythene Bag	98165.1019	1	0	1	
.1.4	Piston Ring	98477.1077	2	0	2	
16	CONN ROD ASSY 3rd STAGE Parts:-	C201062*	1	2	1	
.1	Conn Rod	C200535#	1	2	1	016
.2	Bearing S/E	96072.29	1	2	1	014
.3	Bearing B/E	98076.1021	1	2	1	016
17	CRANKSHAFT ASSY Parts:-	D100427*	1	1	1	
.1	Balance Weight	C200554#	1	1	1	017
.2	Crankshaft	D100153#	1	1	1	017
.3	Capscrew M8 x 55	95018.207	1	1	1	017
.4	Washer Plain M8	95148.14	1	1	1	017
.5	Key Parallel 8 x 7 x 40	95301.8	1	1	1	017
.6	Inner Ring	98076.1063	3	3	3	017
.7	Locknut M8	98422.1009	1	1	1	017
.8	Spacer	98660.1061	3	3	3	017
18.1	Spacer Conn Rod	98660.1060	4	4	4	018
19.1	CROSSHEAD 2nd/3rd STAGE	98438.1001	1	2	1	019
	Circlip with piston	95650.14	2	4	2	
20.1	PLUNGER/LINER ASSY 3rd STAGE	C202153	0	1	0	020
.1	Liner	C202151#	0	1	0	
.2	Plunger	C202152#	0	1	0	
.3	Piston Rings	98477.1076	0	2	0	
.4	'O' Ring	95602.18	0	3	0	
21	PISTON ASSY 2nd STAGE Parts:-	C202186.100*	0	1	0	
.1	Piston 2nd Stage	C202186	0	1	0	021
.2	Piston Ring	98477.1002#	0	1	0	021
.3	Piston Ring	98477.1013#	0	1	0	021
.4	Oil Control Ring	98477.1122#	0	1	0	021
a	Piston Ring Set	98477.1101*	0	1	0	
22.1	OIL PUMP CAM ASSEMBLY	C203495	0	1	0	022

RUNNING GEAR 5405 & 5405E STANDARD MACHINES

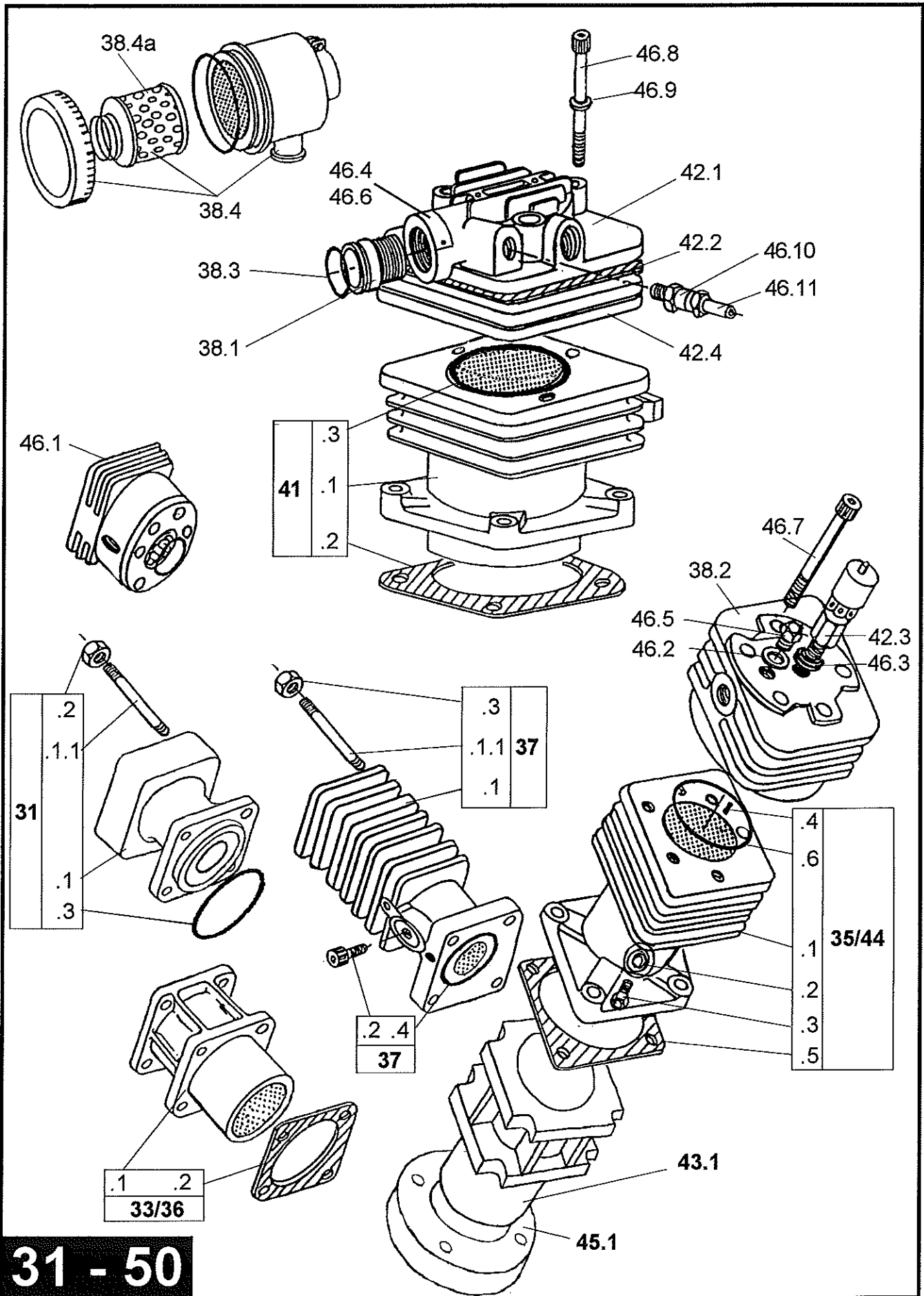


10 - 30

RUNNING GEAR PARTS cont.

