INSTRUCTION MANUAL

LW 170 D
Nautic

Breathing Air Compressor

LENHARDT & WAGNER GMBH

Technical Data

Issue: 11/00

Type of Compressor	:	**LW 170 D - *Nautic*** **LW 170 E - *Nautic***
Delivery Capacity	:	170 l/min - 6.05 cfm
Max. Pressure	:	225 / 330 bar - 3200 / 4700 psi
Compressor rpm:	:	1530 min^{-1}
Number of Cylinders	:	3
∅ Cylinder Bores	:	72 / 28 / 13 mm
Stroke	:	39 mm
Motor	:	LW 170 E - *Nautic*: 4 KW / 400 V / 50 Hz / 3-Phases
Engine	:	LW 170 D - *Nautic*: Yanmar L60 AE - DE; 4.4 KW
Oil Capacity of Compressor	:	0.85 litre
Tank Connectors	:	std. specification: 2 x DIN
Dimensions	:	Length: 1030 mm Height: 730 mm Width: 500 mm Weight: LW 170 D - ***Nautic***: 138 Kg LW 170 E - ***Nautic***: 127 Kg
Manufacturer	:	**Lenhardt & Wagner GmbH** Im Taubenfang 4 64653 Lorsch Germany Tel.: + 49 6251 54850 Fax: + 49 6251 54805

SAFETY PRECAUTIONS

GENERAL REMARKS

CAUTION: Do not open pressure loaded, unconnected filling- or block valves due to high risk of accident.

CAUTION: Always make sure that intake-air is free of toxic gases and exhaust fumes.

CAUTION: Use only filling hoses which are in perfect condition; special attention should be paid to the connecting fittings, check rubber jacket for damage. Immediately replace hoses in case of any faults.

CAUTION: All work on compressors must be carried out while unit is pluged off and depressurized.

SAFETY REGULATIONS

Note the following orders for operating a compressor unit as a filling unit within Germany:

a - Druckbehälterverordnung (DruckbehV) vom 21.04.1989.

b - Technische Regeln Druckgase (TRG 400, 401,402, 730).

Note the following orders if a high-pressure compressor unit is used for industrial applications within Germany:

c - die gesetzlichen Unfallverhütungs-Vorschriften (UVV) der Berufsgenossenschaften:

- **UVV Verdichter (VBG 16)**
- **UVV Druckbehälter(VBG 17)**

If an industrial compressor unit is used as a filling device, regulations **a** & **b** must also be considered.

The manufacturer has payed attention to all the previous mentioned regulations - concerning the manufactur of high pressure compressors - all products are confirm with those regulations.

According to §10 Druckbehälterverordnung, appointed types of pressure tanks must be tested at given intervals:

- Pressure tanks of groups IV & V must be checked by an expert at intervals stated in paragraphs 4 to 9.
- Pressure tanks of groups II, III & IV must be checked by an expert, at intervals stated by the operators experience.
- Repeated checks consist in internal checks and pressure checks. Internal checks according to §1 must be complemented by pressure checks (or other suited checks) if they can not be carried out as desired. Pressure checks according to §1 must be substituted by anti-destructive test procedures, if they can not be carried out due to design features of the pressure tank.
- §9 Paragraph 9 is applied.

According to §15 Druckbehälterverordnung, a portable pressure tank should only be filled if:

- it is signed with: test sign, test date & date of next test
- the test date stated on the tank is still valid (see §23 DruckbehV for test intervals)
- it is free of faults which can affect operators or others (damaged valve etc.)

It is only allowed to fill compressed-air tanks - never fill oxygen tanks - By the use of different threads (DIN 477) it is not possible to connect oxygen bottles directly.
The use of adaptors is strictly prohibited!

According to TRG 402 - Operation of Filling Units -

2. Employees & their Instruction

2.1 Filling devices should only be operated by persons which:

- are at least 18 years of age
- have the required knowledge
- do their work in expected good manner

2.2 Insignificant work can also be done by persons who do not have the experience stated at 2.1 item 1 & 2.1 item 2

2.3 All employees have to be trained prior any work and in adequate intervals - at least once a year - in reference to:

- Danger by handling with pressurized gases
- Safety precautions (especially TRG)
- Instructions in case of accidents, faults & damage
- Handling of safety- & fire-fighting equipment
- Operation & maintenance of filling devices, in reference to the instruction manual.

2.4 All necessary instructions of employees must be recorded (according to 2.3) and confirmed by signature.

2.5 Nummers 2.3 & 2.4 are also valid for short-time employees.

3. Operation

3.1 There must be an instruction manual available for every filling unit. It should be easy to understand, and has to contain all safety relevant informations. Copies and translations should be available to the operator(s).

3.2 Especially dangerous work (repairs, maintenance etc.) which can not be listed in the instruction manual referring to 3.1, can only be done on written order of the manufacturer or an authorized representative person.

5. Filling

5.1 Pressure tanks can only be filled by the medium, to pressure, weight & capacity stated on its housing (see §15.2 DruckbehV).

6. Measures after Filling

6.1 Checking pressure tanks for leaks

All blocking devices and their connections have to be checked, after the filling process, in a suitable way with foambuilding medium or under water, for any air leaks.

6.3 Faults on pressurized tanks

If there are any signs for air leaks or other faults (referring 6.1), which can not be corrected instandly, the tank has to be deflated immediately to avoid any kind of danger (see §21.1 DruckbehV).

9. Inspection & Maintenance of Filling Devices

9.1 Check filling devices for air leaks.

9.1.1 Filling devices or parts of any filling devices can only be put into first-time operation (after repairs, technical changes etc.) if they were checked for leaks by an expert or an authorized person stated by the manufaturer.

9.1.2 Test medium has to be pressure gas (in gas form).

9.1.3 Pressure has to be increased slowly and in steps till maximum working pressure of unit is achieved.

9.1.4 Test proceedings have to be recorded and stored. They must contain:

- Date of Test
- Name of Supervisor
- Name of Expert
- Designation of Unit (or part of unit)
- Test Medium
- Description of Procedure
- Notice of Faults
- Notice of Faults Elemination

9.2 Inspection of Flexible Pressure Lines

9.2.1 Flexible lines (hoses & joints) must be checked for their condition prior first use, at least once a year, by an expert of the operating company or the manufaturer.

9.2.2 Test Procedure (referring to 9.2.1) consists of:

1. Examination of external and internal condition
2. Pressure test (1.5 x max. working pressure)

9.2.3 Pressure tests of hoses have to be done by water as test medium. Maintain test pressure for at least 10 minutes. Hoses have to be checked in straight and in rolled condition (roll diameter: 30 x outer dia. of hose).

9.2.3 Test certificates from the manufacturer must be present prior first use, additional ones - verified by an expert of the operating company - at given intervals. All certifications have to be stored and must contain:

- Date of Test
- Name of Expert
- Designation of Unit
- Test Medium
- Description of Procedure
- Notice of Faults
- Notice of Faults Elemination

Test certifications of the manufacturer must further state material, working pressure, and in the case of hoses, a confirmation that they are suitable for pressurized gas.

9.3 Maintenance

9.3.1 Rarely used pressure block devices should be checked in adequate periods of time.

10. Putting Units out of Operation / Reports of Accidents & Damage

10.1 Filling devices must be put out of operation if they are in irregular condition or of danger to the operator (see §34 DruckbehV).

10.2 Everyone who operates a filling device, has the duty to report of accidents, fatal injuries and so on, to responsible supervisory authorities (see §34 DruckbehV).

10.3 No.10.2 is valid if a pressure tank (capacity 1 ltr. +) bursts or cracks in-/outside a filling device (see §34 DruckbehV).

Additional Remarks

- Read the operation manuals of your compressor and its drive engine carefully
- Allow only qualified personell to run the compressor
- Do not place any objects on compressor while in operation
- Make sure no person or object can accidentally touch any moving parts while running
- Take care that the intake-air is pure and free of toxic gases and exhaust fumes
- All work on compressor must be carred out while compressor is pluged off and depressurized
- Check regulary for leaks by brushing all fittings and coulings with a soup solution
- Never weld high-pressure tubing
- Filling-hoses must be in perfect condition; special attention should be paid to the connecting fittings, check rubber jacket for damage, immediately replace hoses in case of any faults
- On units with an electric motor disconnect the power-cable prior to any work
- Make sure no person is within one meter of the drain-hoses before draining the condensate
- Do not touch the exhaust while the engine is running and within ten minutes after shut-down (on engine-driven units)
- The operator should wear ear protection if exposed to noise of the running compressor for extended periods of time

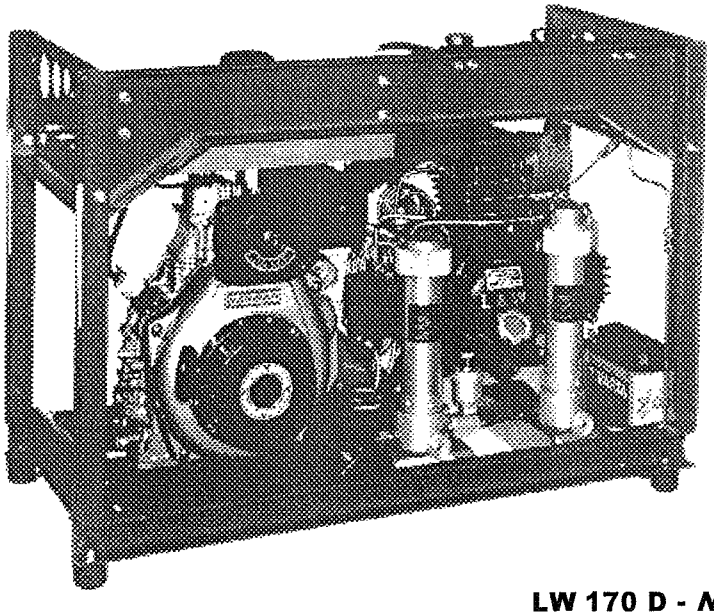
General Notice

This operation manual contains the operating and maintenance procedures necessary to safely run your **L&W** compressor. We strongly recommend that you read this manual thoroughly prior to operation and follow all the safety precautions precisely. Damage resulting from any deviation from these instructions is excluded from warranty and liability for this product. Be sure to pay attention to the following points:

- Fill only tanks with a valid hydrostatic test date
- Never exceed the working-pressure rating indicated on the tank
- Do proper maintenance of the filtration system
- Do regular drainage of the condensate system
- Avoid contaminated air to reach the air intake
- Do not exceed maximum rpm

Description of Function

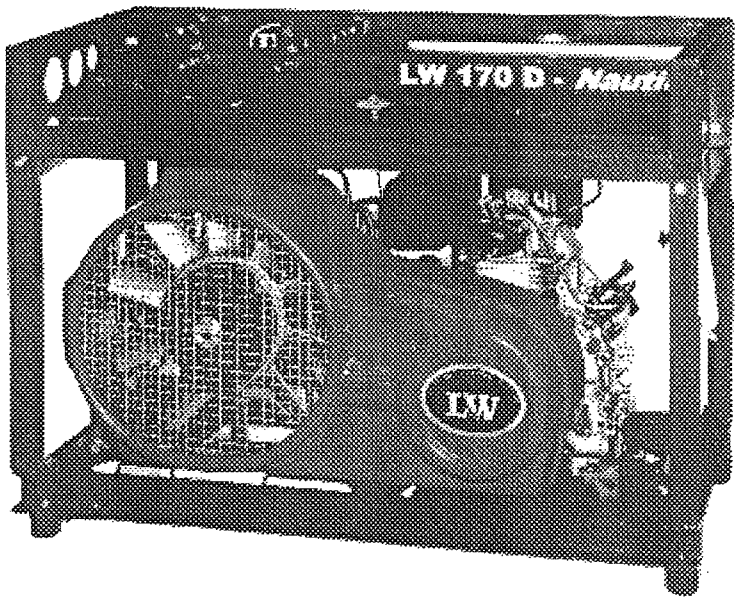
The **L&W** compressor is a 3-stage compressor designed to fill scuba tanks with compressed air. The air-intake is via filter. The air then enters the 1st stage together with a tiny quantity of oil-vapour and is compressed to 9 bar. From there it passes a cooling pipe to the 2nd stage, where it is compressed to 65 bar. After that the water and oil are removed in a (mechanical-expansional) separator and the air is cooled in the next cooling-pipe before entering stage 3. There it is compressed to the final pressure of 330 bar and then led to the next filter, where again oil and water are separated through expansion before the air passes through an activated carbon filter. The filter exit-port is connected to a high-pressure hose, which ends with a pressure-gauge and a tank-connection (filling-valve assembly).
Each stage has its own safety valve, set and sealed by the manufacturer. The final one is adjusted to either 225 or 330 bar, depending on specification.