ITEM REF	DESCRIPTION	PART N°	N° OFF			STG
			5404	5404H	5405	
28	CONN ROD ASSY 1st STAGE Parts:-	C201063*	0	0	1	
.1	<i>Conn Rod</i>	<i>C202040#</i>	<i>0</i>	<i>0</i>	<i>1</i>	<i>028</i>
.2	<i>Bearing B/E</i>	<i>98076.1021</i>	<i>0</i>	<i>0</i>	<i>1</i>	<i>028</i>
.3	<i>Bearing S/E</i>	<i>98076.1022</i>	<i>0</i>	<i>0</i>	<i>1</i>	<i>028</i>
29	PISTON ASSY 1st STAGE Parts:-	C200564*	0	0	1	
	<i>Circlip with Piston</i>	<i>95650.20</i>	<i>0</i>	<i>0</i>	<i>2</i>	
.1	<i>Piston with gudgeon pin</i>	<i>98438.1003#</i>	<i>0</i>	<i>0</i>	<i>1</i>	<i>029</i>
.2.	<i>Piston Ring</i>	<i>98477.1017#</i>	<i>0</i>	<i>0</i>	<i>2</i>	<i>029</i>
.3	<i>Oil Control Ring</i>	<i>98477.1026#</i>	<i>0</i>	<i>0</i>	<i>1</i>	<i>029</i>
.4	<i>Oil Control Ring</i>	<i>98477.1039#</i>	<i>0</i>	<i>0</i>	<i>1</i>	<i>029</i>
a	<i>Piston Ring Set</i>	<i>98477.1100*</i>	<i>0</i>	<i>0</i>	<i>1</i>	

1st, 2nd & 3rd STAGE CYLINDERS 5404 & 5404H STANDARD MACHINES

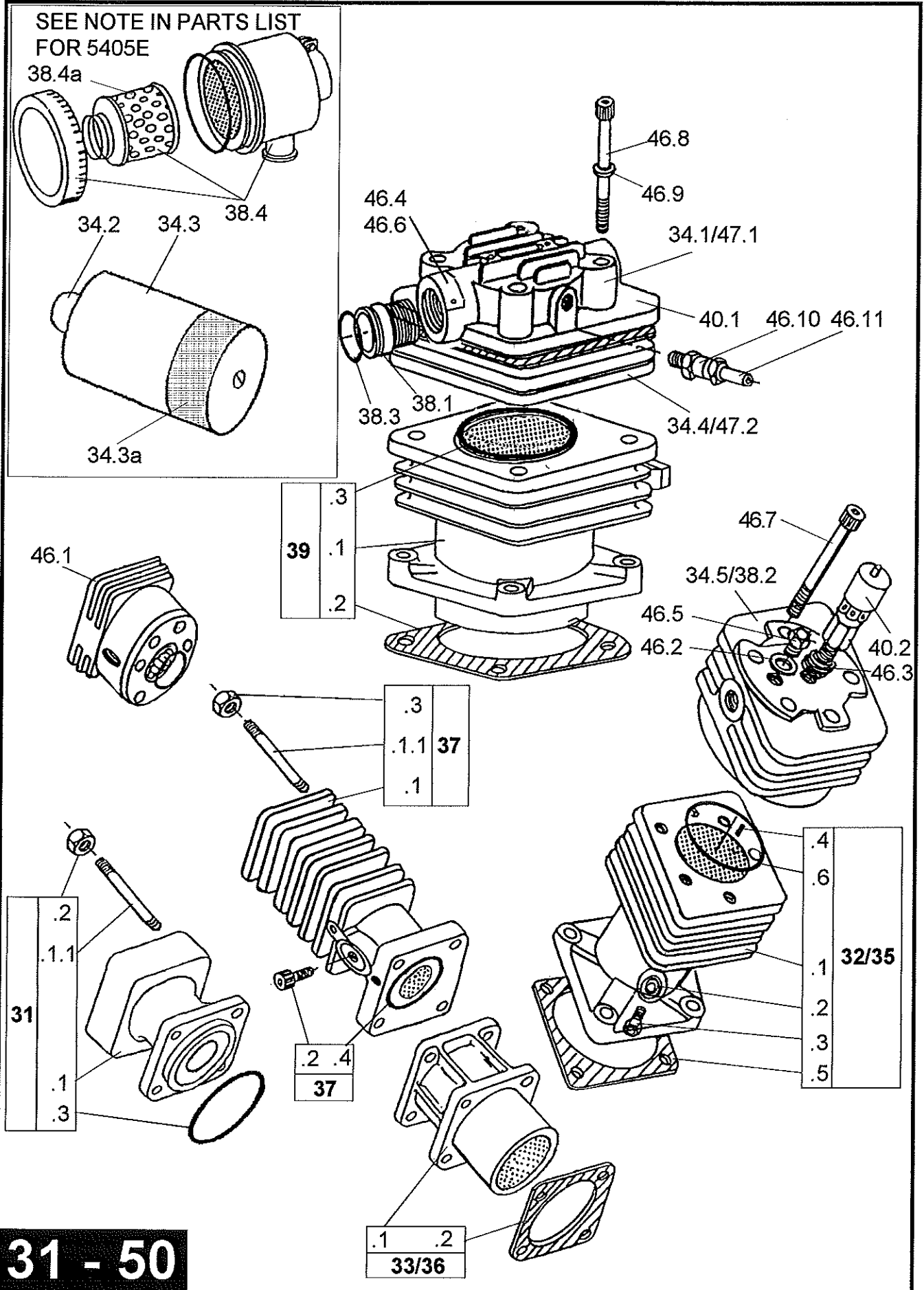


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1st, 2nd & 3rd STAGE CYLINDER PARTS

ITEM REF	DESCRIPTION	PART N°	N° OFF			STG
			5404	5404H	5405	
35	CYLINDER 2nd STAGE Assy Parts:-	D100159100*	1	0	1	
.1	Cylinder	D100159#	1	0	1	035
.2	Seal Dowty 1/8" BSP	PS1322.1	1	0	1	035
.3	Plug	PS1814.2	1	0	1	035
.4	Tension Pin	95540.160	1	0	1	035
.5	'O' Ring	95602.51	1	0	1	035
.6	Joint	98502.1014	1	0	1	035
36	CROSSHEAD GUIDE Assy Parts:-	D100161.100*	1	1	1	
.1	Crosshead Guide	D100161#	1	1	1	036
.2	Joint	98502.1015	1	1	1	036
37	CYLINDER 3rd STAGE Assy Parts:-	D100325.100*	1	1	1	
.1	Cylinder	D100325#	1	1	1	037
1.1	Stud with cylinder	D100171.8.91	6	6	6	037
.2	Capscrew M6 x 12	95018.166	1	1	1	037
.3	Nut M8	98422.1028	6	6	6	037
.4	'O' Ring	98504.1029	1	1	1	037
38.1	ADAPTER	C200634	1	1	1	038
38.2	VALVE 2nd STAGE	C201653	1	1	1	038
38.3	'O' RING	95602.45	1	1	1	038
38.4	FILTER SUCTION (check illustration for type fitted)	98262.1036	1	1	1	038
38.4a	ELEMENT (check illustration for type fitted)	98262.1037*	1	1	1	
39	CYLINDER 1st STAGE Assy Parts:-	D100409.100*	0	0	1	
.1	Cylinder	D100409#	0	0	1	039
.2	Joint	98502.1013	0	0	1	039
.3	'O' Ring	98504.1028	0	0	1	039
40.1	JOINT 1st STAGE COVER	98502.1022	0	0	1	040
40.2	SAFETY VALVE 1st STAGE	98650.1163-8.3	0	0	1	040
41	CYLINDER 1st STAGE Assy Parts:-	D100424.100*	1	1	0	
.1	Cylinder	D100424#	1	1	0	041
.2	Joint	98502.1013	1	1	0	041
.3	'O' Ring	98504.1030	1	1	0	041
42.1	COVER 1st STAGE	D100425	1	1	0	042
42.2	JOINT 1st STAGE COVER	98502.1021	1	1	0	042
42.3	SAFETY VALVE 1st STAGE	98650.1163-5.9	1	1	0	042
42.4	VALVE REED 1st STAGE	98650.1310	1	1	0	042

1st, 2nd & 3rd STAGE CYLINDERS 5405 STANDARD MACHINES

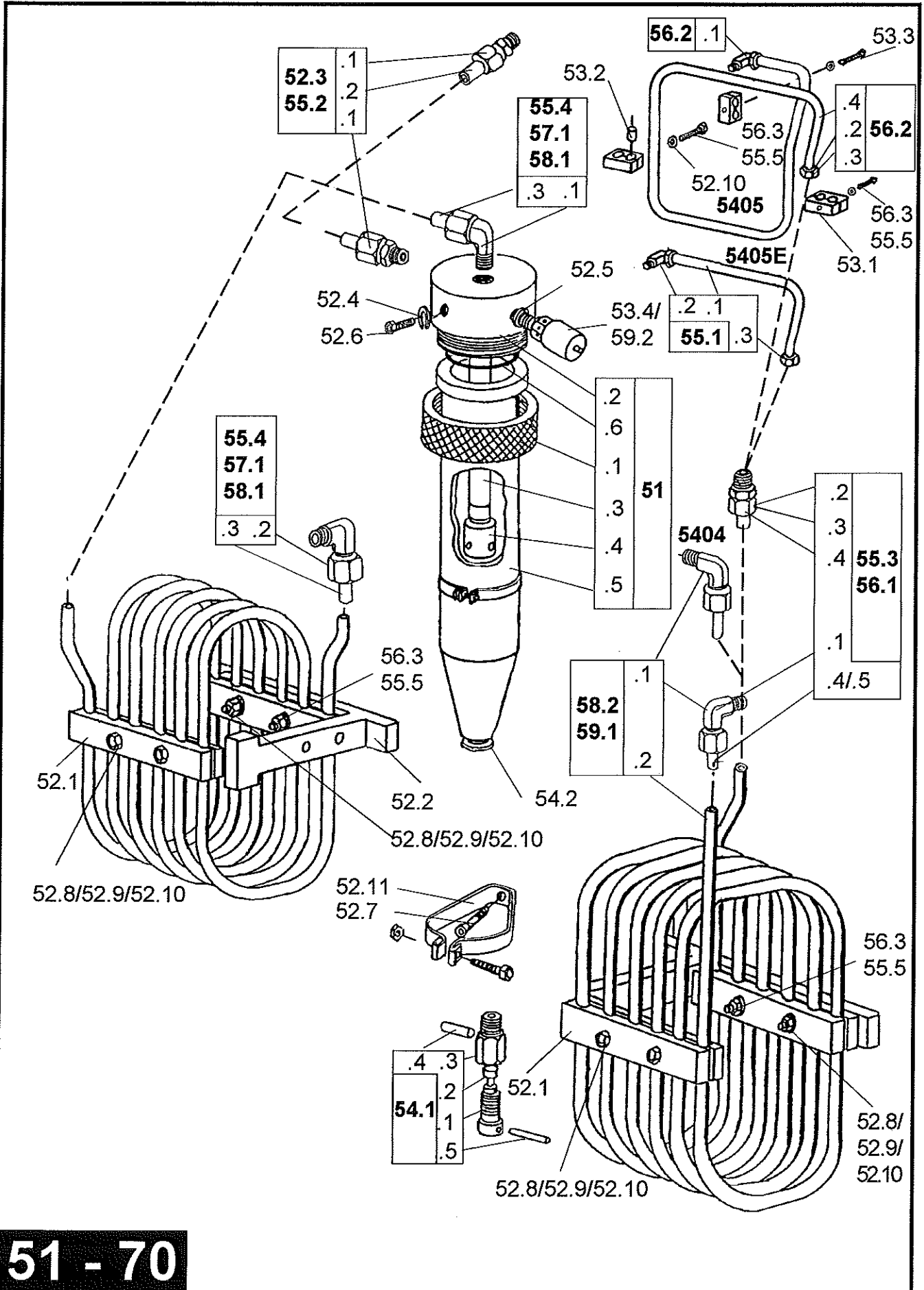


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1st, 2nd & 3rd STAGE CYLINDER PARTS cont.

ITEM REF	DESCRIPTION	PART N°	N° OFF			STG
			5404	5404H	5405	
43.1	CROSSHEAD GUIDE ASSY	D100807	0	1	0	043
1	<i>Crosshead</i>	<i>D100161</i>	0	1	0	
44	CYLINDER 2nd STAGE Assy Parts:-	D100808.100*	0	1	0	
.1	<i>Cylinder</i>	<i>D100808#</i>	0	1	0	044
.2	<i>Seal Dowty 1/8" BSP</i>	<i>PS1322.1</i>	0	1	0	044
.3	<i>Plug</i>	<i>PS1814.2</i>	0	1	0	044
.4	<i>Tension Pin</i>	<i>95540.160</i>	0	1	0	044
.5	<i>Joint</i>	<i>98502.1014</i>	0	1	0	044
.6	<i>'O' Ring</i>	<i>95602.50</i>	0	1	0	044
45.1	ADAPTER 2nd STG CYL to 3rd CRANKCASE	C202188	0	1	0	045
46.1	VALVE 3rd STAGE	C201654	1	1	1	046
46.2	SEAL DOWTY	PS1322.1	1	1	1	046
46.3	SEAL DOWTY	PS1322.2	1	1	1	046
46.4	NAMEPLATE MADE IN ENGLAND	PS1673	1	1	1	046
46.5	PLUG	PS1814.2	1	1	1	046
46.6	RIVET ROKUT	PS2189.1	2	2	2	046
46.7	CAPSCREW	95018.206	6	6	6	046
46.8	CAPSCREW	95018.208	3	3	4	046
46.9	WASHER	95148.14	3	3	4	046
46.10	COUPLING	98156.1551	1	1	1	046
46.11	TUBE NYLON Ø8 x 330 mm	98617.1012	1	1	1	046
47.1	COVER 1st STAGE	D100408	0	0	1	047
47.2	VALVE REED 1st STAGE	98650.1311	0	0	1	047