LW 170 D - *Nautic*

Safety Precautions

- Read the operation manuals of your compressor and its drive engine carefully
- Allow only qualified personell to run the compressor
- Do not place any objects on compressor while in operation
- Make sure no person or object can accidentally touch any moving parts while running
- Take care that the intake-air is pure and free of toxic gases and exhaust fumes
- All work on the compressor must be carred out with compressor shut down and depressurized
- Check regulary for leaks by brushing all fittings and coulings with a soup solution
- Never weld high-pressure tubing
- Filling-hoses must be in perfect condition; special attention should be paid to the connecting fittings
- On units with electric motor (LW 170 E - ***Nautic***) disconnect the power-cable prior to any work
- Make sure no person is within one meter of the drain-hoses before draining the condensate
- Do not touch the exhaust (LW 170 D - ***Nautic***) while the engine is running and within 15 minutes after shut-down
- The operator should wear ear protection if exposed to the noise of the running compressor for extended periods of time



LW 170 D - *Nautic*

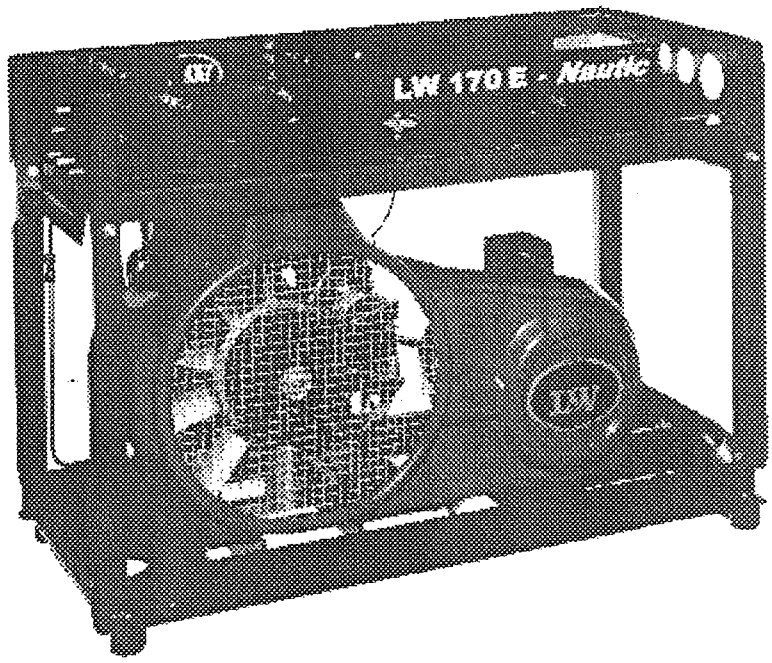
Installation

LW 170 E - *Nautic:*

Connect compressor to an 16 Ampere plug.

NOTE: Check direction of rotation immediately after the first start. If it is wrong the pistons may cease due to lack of lubrication! Furthermore the unit would not be cooled properly. When facing the front of the compressor (water separator side), the direction of rotation should be clockwise (check arrows on compressor block and cover). Don't place compressor closer than 0.5 m to any walls and always ensure good ventilation.

NOTE: Always make sure that intake air is free of toxic gases



LW 170 E - *Nautic*

Filling Process

Fill only air tanks which are:
suitable for final pressure and hydro static tested (check last testing date).

LW 170 D - *Nautic:*

(with starter motor)

- Check fuel level
- Close filling valves
- Close drain valves
- Adjust engine speed lever on Yanmar engine *(full throttle)*
- Start engine by key *(rotate clockwise)*
- Run compressor to max. pressure and check final safety valve
- Connect tank to compressor. *Filling valves and tank still closed*
- Slowly open filling valve
- Slowly open tank valve
- Fill tank to desired pressure
- Close tank valve first
- Close filling valve *(selfventing type)*
- Disconnect tank from compressor
- Turn off compressor by engine speed lever on Yanmar engine

LW 170 E - *Nautic:*

- Close filling valves
- Close drain valves of water separators
- Start compressor by push botton **1**
- Check direction of rotation immetiately after start - *change if necessary* -
- Run compressor to max. pressure and check final safety valve
- Connect tank to compressor. Filling valves and tank still closed
- Slowly open filling valve
- Slowly open tank valve
- Fill tank to desired pressure
- Close tank valve first
- Close filling valve *(- selfventing type -)*
- Disconnect tank from compressor

Turn off compressor by push botton **0**

Intake Filter

A micro filter cartridge is used as an air intake filter. The filter cartridge has to be checked regulary and should be replaced if necessary - at least once a year.
A dirty contaminated filter restricts the airflow, reduces the compressor's capacity and causes overheating.

Cylinder Heads and Valves

Inlet and outlet valves of the 1st stage are located under the 1st stage valve cover. The inlet valve opens on the down-stroke, the outlet one on the up-stroke. To reach the 2nd and 3rd stage valves it is necessary to remove the cylinder heads first. Then the valves can be pulled out of theit seat and held in a bench-vice with the alloy valve holder (table D) for further dismandling. The valves should be replaced after 1000 working hours due to normal wear and tear.

Lubrication

0.85 litre of synthetic oil (order no. L&W 9001) is required for an oil change.
NOTE: The oil level should always be above the red oil level marking
(located on the left hand side of the oil filling plug).

Starting the Compressor for the first Time

- Place compressor in a distance of at least 20 inches to any walls (air temperature max. 40 degree centigrate)
- Make sure your location is properly vented due to exhaust gases
- (LW 170 D - ***Nautic***)
- Check oil level on Yanmar engine (LW 170 D - ***Nautic***)
- Check fuel level (LW 170 D - ***Nautic***)
- Check connections
- Check oil level on compressor
- Check if air filter cartridge is in place
- Make sure filling valves are closed
- Start compressor
- Run compressor to max. pressure
- Check if safety valve opens at max. pressure
- Check compressor unit for air leaks
- Check drain valves of water separators
- Turn off compressor
- Release pressure by filling valves

Safety Valves

Every pressure-stage is equipped with its own safety valve. They protect the unit from over-pressure / load.
Thees valves are adjusted to:

1st Stage: 15 bar
2nd Stage: 72 bar
3rd Stage: final pressure (225 or 330 bar)

If a safety valve blows it indicates problems with either inlet or outlet valve of the next stage.

NOTE: A faulty safety valve should always be replaced!

Removing the Compressor Cover

The GRP compressor cover is held in place by three allen bolts (M8). One is placed on top of it, two are mounted to the frame. In order to reach them, tilt the unit and loose bolts by 6 mm allen key.

Pressure Maintaining- / Non-Return Valve

A pressure maintaining / non-return valve is fitted between water separator / filter housing and filling valves. It is adjusted to provide a pressure of at least 160 bar to the filling hose, optimising the effectiveness of the filter to ensure the best possible air quality.

Changing the Molecarbon Cartridge

The molecarbon cartridge lasts for about 20 hours at an average humidity and at 25 degree centigrate. At 30 degree centigrate plus and high humidity, its life is reduced to 11 (10) hours. The cartridges are packed airtight. We recommend that they should be opened just before they are fitted to the compressor, as they could be saturated with moisture just being exposed to high humidity. To change the filter cartridge stop the compressor and release all pressure by opening the drain and filling valves. Once the unit is free of pressure the filter housing cap can be unscrewed using the filter tool delivered with the compressor. If pressure remains in the housing, it is almost impossible to open the filter housing cap. Pull out used filter cartridge and replaced it by a new one. Make sure O-ring is in place and in useable condition. Fit spring on top of filter. Screw cap on hand tight. Check filter housing for air leaks during the next filling process.

Conservation of Compressor

If the compressor will not be used for a long period of time the following steps should be carried out:

- Run the compressor for about 10 minutes
- Open filling valves and let the compressor run for another five minutes
- Turn the compressor off
- Release all remaining pressure and condensate
- Close filling valves
- Compressor should be stored dry and dust free

Before restarting the compressor, the following steps should be carried out:

- Change oil (if the compressor was out of use for more than 12 months)
- Check air intake filter
- Replace mole carbon filter cartridge
- Check oil level(s)
- Check fuel level (LW 170 D - *Nautic*)
- Check condition of filling hoses
- Start compressor
- Run compressor with open filling valves for 5 minutes
- Close filling valves
- Drive compressor close to 200 bar and control connections for air leaks
- Release pressure and drain water separators

The compressor is now ready for use

Remarks for the Operator

The fittings (safety equipment) of the particular pressure vessels have been tested.

The pressure vessels have to be submitted to an inspection of the local conditions at site by a competent expert before being taken into operation.

According to the German pressure vessel regulation § 10 (Druckbehälter - Verordnung) the pressure vessel has to be subjected to re-examination by a competent expert.
(Valid in the F.R.G.)

Additional Remarks

Water Separator 2nd Stage

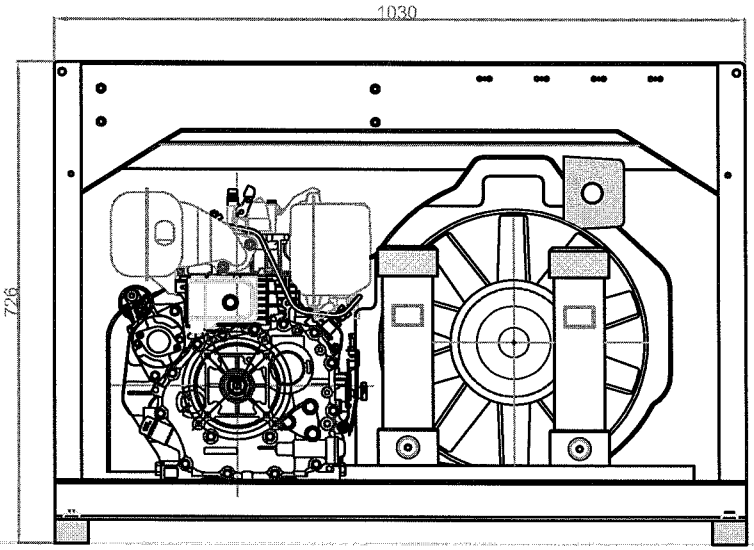
This pressure vessel is released for 50,000 loading cycles at a pressure fluctuation range of 60 bar.
After reaching this figure the pressure vessel has to be renewed.
It is the duty of the operator to record the actual loading cycles.

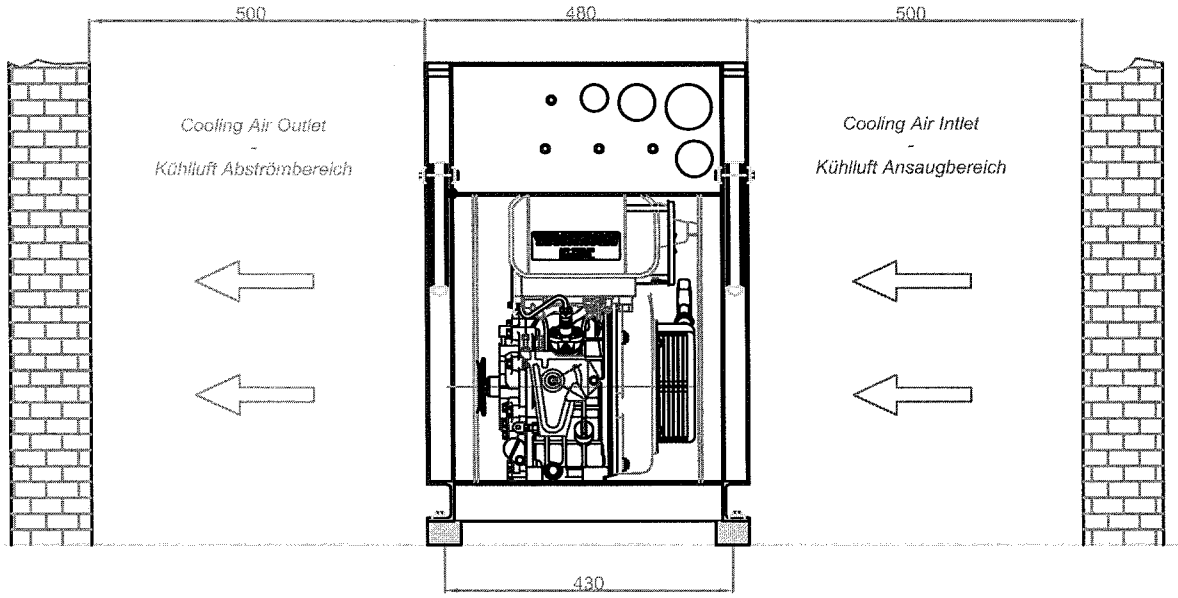
High Pressure Filter Housing

This pressure vessel is released for 3,800 / 40,000 loading cycles at a pressure fluctuation range of 330 / 225 bar.
After reaching this figure the pressure vessel has to be renewed.
It is the duty of the operator to record the actual loading cycles.

TIGHTENING TORQUES

Cylinder Head Bolts	1st Stage	22 - 24 Nm
Cylinder Head Bolts	2nd & 3rd Stage	28 Nm
Nuts M10	(8.8)	44 Nm
Fan Bolts	(8.8)	20 Nm
Guide Bar Bolts		10 Nm





LW 170 D *Nautic*

Installation Drawing - Overall Dimesions

Warranty Registration

This warranty only covers compressors which were bought from an authorised **L&W** dealer, set up as a complete unit with frame and engine (or electric motor).