1st & 2nd STAGE COOLERS 5404, 5404H & 5405 STANDARD MACHINES

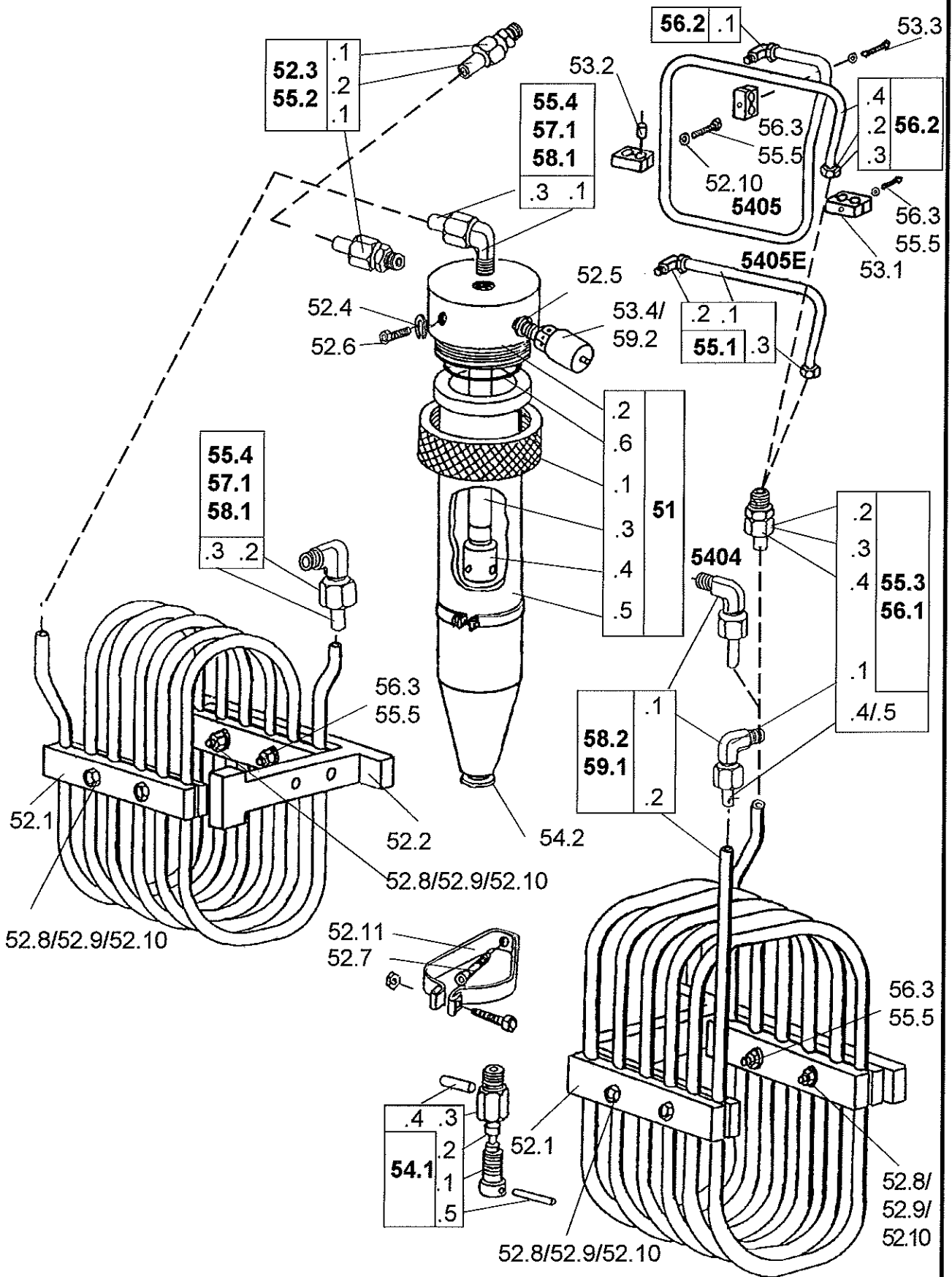


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1st & 2nd STAGE COOLER PARTS

ITEM REF	DESCRIPTION	PART N°	N° OFF			STG
			5404	5404H	5405	
51	SEPARATOR ASSY Parts:-	D100538*	1	1	1	
.1	Collar Nut	C200650	1	1	1	051
.2	Cover Separator	C203441	1	1	1	051
.3	Swirl fitting	98508.1002	1	1	1	051
.4	Swirl adaptor	C203442	1	1	1	051
.5	Body	C201602	1	1	1	051
.6	'O' Ring	95602.51	1	1	1	051
52.1	CLAMPS	C200576	6	6	6	052
52.2	BRACKET	D100183	2	2	2	052
52.3	PIPE ASSY 3rd STAGE SUCTION Parts:-	D100208	1	1	1	052
.1	Coupling 1/2" tube x 1/4" BSPT	98156.1801	2	2	2	
.2	Pipe 1/2" Aluminium	98617.1019	1	1	1	
52.4	SEAL DOWTY	PS1322.1	1	1	1	052
52.5	SEAL DOWTY	PS1322.2	1	1	1	052
52.6	PLUG	PS1814.2	1	1	1	052
52.7	SETSCREW	95006.130	8	8	6	052
52.8	SCREW CSK	95028.134	1	1	1	052
52.9	NUT	95111.4	8	8	8	052
52.10	WASHER	95149.13	8	8	11	052
52.11	CLIP	98150.1006	1	1	1	052
53.1	CLIP COOLER	C200586	0	0	6	053
53.2	SPACER TUBE	C200878	0	0	2	053
53.3	SETSCREW	95000.232	0	0	1	053
53.4	SAFETY VALVE	98650.1164-69	0	0	1	053
54.1	DRAIN VALVE ASSY Parts:-	C200659	1	1	1	054
.1	Drain Valve Screw	C200656.2	1	1	1	
.2	Valve	C200656.3	1	1	1	
.3	Drain Body	C200657.2	1	1	1	
.4	Branch Pipe	C200657.3	1	1	1	
.5	Tension Pin	95540.172	1	1	1	
54.2	SEAL DOWTY	98504.1051	1	1	1	054
55.5	SETSCREW	95006.136	0	0	2	055
56.1	COOLER COIL ASSY 1st STAGE Parts:-	E60187	0	0	1	056
.1	Elbow 1/2" Tube x 3/8" BSPT	98156.2611	0	0	1	
.2	Sleeve	98156.2860	0	0	1	
.3	Body	98156.2861	0	0	1	
.4	Nut	98156.2862	0	0	1	
.5	Pipe 1/2" Aluminium	98617.1019	0	0	1	

1st & 2nd STAGE COOLERS 5404, 5404H & 5405 STANDARD MACHINES

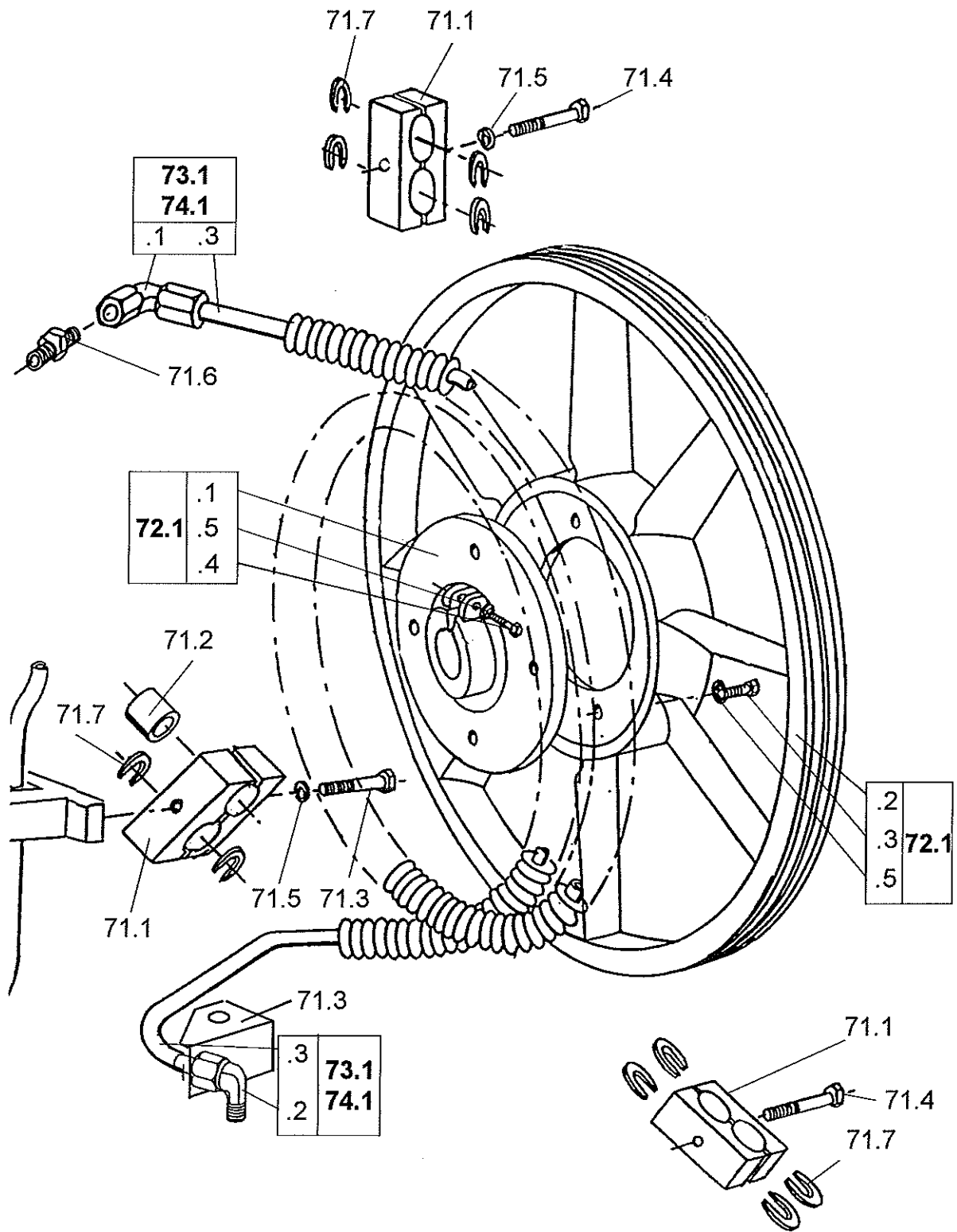


51 - 70

1st & 2nd STAGE COOLER PARTS cont.

ITEM REF	DESCRIPTION	PART N°	N° OFF			STG
			5404	5404H	5405	
56.2	COOLER COIL ASSY 1st STAGE Parts:-	E60202	0	0	1	056
.1	Elbow 1/2" Tube x 3/8" BSPT	98156.2611	0	0	1	
.2	Sleeve	98156.2860	0	0	1	
.3	Nut	98156.2862	0	0	1	
.4	Pipe 1/2" Aluminium	98617.1019	0	0	1	
56.3	SETSCREW	95006.134	0	0	2	056
57.1	COOLER COIL ASSY 2nd STAGE Parts:-	E60448	1	0	1	057
.1	Elbow 1/2" Tube x 1/4" BSPT	98156.2610	1	0	1	
.2	Elbow 1/2" Tube x 3/8" BSPT	98156.2611	1	0	1	
.3	Pipe 1/2" Aluminium	98617.1019	1	0	1	
58.1	COOLER COIL ASSY 2nd STAGE Parts:-	E60863	0	1	0	058
.1	Elbow 1/2" Tube x 1/4" BSPT	98156.2610	0	1	0	
.2	Elbow 1/2" Tube x 3/8" BSPT	98156.2611	0	1	0	
.3	Pipe 1/2" Aluminium	98617.1019	0	1	0	
58.2	COOLER COIL ASSY 1st STAGE Parts:-	E60862	0	1	0	058
.1	Elbow 1/2" Tube x 3/8" BSPT	98156.2611	0	2	0	
.2	Pipe 1/2" Aluminium	98617.1019	0	1	0	
59.1	COOLER COIL ASSY 1st STAGE Parts:-	E60572	1	0	0	059
.1	Elbow 1/2" Tube x 3/8" BSPT	98156.2611	2	0	0	
.2	Pipe 1/2" Aluminium	98617.1019	1	0	0	
59.2	SAFETY VALVE	98650.1164-54	1	1	0	059