Compressor Type	:
Serial Number	:
Engine / Motor Number	:
Compressor Options	:
Date of Purchase	:
Name of L&W Dealer	:
Dealer Address	:
Name of Buyer	:

Signature L&W Dealer	Signature Buyer

MAINTENANCE LIST

LW 170 D - *NAUTIC*

LW 170 E - *NAUTIC*

Routine Service	Intervals
Renewal of filter cartridge	every 19 working hours (at 20°C)
Oil changes	1st Oil change after 5 working hours 2nd Oil change after 25 working hours 3rd Oil change after 50 working hours 4th Oil change after 200 working hours thereafter every 200 working hours - but at least once a year (Order No. LW 9001 - Filling capacity 850 ml)
Replacing air inlet filter	Depends on degree of pollution - but at least once a year
Check V-belts	every 50 working hours
Replacing suction & pressure valves	every 1000 working hours
Check end-pressure safety valve	before each filling process
Check safety devices	at least once a year - these service is exclusivly expert work
Clean pressure pipes and check for air leaks	every 50 working hours
Check filling hose(s) for damage	before each filling process
Clean oil / waterseparators	every 200 working hours
Replace O-rings of oil / waterseparators	every 400 working hours
Control all connections, unions and bolts for correct torques	after 15 working hours - thereafter every 50 working hours
FOR SERVICING THE YANMAR DIESEL ENGINE, PLEASE NOTE SEPARATELY DELIVERED YANMAR INSTRUCTION MANUAL	

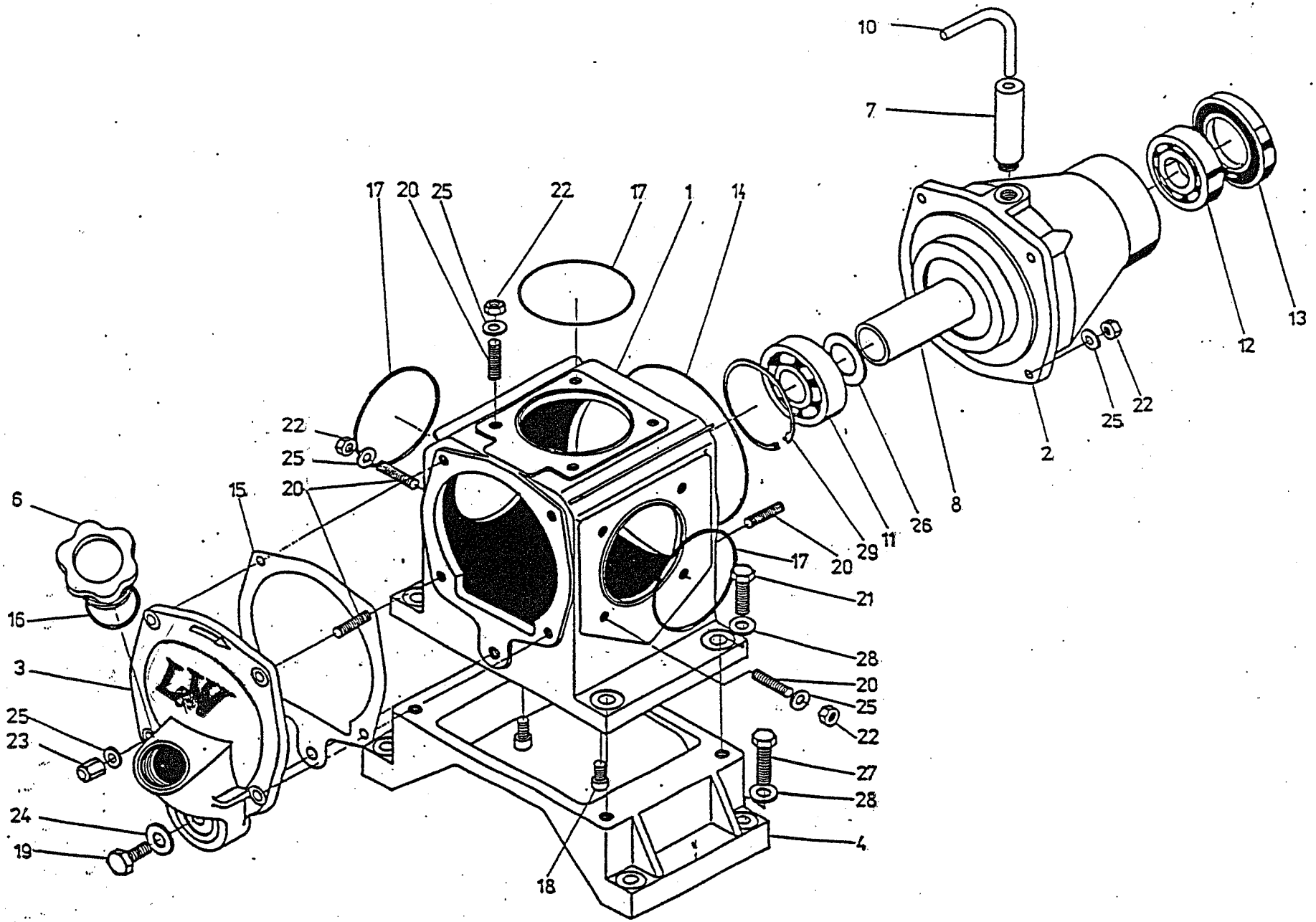
SPARE PART LIST

LW 170 D - *Nautic*

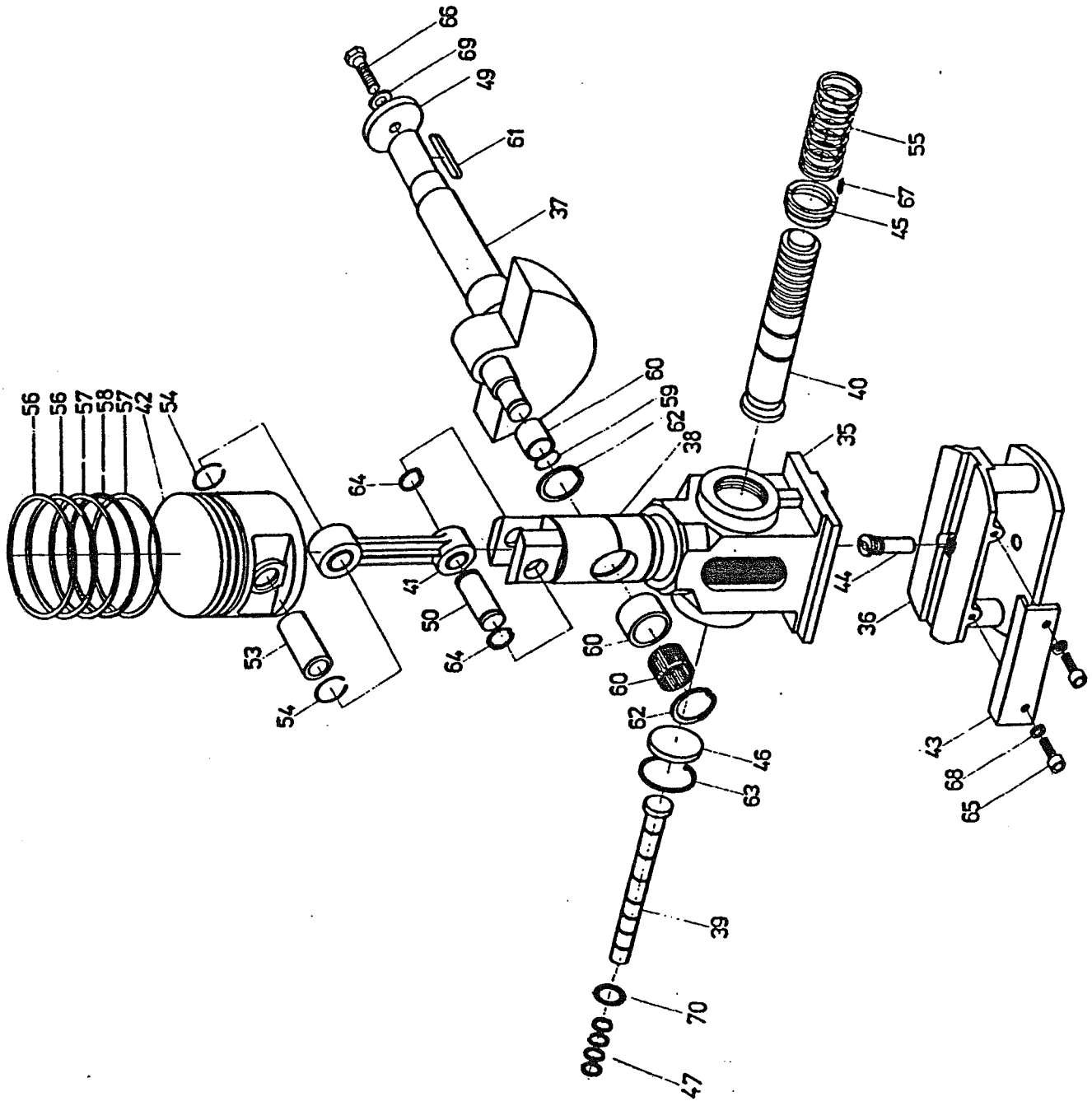
&

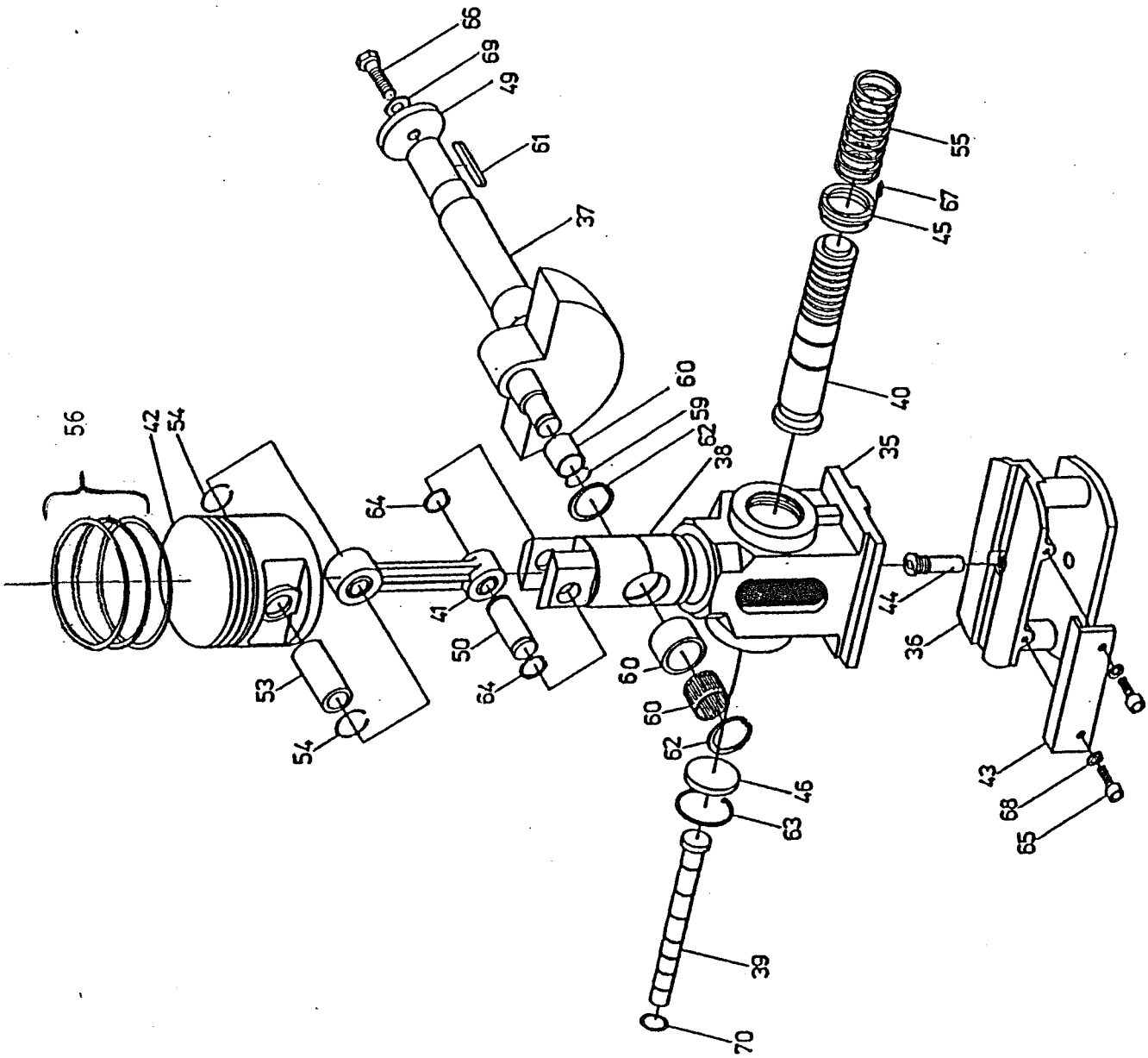
LW 170 E - *Nautic*

COMPRESSOR BLOCK LW 170 D- *Nautic* & LW 170 E - *Nautic*			
Part No.	**Description**	**Qyt.**	**Remarks**
LW 160 / 190 1	Crankcase	1	
LW 160 / 190 2	Front Cover	1	
LW 160 / 190 3	Backcover	1	
LW 160 / 190 4	Mounting Stand	1	
LW 160 / 190 5	Oil-Fill	1	
LW 160 / 190 6	Oil-Cap	1	
LW 160 / 190 7	Breather	1	
LW 160 / 190 8	Spacer	1	
LW 160 / 190 9	Dipstick	1	
LW 160 / 190 10	PVC Hose	1	
LW 160 / 190 11	Bearing 6306	1	
LW 160 / 190 12	Bearing 6305	1	
LW 160 / 190 13	Gasket	1	
LW 160 / 190 14	O-Ring	2	
LW 160 / 190 15	O-Ring ∅ 130 x 3 mm	2	
LW 160 / 190 16	O-Ring ∅ 530x 2 mm	2	
LW 160 / 190 17	O-Ring ∅ 85x 2 mm	1	
LW 160 / 190 18	Allen Bolt M8 x 30 mm	2	
LW 160 / 190 19	Drain Plug M12 x 20 mm	1	
LW 160 / 190 20	Stut M8 x 20 mm	22	
LW 160 / 190 21	Bolt M10 x 35 mm	4	
LW 160 / 190 22	Nut M8	22	
LW 160 / 190 23	Dome Nut	1	
LW 160 / 190 24	Plastic Washer ∅ 12 x 26 x 3 mm	1	
LW 160 / 190 25	Washer ∅ 8.4 mm	22	
LW 160 / 190 26	Washer	1	
LW 160 / 190 27	Bolt M10 x 40 mm	4	
LW 160 / 190 28	Washer ∅ 10.5	8	
LW 160 / 190 29	Circlip ∅ 72 mm	1	

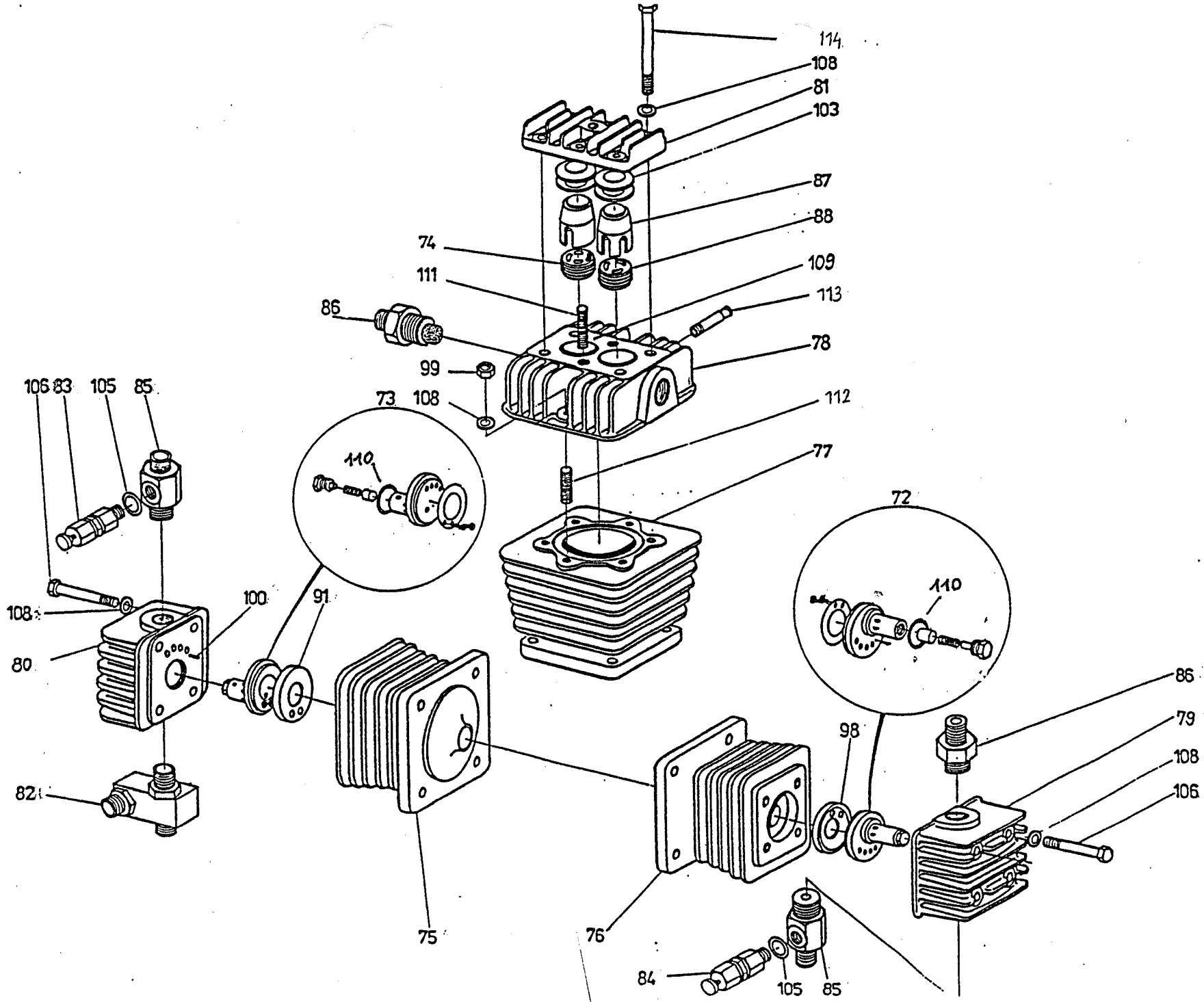

10
7
17
20
25
22
17
1
14
13
12
22
25
2
8
26
11
29
20
17
21
28
20
25
22
27
28
4
18
22
25
20
15
6
16
3
25
23
24
19

COMPRESSOR BLOCK LW 170 D - *Nautic* & LW 170 E - *Nautic*			
Part No.	**Description**	**Qyt.**	**Remarks**
LW 160 / 190 35	Slider	1	obtainable only in combination with part no. 38
LW 160 / 190 36	Bridge	1	
LW 160 / 190 37	Crankshaft	1	
LW 160 / 190 38	Plunger	1	obtainable only in combination with part no. 35
LW 160 / 190 39	Piston 3rd Stage	1	obtainable only in combination with part no. 75
LW 160 / 190 40	Piston 2nd Stage	1	
LW 160 / 190 41	Connecting Rod	1	
LW 160 / 190 42	Piston 1st Stage	1	
LW 160 / 190 43	Guide Bar	1	
LW 160 / 190 44	Oil Jet	1	
LW 160 / 190 45	Piston Nut (2nd Stage)	1	
LW 160 / 190 46	Piston Base 2nd Stage	1	
LW 160 / 190 49	Retaining Washer Pulley	1	
LW 160 / 190 50	Plunger Pin 1st Stage	1	
LW 160 / 190 53	Piston Pin 1st Stage	1	
LW 160 / 190 54	Circlip Piston Pin 1st Stage	2	
LW 160 / 190 55	Piston Rings ∅ 28 x 1,5 mm (2nd Stage)	1 Set	
LW 160 / 190 56	Piston Rings ∅ 75,5 x 1,5 mm (1st Stage)	1 Set	
LW 160 / 190 59	Circlip ∅ 17 mm	1	
LW 160 / 190 60	Needle Bearing INA 17 / 20	1	
LW 160 / 190 61	Key 8 x 7 x 32 mm	1	
LW 160 / 190 62	Circlip ∅ 30 mm	2	
LW 160 / 190 63	Circlip ∅ 35 mm	1	
LW 160 / 190 64	Circlip ∅ 16 mm	2	
LW 160 / 190 65	Bolt M6 x 20 mm	2	
LW 160 / 190 66	Bolt M8 x 30 mm	1	
LW 160 / 190 67	Bolt M4 x 5 mm	1	
LW 160 / 190 68	Washer M6	2	
LW 160 / 190 69	Washer M8	1	
LW 160 / 190 70	O-Ring ∅ 12 x 3 mm	1	

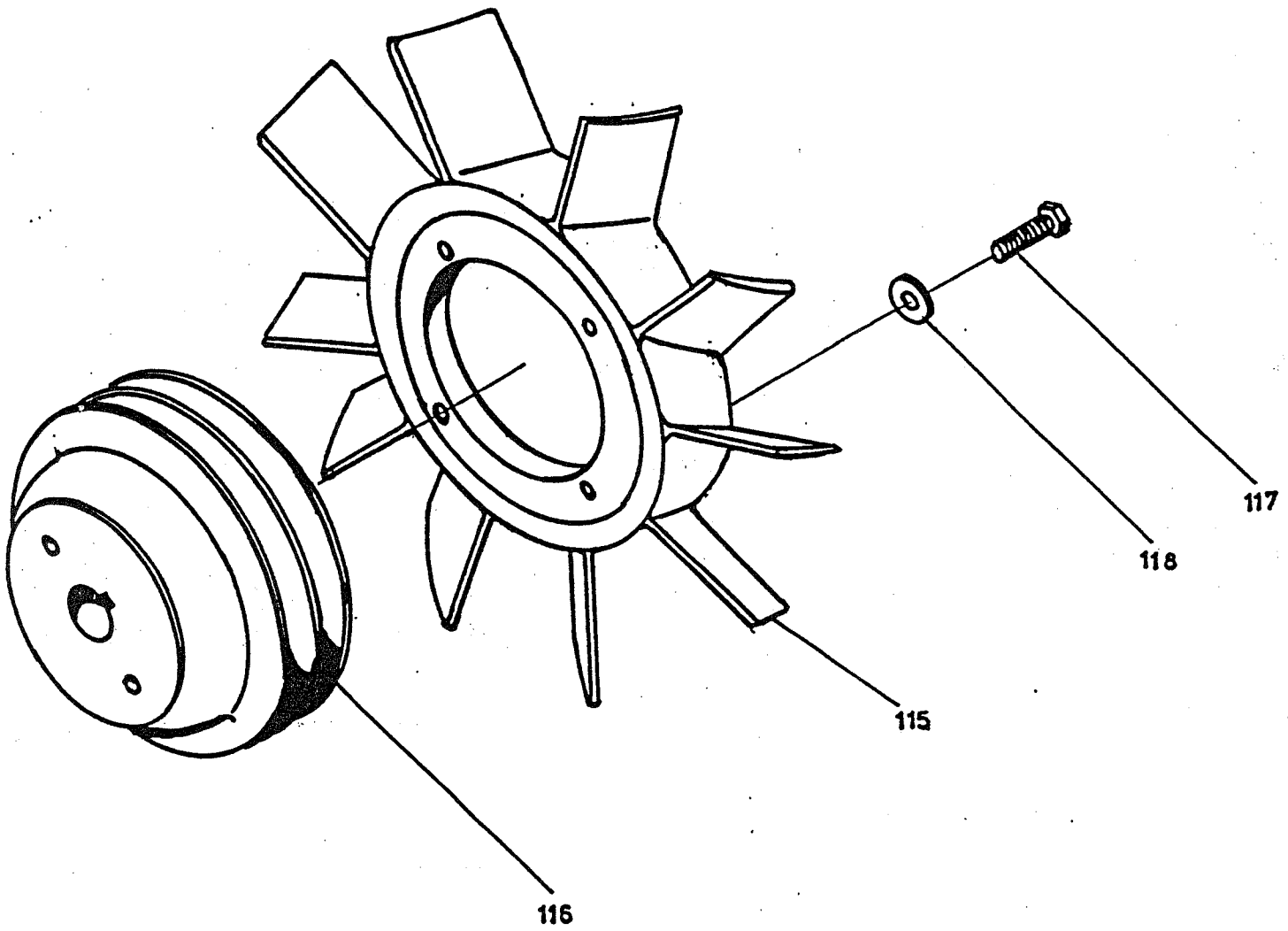

66
69
49
61
37
55
67
45
40
60
59
62
38
35
64
56
56
57
58
57
42
54
41
50
64
53
54
60
60
62
46
63
44
36
43
68
65
39
70
47


66
69
49
61
37
55
67
45
40
60
59
62
38
35
56
42
54
64
41
50
64
60
60
62
46
63
39
70
44
36
43
68
65
53
54