3rd STAGE COOLER & FLYWHEEL 5404, 5404H & 5405 STANDARD MACHINES

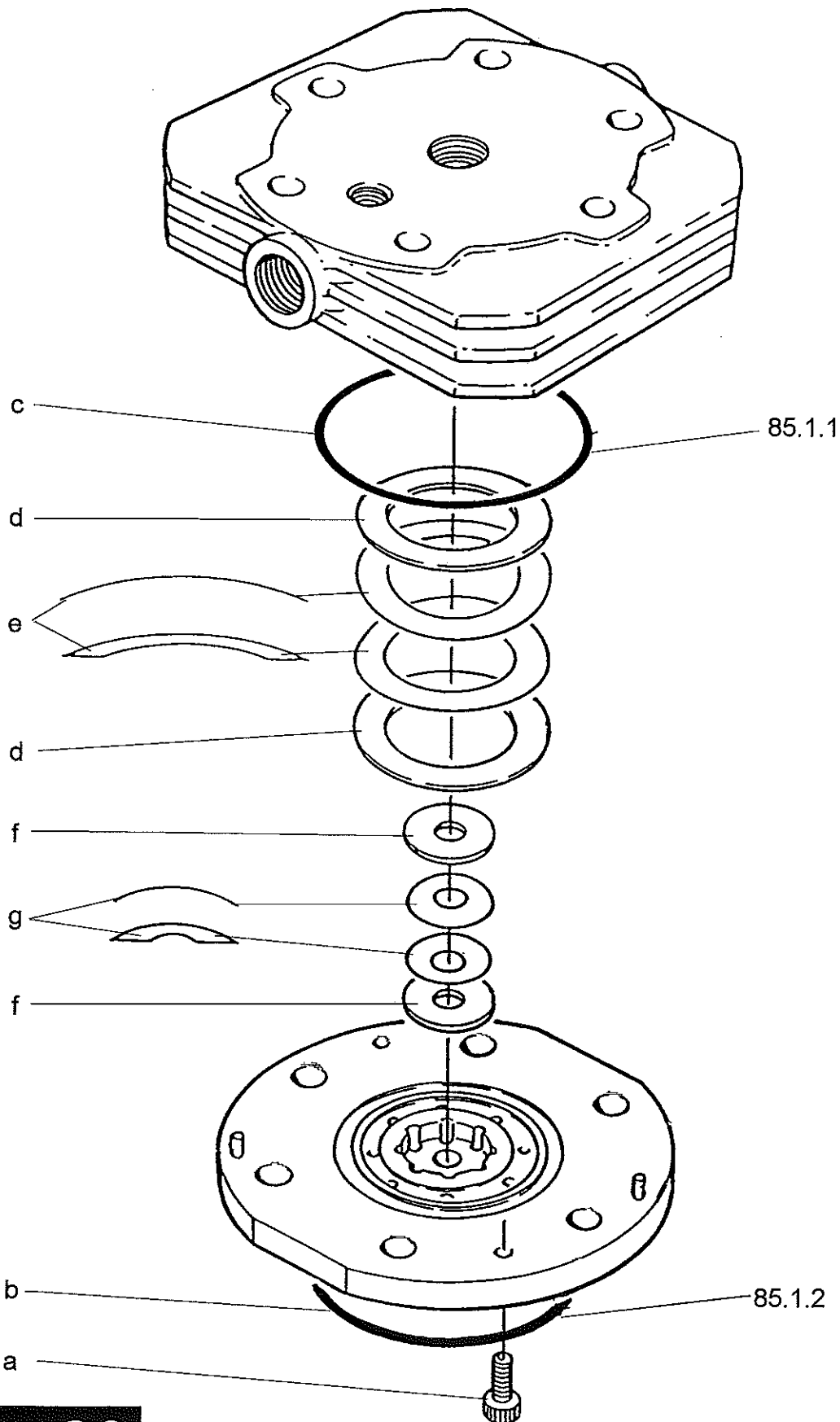


71 - 80

3rd STAGE COOLER & FLYWHEEL PARTS

ITEM REF	DESCRIPTION	PART N°	N° OFF			STG
			5404	5404H	5405	
71.1	COOLER CLIP	C200587	6	6	6	071
71.2	SPACER TUBE	C200879	1	1	1	071
71.3	BRACKET F/D PIPE	C202563	1	1	1	071
71.4	SETSCREW M6 X 60	95000.233	3	3	3	071
71.5	SPRING WASHER M6	95179.5	3	3	3	071
71.6	CONNECTOR	98156.2809	1	1	1	071
71.7	SUPPORT WASHERS	98660.1109	20	20	20	071
72.1	FLYWHEEL ASSY Parts:-	E60341	1	1	1	072
.1	Hub	C200577	1	1	1	
.2	Flywheel/Fan	E60179	1	1	1	
.3	Setscrew M8 x 20	95000.255	4	4	4	
.4	Setscrew M8 x 40	95000.29	1	1	1	
.5	Washer Spring M8	95179.6	5	5	5	
73.1	COOLER ASSY 3rd STAGE Parts:-	E60393	1	0	1	073
.1	Swivel Nut Elbow	98156.1604	1	0	1	
.2	Union Elbow	98156.2180	1	0	1	
.3	Tube 8 mm x 2000 mm	98617.1006	1	0	1	
74.1	COOLER ASSY 3rd STAGE Parts:-	E60857	0	1	0	074
.1	Swivel Nut Elbow	98156.1604	0	1	0	
.2	Union Elbow	98156.2180	0	1	0	
.3	Tube 8 mm x 2000 mm	98617.1006	0	1	0	