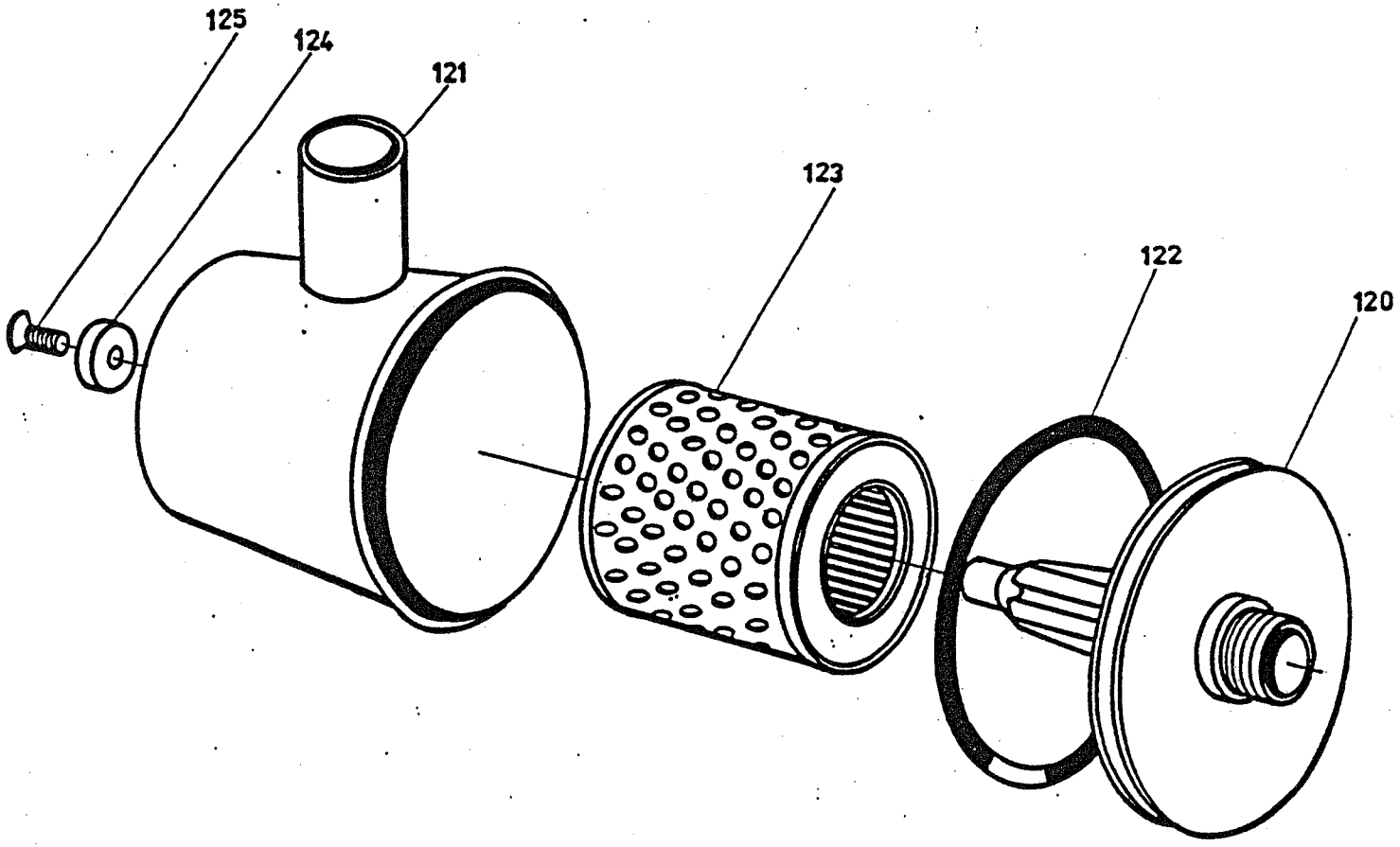
COMPRESSOR BLOCK LW 170 D - *Nautic* & LW 170 E - *Nautic*			
Part No.	**Description**	**Qyt.**	**Remarks**
LW 160 / 190 72	Valve 2nd Stage (compl.)	1	
LW 160 / 190 73	Valve 3rd Stage (compl.)	1	
LW 160 / 190 74	Outlet Valve 1st Stage	1	
LW 160 / 190 75	Cylinder 3rd Stage	1	obtainable only in combination with part no. 39
LW 160 / 190 76	Cylinder 2nd Stage	1	
LW 160 / 190 77	Cylinder 1st Stage	1	
LW 160 / 190 78	Valvehead 1st Stage	1	
LW 160 / 190 79	Valvehead 2nd Stage	1	
LW 160 / 190 80	Valvehead 3rd Stage	1	
LW 160 / 190 81	Valvecover 1st Stage	1	
LW 160 / 190 82	Pipe Junction 3rd Stage	1	
LW 160 / 190 83	Safety Valve 2nd Stage	1	
LW 160 / 190 84	Safety Valve 1st Stage	1	
LW 160 / 190 85	Pipe Coupling - Inlet 2nd Stage	2	
LW 160 / 190 86	Pipe Coupling - Outlet 1st Stage	2	
LW 160 / 190 87	Inlet Valve Housing 1st Stage	1	
LW 160 / 190 88	Inlet Valve 1st Stage	1	
LW 160 / 190 91	Valve Cap 3rd Stage	1	
LW 160 / 190 97	Outlet Valve Housing 1st Stage	1	
LW 160 / 190 98	Valve Cap 2nd Stage	1	
LW 160 / 190 103	Spring Washer 1st Stage	6	
LW 160 / 190 104	Nut M8	1	
LW 160 / 190 105	Washer Copper ∅ 14 x 20 x 1 mm	2	
LW 160 / 190 106	Bolt M8 x 70 mm	8	
LW 160 / 190 108	Washer M8	15	
LW 160 / 190 109	Paper Gasket	1	
LW 160 / 190 110	O-Ring ∅ 24 x 2,5 mm Viton	1	
LW 160 / 190 111	O-Ring ∅ 25 x 2 mm Viton	1	
LW 160 / 190 112	Stut M8 x 20 mm	1	
LW 160 / 190 113	Vent Pipe	1	
LW 160 / 190 114	Bolt M8 x 80 mm	6	


114
108
81
103
87
88
74
109
111
113
86
78
99
73
108
112
77
72
110
106
83
105
85
110
108
100
91
80
82
75
86
79
98
108
106
76
84
105
85

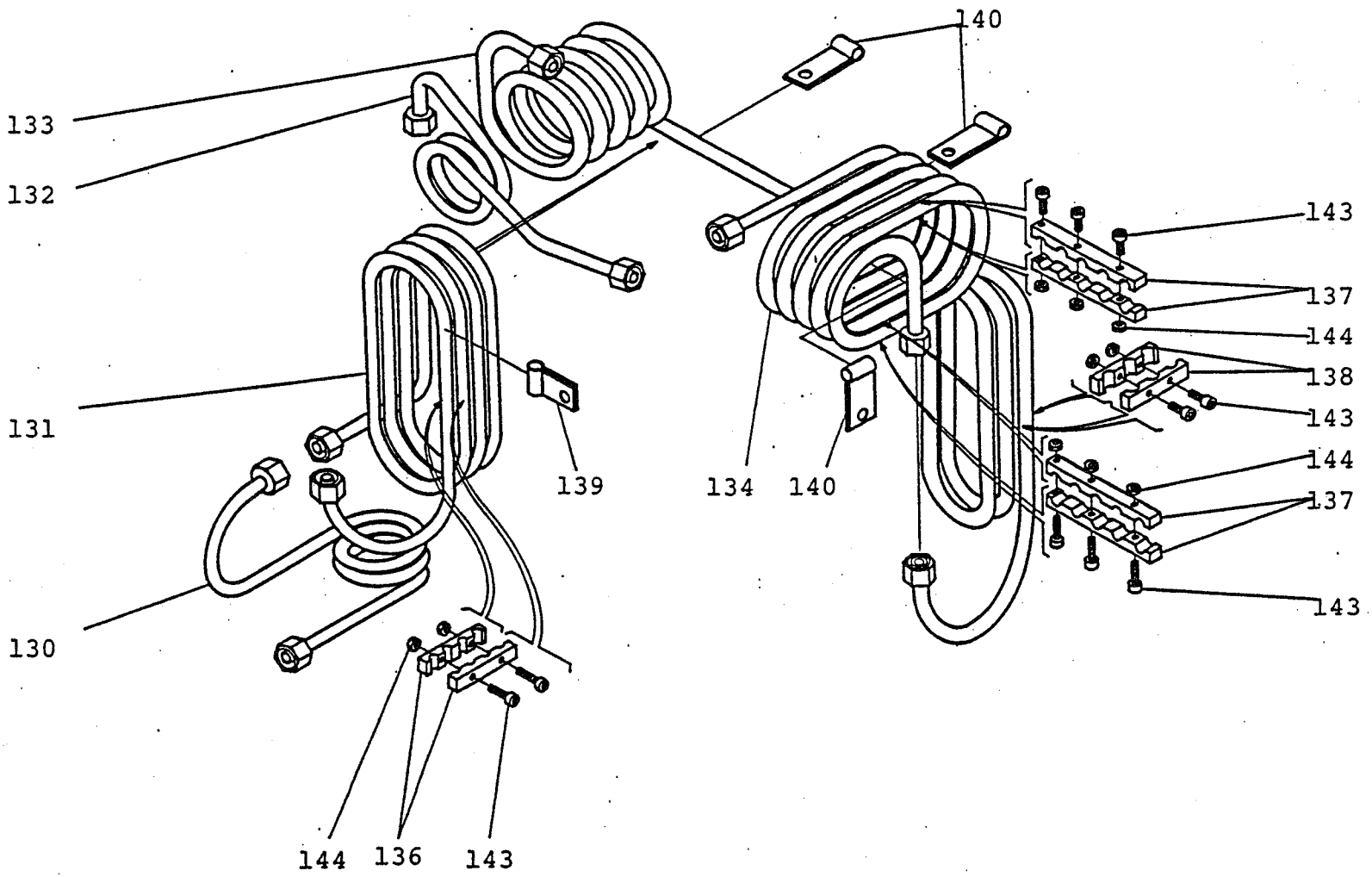
COMPRESSOR BLOCK LW 170 D - *Nautic* & LW 170 E - *Nautic*			
Part No.	**Description**	**Qyt.**	**Remarks**
LW 160 / 190 115	Cooling Fan	1	
LW 160 / 190 116	Pulley Compressor ∅ 173 mm	1	
LW 160 / 190 117	Bolt M8 x 25 mm	4	
LW 160 / 190 118	Washer M8	4	


117
118
115
116

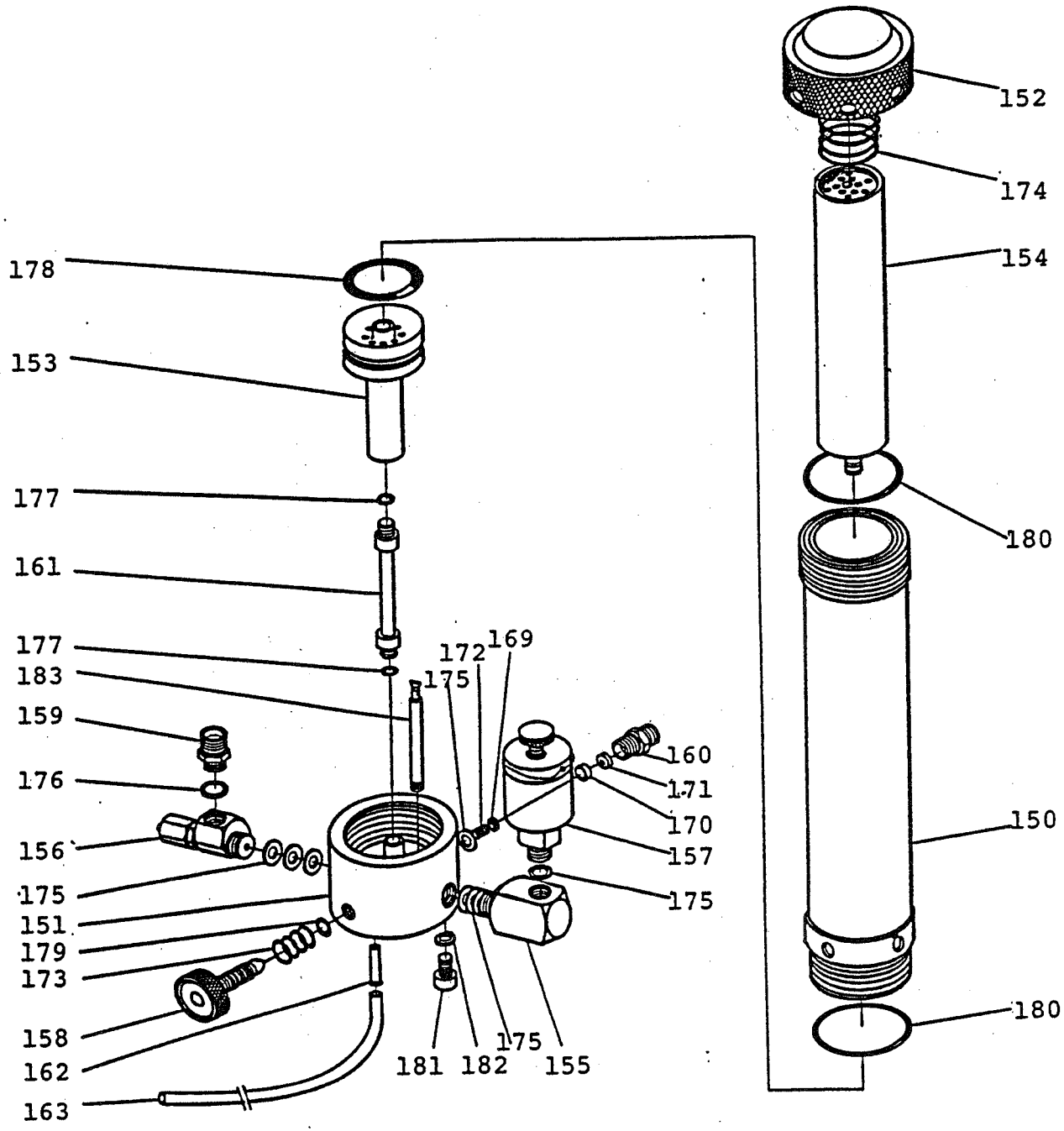
AIR INTAKE FILTER ASSEMBLY LW 170 D - *Nautic* & LW 170 E - *Nautic*			
Part No.	**Description**	**Qyt.**	**Remarks**
LW 160 / 190 120	**Filter Base**	**1**	
LW 160 / 190 121	**Filter Housing**	**1**	
LW 160 / 190 122	**Rubber Gasket**	**1**	
LW 160 / 190 123	**Air Filter Cartridge**	**1**	
LW 160 / 190 124	**Washer Air Filter Housing**	**1**	
LW 160 / 190 125	**Bolt M6 x 14 mm**	**1**	


125
124
121
123
122
120

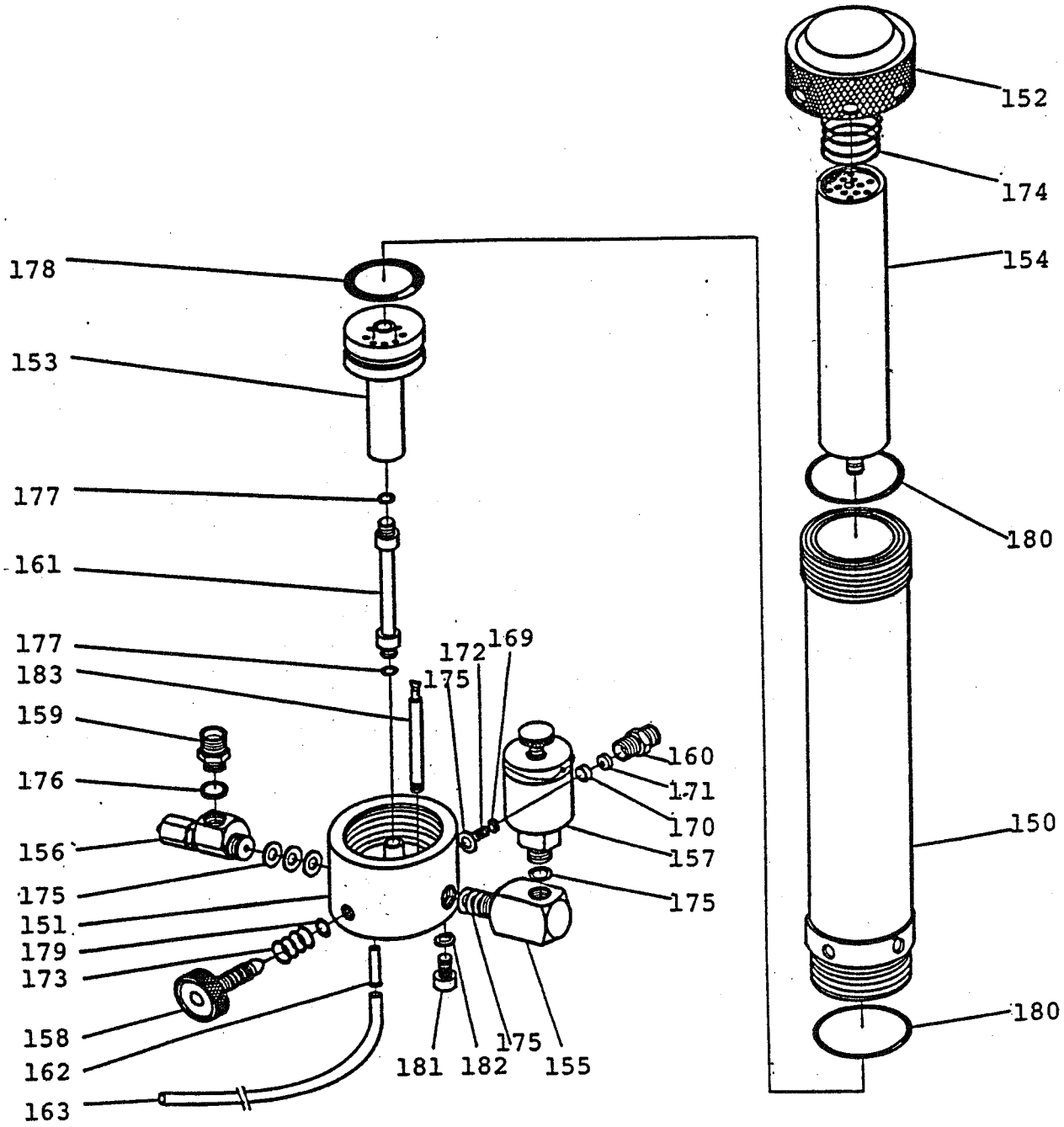
HIGH PRESSURE TUBES LW 170 D - *Nautic* & LW 170 E - *Nautic*			
Part No.	**Description**	**Qyt.**	**Remarks**
LW 160 / 190 130	Cooling Tube 3rd Stage to Filterhousing	1	
LW 160 / 190 131	Cooling Tube 3rd Stage to Pipe Junction	1	
LW 160 / 190 132	Cooling Tube Waterseparator 1st / 2nd Stage to 3rd Stage	1	
LW 160 / 190 133	Cooling Tube 1st Stage to 2nd Stage	1	
LW 160 / 190 134	Cooling Tube 2nd Stage to Waterseparator 1st / 2nd Stage	1	
LW 160 / 190 136	Stabilizing Clamp 4 (8mm) Alloy	1	obtainable only in combination with parts no. 143 & 144
LW 160 / 190 137	Stabilizing Clamp 5 (10mm) Alloy	2	
LW 160 / 190 138	Stabilizing Clamp 3 (10mm) Alu	1	
LW 160 / 190 139	Attachement Clamp (8mm)	1	obtainable only in combination with part no. 131
LW 160 / 190 140	Attachement Clamp (10mm)	3	to obtain only in combination with corresponding cooling tubes
LW 160 / 190 143	Bolt M5 x 20mm	10	
LW 160 / 190 144	Nut M5	10	


140
133
132
143
137
144
138
131
143
139
134
140
144
137
130
143
144
136
143

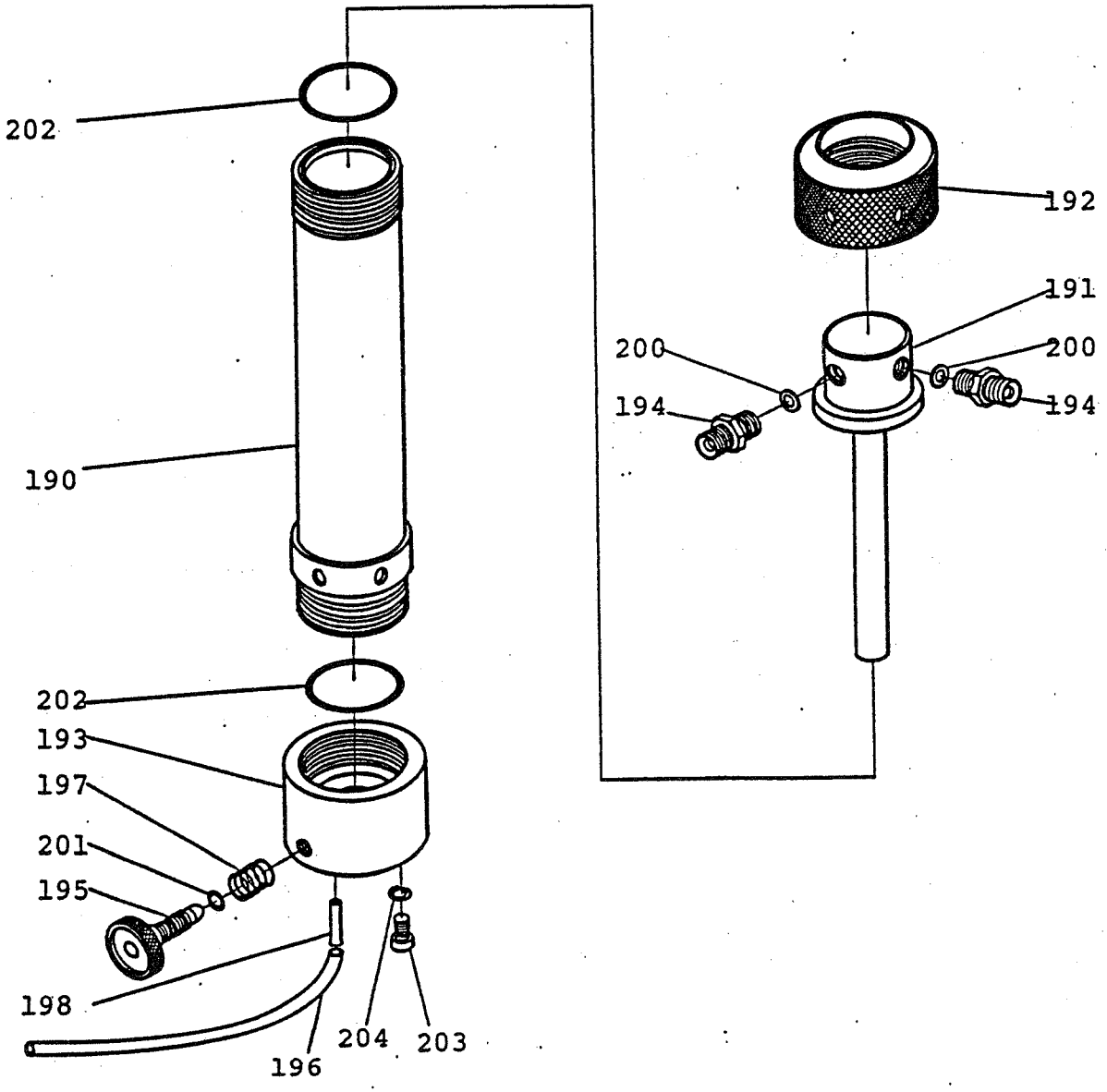
FILTER HOUSING / WATERSEPARATOR LW 170 D - *Nautic* & LW 170 E - *Nautic*			
Part No.	**Description**	**Qyt.**	**Remarks**
LW 160 / 190 150	Filter Housing Tube*	1	*Parts no. 150, 151 & 152 only available as a complete unit
LW 160 / 190 151	Filter Housing Base*	1	
LW 160 / 190 152	Filter Housing Top*	1	
LW 160 / 190 153	Inner Manifold	1	
LW 160 / 190 154	Molecarbon Filtercartridge	1	available only as a complete unit
LW 160 / 190 155	Base Safety Valve M16 x 1,5 mm / G3/8“	1	
LW 160 / 190 156	Pressure Maintaining Valve	1	
LW 160 / 190 157 a	Endpressure Safety Valve 225 bar	1	
LW 160 / 190 157 b	Endpressure Safety Valve 330 bar	1	
LW 160 / 190 158	Condensate Drain Wheel	1	
LW 160 / 190 159	Connection M14 x 1,5 mm / 10 L	1	
LW 160 / 190 160	Cooling Tube Coupler	1	
LW 160 / 190 161	HP Inter Coupler	1	
LW 160 / 190 163	Drain Hose	1	
LW 160 / 190 173	Spring Drain Valve	1	
LW 160 / 190 174	Spring Filter Cartridge	1	
LW 160 / 190 175	Washer Copper ∅ 8 x 14 x 1 mm	7	
LW 160 / 190 176	Washer Copper ∅ 6 x 12 x 1 mm	1	


152
174
154
180
150
180
178
153
177
161
177
183
159
176
156
175
151
179
173
158
162
163
172
169
175
160
171
170
157
175
175
181
182
155

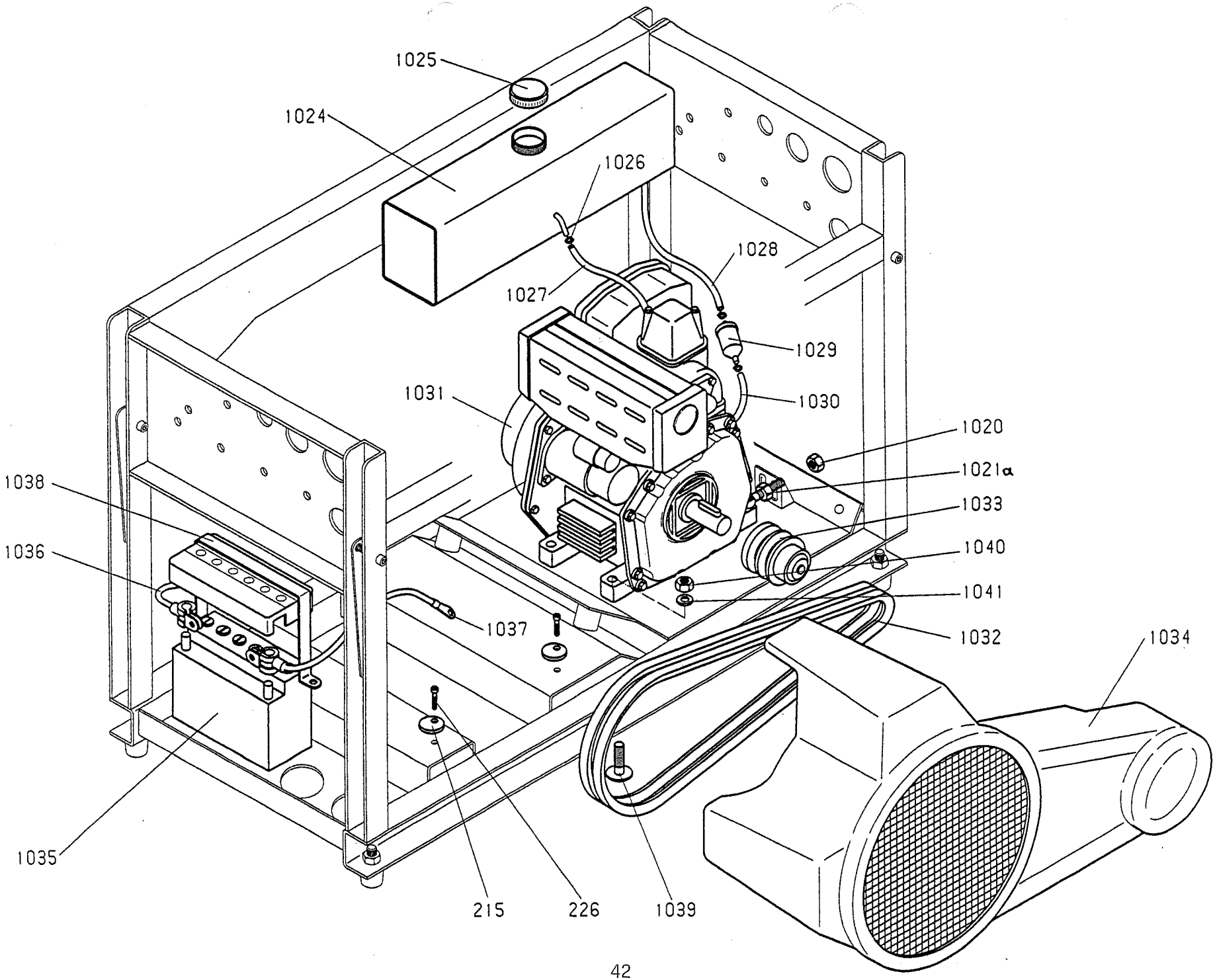
FILTER HOUSING / WATERSEPARATOR LW 170 D - *Nautic* & LW 170 E - *Nautic*			
Part No.	**Description**	**Qyt.**	**Remarks**
LW 160 / 190 177	O-Ring Filter Cartridge	1	
LW 160 / 190 178	O-Ring Manifold	1	
LW 160 / 190 179	O-Ring	1	
LW 160 / 190 180	O-Ring Filter Housing	2	
LW 160 / 190 181	Allen Bolt M8 x 16 mm	3	
LW 160 / 190 182	Spring Washer	3	
LW 160 / 190 183	Jet	1	