2nd STAGE CONCENTRIC VALVE
5404, 5404 & ,5405 STANDARD MACHINES

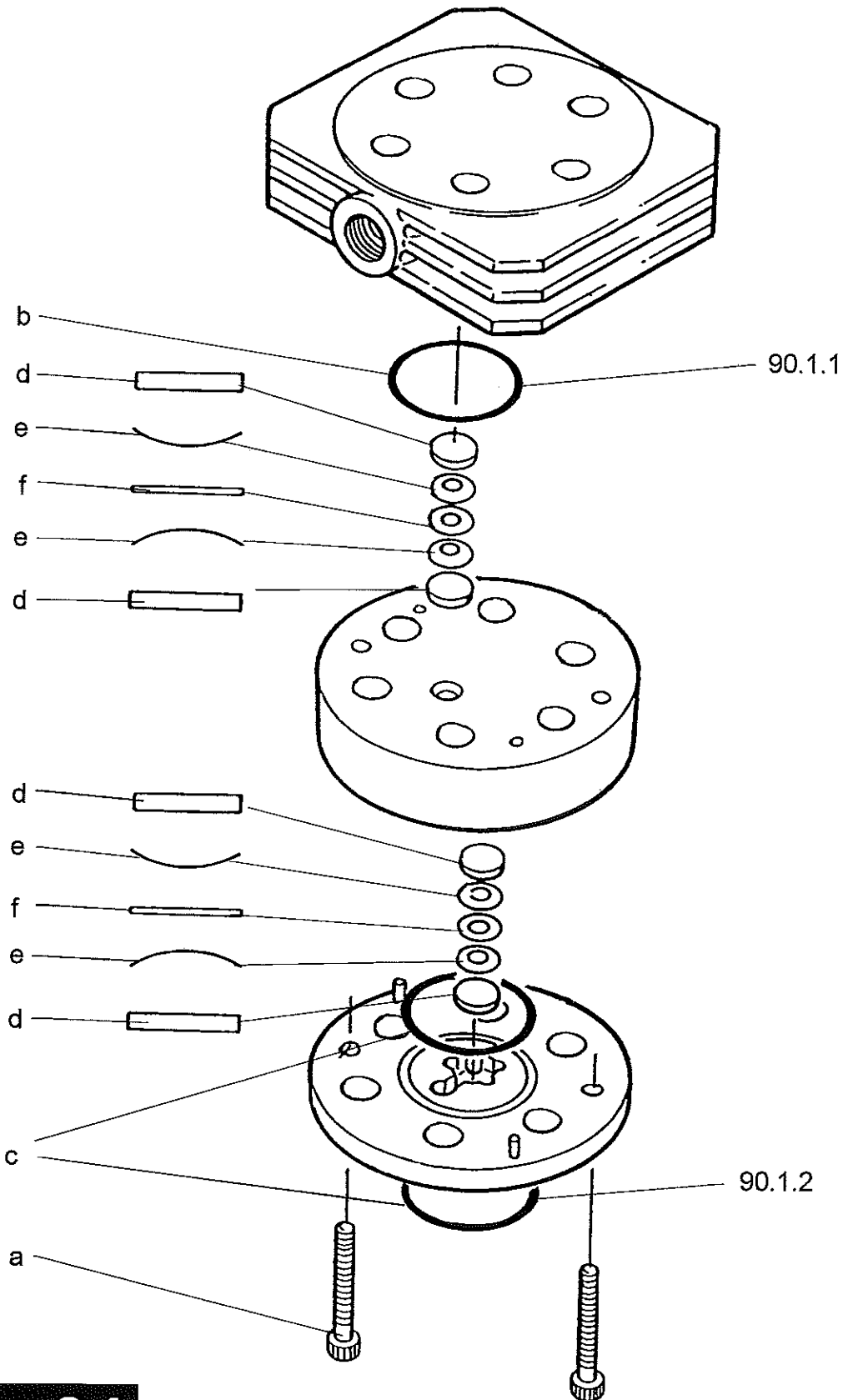


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2nd STAGE CONCENTRIC VALVE PARTS

ITEM REF	DESCRIPTION	PART N°	N° OFF			STG
			5404	5404H	5405	
85.1	VALVE COMPLETE	C201653	1	1	1	038
1.1	'O' Ring	95602.54	1	1	1	
1.2	'O' Ring	95602.50	1	1	1	
85.2	VALVE 2nd STAGE	98650.1883	0	1	0	034
	2nd Stage Valve Maintenance Kit:-	98650.1215*	1	1	1	
a	Capscrew	95018.134	2	2	2	
b	'O' Ring	95602.50	1	1	1	
c	'O' Ring	95602.54	1	1	1	
d	Valve/Backing Plate Delivery	98650.1211	2	2	2	
e	Spring Plate Delivery	98650.1212	2	2	2	
f	Valve/Backing Plate Suction	98650.1213	2	2	2	
g	Spring Plate Suction	98650.1214	2	2	2	

**3rd STAGE CONCENTRIC VALVE
5404, 5404H & 5405 STANDARD MACHINES**



90 - 94

3rd STAGE CONCENTRIC VALVE PARTS

ITEM REF	DESCRIPTION	PART N°	N° OFF			STG
			5404	5404H	5405	
90.1	VALVE COMPLETE	C201654	1	1	1	046
1.1	'O' Ring	95602.16	1	1	1	
1.2	'O' Ring	95602.18	1	1	1	
	3rd Stage Valve Maintenance Kit:-	98650.1199*	1	1	1	
a	Capscrew	95018.106	2	2	2	
b	'O' Ring	95602.16	1	1	1	
c	'O' Ring	95602.18	2	2	2	
d	Valve/Backing Plate	98650.1196	4	4	4	
e	Spring Plate	98650.1197	4	4	4	
f	Centre Plate	98650.1198	2	2	2	