152
174
154
180
150
180
178
153
177
161
177
183
159
176
156
175
151
179
173
158
162
163
172
169
175
160
171
170
157
175
181
182
175
155

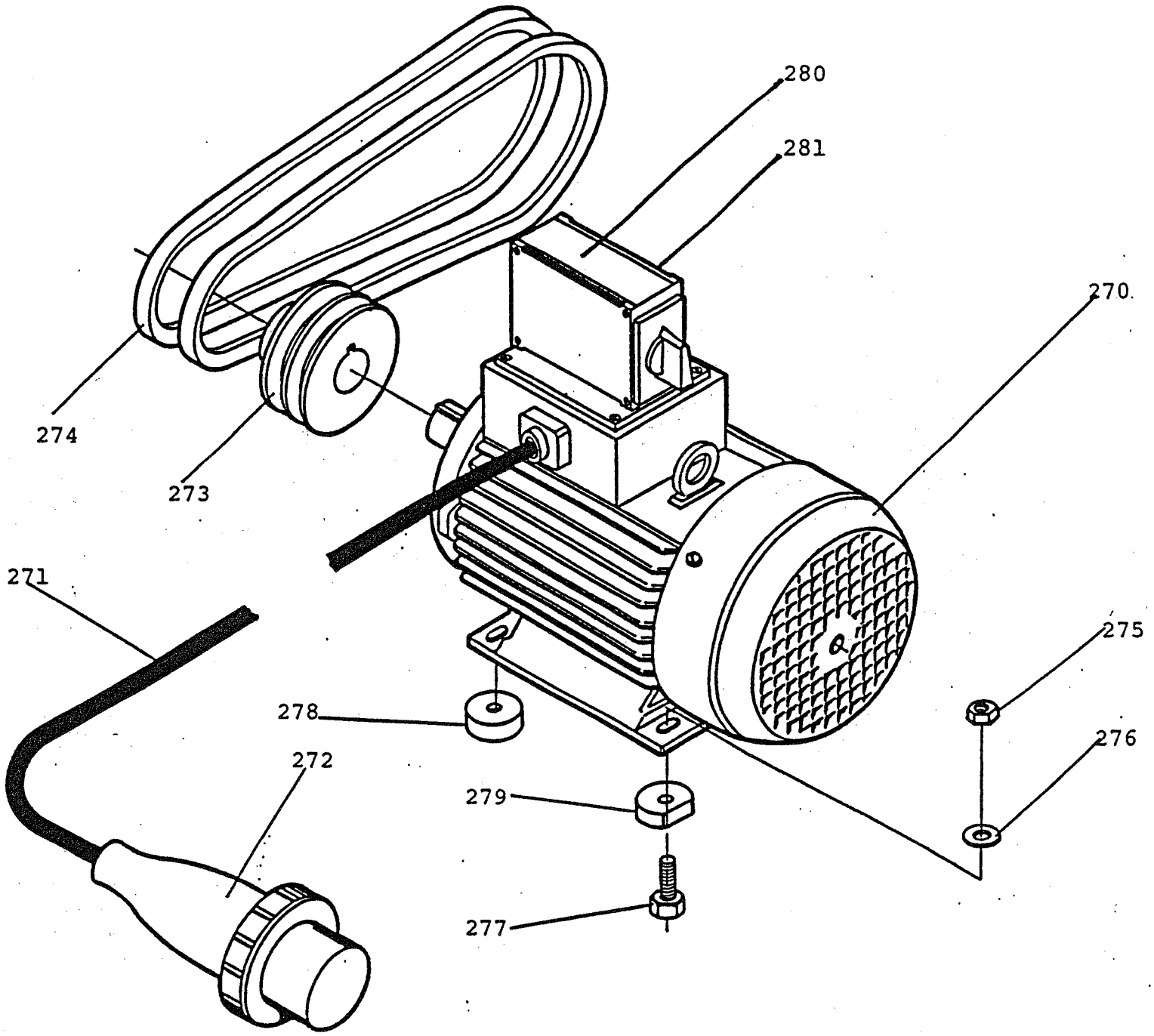
WATERSEPARATOR 1. & 2. STAGE LW 170 D - *Nautic* & LW 170 E - *Nautic*			
Part No.	**Description**	**Qyt.**	**Remarks**
LW 160 / 190 190	Waterseparator Tube*	1	*Parts no. 190, 191, 192 & 193 only as a complete unit available
LW 160 / 190 191	Manifold*	1	
LW 160 / 190 192	Manifold Cap Waterseparator*	1	
LW 160 / 190 193	Waterseparator Base*	1	
LW 160 / 190 194	Cooling Tube Coupler	2	
LW 160 / 190 195	Condensate Drain Wheel	1	
LW 160 / 190 196	Drain Hose	1	
LW 160 / 190 197	Spring	1	
LW 160 / 190 200	Washer Copper ∅ 8 x 14 x 1 mm	2	
LW 160 / 190 201	O-Ring Drain Wheel	1	
LW 160 / 190 202	O-Ring ∅ 54 x 3 mm	2	
LW 160 / 190 203	Allen Bolt M8 x 16 mm	4	
LW 160 / 190 204	Spring Washer M8	4	


202
190
202
193
197
201
195
198
196
204
203
192
191
200
200
194
194

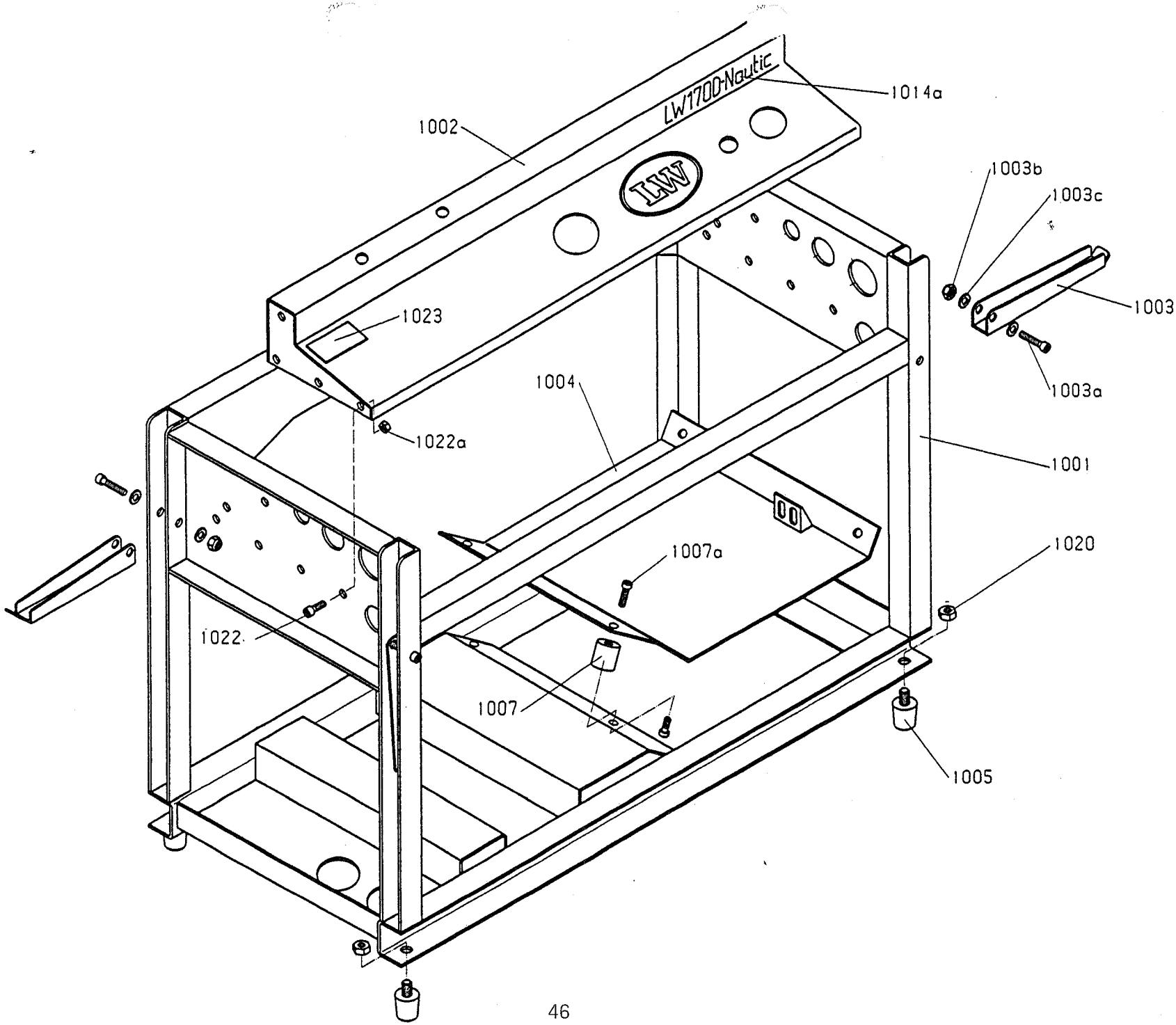
ENGINE & ACCESSORIES LW 170 D - *Nautic* & LW 170 E - *Nautic*			
Part No.	**Description**	**Qyt.**	**Remarks**
LW 160/190 226	Bolt M8	2	
LW 160/190 215	Alloy Washer	2	
LW 170 1020	V-Belt Tensioning Nut	1	
LW 170 1021a	V-Belt Tensioning Bolt	1	
LW 170 1023			
LW 170 1024	Fuel Tank	1	
LW 170 1025	Fuel Filler Cap	1	
LW 170 1026	Clip	6	
LW 170 1027	Fuel Hose	1	
LW 170 1028	Fuel Hose	1	
LW 170 1029	Diesel Fuel Filter	1	
LW 170 1030	Fuel Hose	1	
LW 170 1031	Yanmar Diesel Engine	1	
LW 170 1032	V-Belt	2	
LW 170 1033	Pulley	1	
LW 170 1034	GRP-Cover	1	
LW 170 1035	Batterie	1	
LW 170 1036	Batterie Lead	1	
LW 170 1037	Batterie Lead	1	
LW 170 1038	Batterie Bracket	1	
LW 170 1039	Bolt for Yanmar Engine	4	
LW 170 1040	Nut M8	4	
LW 170 1041	Washer M8		

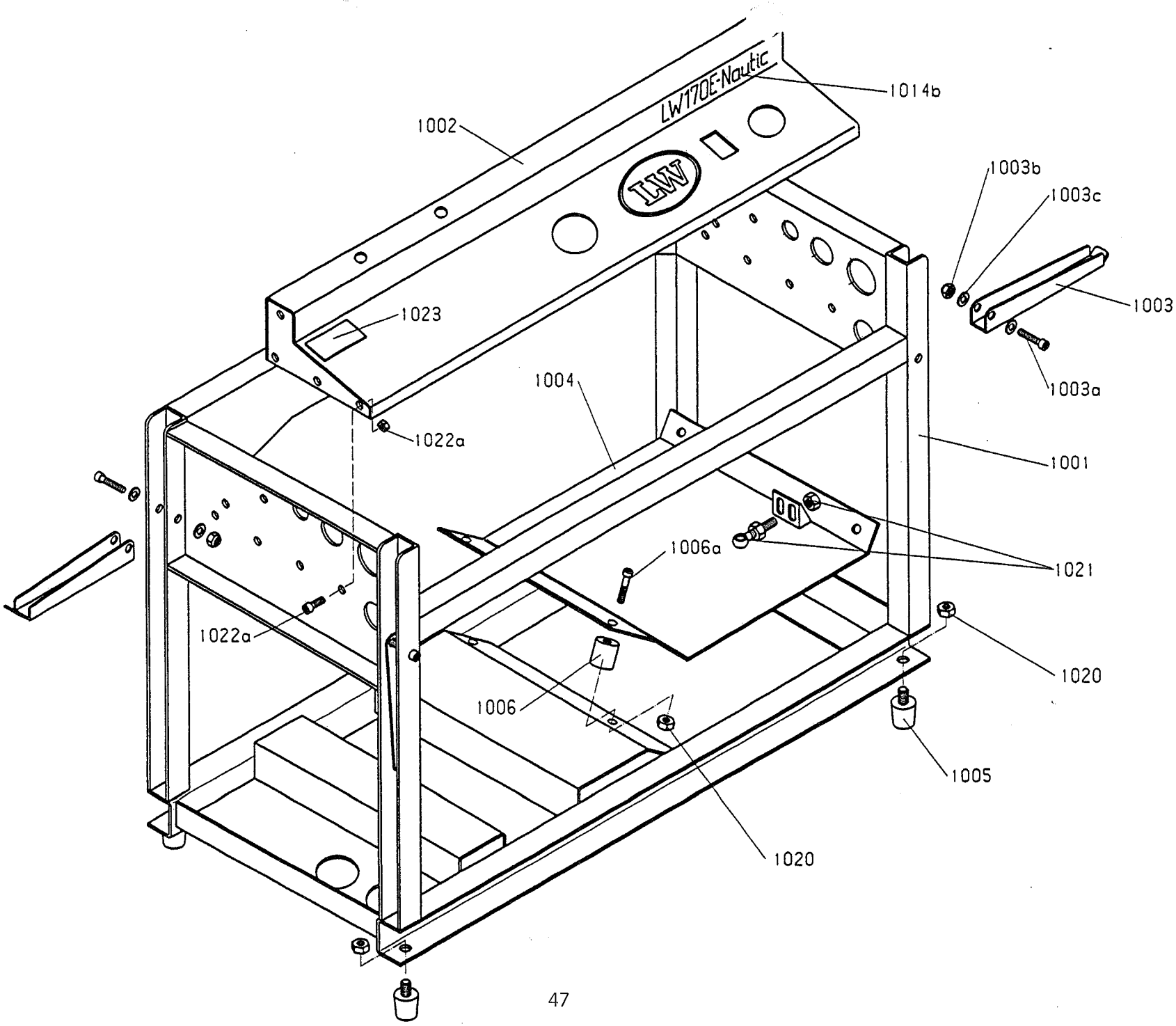

1025
1024
1026
1028
1027
1029
1031
1030
1020
1021a
1038
1033
1036
1040
1041
1037
1032
1034
1035
215
226
1039