MAINTENANCE KITS

ITEM REF	DESCRIPTION	PART N°	N° OFF			STG
			5404	5404H	5405	
	JOINT KIT Consists of:-	98504.1118*	1	1	1	
	'O' Ring 3rd stage liner	95602.18	2	2	2	
	'O' Ring 3rd stage cylinder cover to cylinder	95602.18	1	1	1	
	'O' Ring oil dip stick	95602.40	1	1	1	
	'O' Ring suction filter adapter	95602.45	1	1	1	
	'O' Ring 1st stage valve to cylinder cover (inner)	95602.50	1	1	0	
	'O' Ring 2nd stage valve to cylinder	95602.50	1	1	0	
	'O' Ring 2nd stage separator cap	95602.51	1	1	1	
	'O' Ring crankcase breather cap	95602.58	1	1	1	
	'O' Ring 1st stage valve to cylinder cover (inner)	95602.59	0	0	1	
	'O' Ring oil regulator block to cylinder	95602.7	1	1	1	
	'O' Ring oil sight glass	95602.8	2	2	2	
	'O' Ring 1st stage valve to cylinder cover (outer)	95602.85	1	1	1	
	'O' Ring 1st stage valve to cylinder cover (outer)	95602.90	0	0	1	
	'O' Ring D/E bearing housing	95602.98	1	1	1	
	'O' Ring 1st stage valve to cylinder	98504.1028	0	0	1	
	'O' Ring 3rd stage crosshead to cylinder	98504.1029	1	1	1	
	'O' Ring 1st stage valve to cylinder	98504.1030	1	1	0	
	Joint 1st stage cylinder to crankcase	98502.1013	1	1	1	
	Joint 2nd stage cylinder to crankcase	98502.1014	1	1	1	
	Joint 3rd stage crosshead	98502.1015	1	1	1	
	Joint outer end cover	98502.1016	1	1	1	
	Joint oil pump to crankcase	98502.1017	1	1	1	
	Joint 1st stage cylinder cover	98502.1021	1	1	0	
	Joint 1st stage cylinder cover	98502.1022	0	0	1	
	Joint copper oil sight glass body	98660.1152	1	1	1	
	Seal dowty separator drain	98504.1051	1	1	1	
	Seal dowty separator cap plug	PS1322.1	1	1	1	
	Seal dowty 2nd stage valve cover plug	PS1322.1	1	1	1	
	Seal dowty oil regulator block fitting	PS1322.1	2	2	2	
	Seal dowty plug 2nd stage cylinder	PS1322.1	1	1	1	
	Seal dowty 2nd stage safety valve	PS1322.2	1	1	1	
	Seal dowty 1st stage safety valve	PS1322.2	1	1	1	
	Washer fibre oil drain crankcase	95640.7	1	1	1	
	Washer fibre crankcase breather	95640.9	1	1	1	

MAINTENANCE KITS cont.

ITEM REF	DESCRIPTION	PART N°	N° OFF			STG
			5404	5404H	5405	
	JOINT KIT Non Asbestos Consists of:-	98504.1304	1	1	1	
	Joint 1st stage cylinder to crankcase	98502.1013	1	1	1	
	Joint 2nd stage cylinder to crankcase	98502.1014	1	1	1	
	Joint 3rd stage crosshead	98502.1015	1	1	1	
	Joint outer end cover	98502.1016	1	1	1	
	Joint oil pump to crankcase	98502.1017	1	1	1	
	Joint 1st stage cylinder cover	98502.1021	1	1	0	
	Joint 1st stage cylinder cover	98502.1022	0	0	1	

The following is to used when NON ASBESTOS JOINTS are used

ITEM REF	DESCRIPTION	PART N°	N° OFF			STG
			5404	5404H	5405	
	Supplementary JOINT KIT Consists of:-	98504.1314	1	1	1	
	'O' Ring 3rd stage liner	95602.18	2	2	2	
	'O' Ring 3rd stage cylinder cover to cylinder	95602.18	1	1	1	
	'O' Ring oil dip stick	95602.40	1	1	1	
	'O' Ring suction filter adapter	95602.45	1	1	1	
	'O' Ring 1st stage valve to cylinder cover (inner)	95602.50	1	1	0	
	'O' Ring 2nd stage valve to cylinder	95602.50	1	1	0	
	'O' Ring 2nd stage separator cap	95602.51	1	1	1	
	'O' Ring crankcase breather cap	95602.58	1	1	1	
	'O' Ring 1st stage valve to cylinder cover (inner)	95602.59	0	0	1	
	'O' Ring oil regulator block to cylinder	95602.7	1	1	1	
	'O' Ring oil sight glass	95602.8	2	2	2	
	'O' Ring 1st stage valve to cylinder cover (outer)	95602.85	1	1	1	
	'O' Ring 1st stage valve to cylinder cover (outer)	95602.90	0	0	1	
	'O' Ring D/E bearing housing	95602.98	1	1	1	
	'O' Ring 1st stage valve to cylinder	98504.1028	0	0	1	
	'O' Ring 3rd stage crosshead to cylinder	98504.1029	1	1	1	
	'O' Ring 1st stage valve to cylinder	98504.1030	1	1	0	
	Joint copper oil sight glass body	98660.1152	1	1	1	
	Seal dowty separator drain	98504.1051	1	1	1	
	Seal dowty separator cap plug	PS1322.1	1	1	1	
	Seal dowty 2nd stage valve cover plug	PS1322.1	1	1	1	
	Seal dowty oil regulator block fitting	PS1322.1	2	2	2	
	Seal dowty plug 2nd stage cylinder	PS1322.1	1	1	1	
	Seal dowty 2nd stage safety valve	PS1322.2	1	1	1	
	Seal dowty 1st stage safety valve	PS1322.2	1	1	1	
	Washer fibre oil drain crankcase	95640.7	1	1	1	
	Washer fibre crankcase breather	95640.9	1	1	1	

DESIGN CLEARANCES & TORQUE WRENCH SETTINGS

Design Clearances

SIZE	DESCRIPTION	5404 mm	5404H mm	5405 mm
	Crankshaft End Float	0.35 - 0.84	0.35 - 0.84	0.35 - 0.84
	TDC Clearance 1st Stage	0.30 - 0.84	0.30 - 0.84	0.30 - 0.84
	TDC Clearance 2nd Stage	0.50 - 1.04	0.95 - 1.73	0.50 - 1.04
	TDC Clearance 3rd Stage	0.43 - 1.11	0.43 - 1.11	0.43 - 1.1

Class 'A' Critical Torque Wrench Settings All Figures \pm 5% For Non Lubricated Fasteners

SIZE	DESCRIPTION	5404		5404H		5405	
		Nm	Lbf Ft	Nm	Lbf Ft	Nm	Lbf Ft
M8	1st Stage Valve Cover	13	10	13	10	13	10
3/8 UNF	1st Stage Valve	21	16	21	16	21	16
M8	2nd Stage Valve to Cylinder	16	12	16	12	16	12
M5	2nd Stage Valve	6	5	6	5	6	5
M4	3rd Stage Valve	4	3	4	3	4	3
M8	3rd Stage Valve to Cylinder	16	12	16	12	16	12
M8	Flywheel	27	20	27	20	27	20
M6	Oil Pump Cam	-	-	11	8	-	-
M8	Crankshaft Balance Weight	27	20	27	20	27	20

Class 'B' Torque Wrench Settings All Figures + 5% - 15% For Non Lubricated Fasteners

SIZE	DESCRIPTION	5404		5404H		5405	
		Nm	Lbf Ft	Nm	Lbf Ft	Nm	Lbf Ft
M6	All Other Fasteners	11	8	11	8	11	8
M8	All Other Fasteners	27	20	27	20	27	20
M10	All Other Fasteners	54	40	54	40	54	40

Note: Under no circumstances are any deviations from the above figures allowed unless authorised in writing by the Chief Designer or Development Engineer.