ELECTRIC MOTOR LW 170 D - *Nautic* & LW 170 E - *Nautic*			
Part No.	**Description**	**Qyt.**	**Remarks**
LW 160 / 190 270	Electric Motor 400 V / 50Hz / 4 KW	1	
LW 160 / 190 271	Cable	1	
LW 160 / 190 272	Plug 16 A	1	
LW 160 / 190 273	Pulley ∅ 96 mm	1	
LW 170 274	V-Belt LW 170 E - *Nautic*	2	
LW 160 / 190 275	Nut M10	4	
LW 160 / 190 276	Washer M10	4	
LW 160 / 190 277	Bolt M10 x 50 mm	4	
LW 160 / 190 278	Spacer Alloy	3	
LW 160 / 190 279	Spacer Alloy modified	1	
LW 160 / 190 280	Power Switch	1	
LW 160 / 190 281	Power Switch Housing	1	

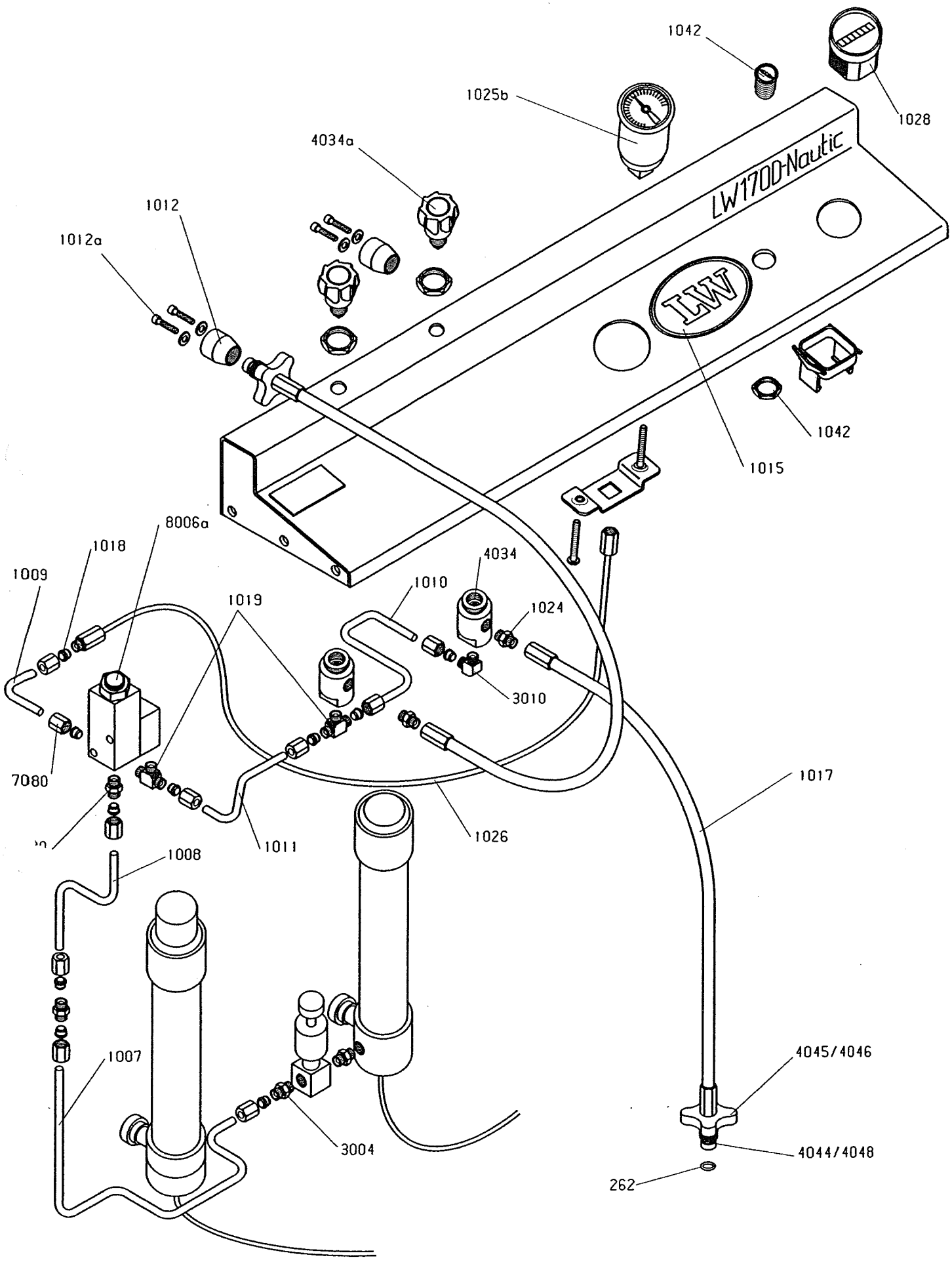

280
281
270
274
273
271
275
278
276
272
279
277

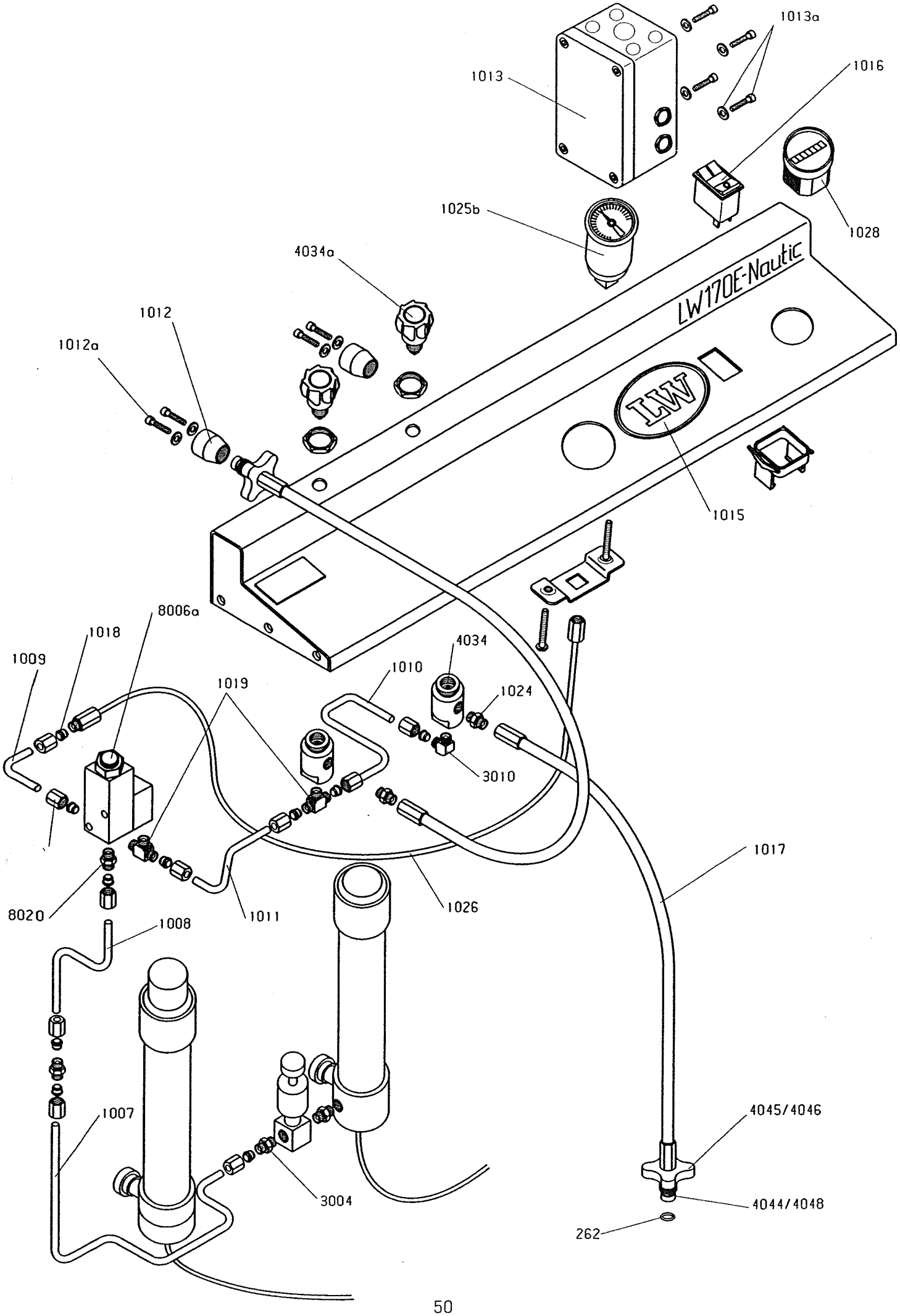
FRAME LW 170 D - *Nautic* & LW 170 E - *Nautic*			
Part No.	**Description**	**Qyt.**	**Remarks**
LW 170 1001	Frame	1	
LW 170 1002	Dashpanel	1	
LW 170 1003	Handle	4	
LW 170 1003 a	Allen Bolt M8	8	
LW 170 1003 b	Nut M8	8	
LW 170 1003 c	Washer M8	24	
LW 170 1004	Motor Base Plate	1	
LW 170 1005	Rubber Stands	4	
LW 170 1006	Plastic Bearings LW 170 E - *Nautic*	4	
LW 170 1006 a	Bolt	4	
LW 170 1007	Rubber Bearings LW 170 D - *Nautic*	4	
LW 170 1014 a	Sticker LW 170 D - *Nautic*	1	
LW 170 1014 b	Sticker LW 170 E - *Nautic*	1	
LW 170 1020	Nut M10	8	
LW 170 1021	V-Belt Tensioning Bolt LW 170 E - *Nautic*	1	
LW 170 1021 a	V-Belt Tensioning Bolt LW 170 D - *Nautic*	1	
LW 170 1022	Bolt M8 x 20 mm	8	
LW 170 1022 a	Nut M8	8	
LW 170 1023	Type Sign	1	


LW1700-Nautic
LW
1002
1014a
1003b
1003c
1003
1003a
1023
1004
1022a
1001
1007a
1020
1022
1007
1005


LW170E-Nautic
LW
1014b
1002
1003b
1003c
1003
1023
1003a
1004
1022a
1001
1006a
1021
1022a
1020
1006
1020
1005

FRAME LW 170 D - *Nautic* & LW 170 E - *Nautic*			
Part No.	**Description**	**Qyt.**	**Remarks**
LW 170 1008	Pressure Tube	1	
LW 170 1009	Pressure Tube	1	
LW 170 1010	Pressure Tube	1	
LW 170 1011	Pressure Tube	1	
LW 170 1012	Brackets for DIN Filling Necks	2	
LW 170 1012 a	Bolt M6 x 16 mm	4	
LW 170 1013	Electro Box	1	
LW 170 1013 a	Fixing Kit	1	
LW 170 1015	L&W Sticker	1	
LW 170 1016	Start / Stop Key	1	
LW 170 1017	HP Filling Hose, lenght: 700 mm	2	
LW 170 1018	Reduction GR8l / 6L	1	
LW 170 1019	T-Piece TE 8L	2	
LW 450 3004	Connection G1/4“ / 8L	1	
LW 170 4034	Filling Valve (Handwheel or Lever Type)	2	
LW 170 4034 a	Rubber Handwheel (incl. Cap & Sticker)	2	
LW 450 1026	Hose for Pressure Gauge	1	
LW 450 1028	Hour Meter 220 V (170 E)	1	
LW 450 1028 a	Hour Meter 12 Volt (170 D)	1	
LW 450 1025 b	Pressure Gauge 0-400 bar	1	
LW 450 3010	90° Connection G1/4“ / 8L	1	
LW 450 7080	Nut 8L	8	
LW 450 8006 a	Pressure Maintaining- / Non-Return Valve	1	
LW 450 8020	Inlet Connection for LW 450 8006 a	1	
LW 170 1024	Connection G14“ / 10L	1	
LW 170 262	O-Ring for DIN Filling Neck	2	
LW 170 4044	Filling Neck DIN 200 bar	2	
LW 170 4045	DIN Handwheel G5/8“ - 200 bar - black	2	
LW 170 4046	DIN Handwheel G5/8“ - 300 bar - red	2	
LW 170 4048	Filling Neck DIN 300 bar	2	


1042
1025b
1028
4034a
LW1700-Nautic
1012
1012a
LW
1042
1015
8006a
1018
1009
4034
1010
1019
1024
3010
7080
1017
1026
1011
1008
1007
4045/4046
3004
4044/4048
262


1013a
1013
1016
1028
1025b
4034a
1012
1012a
LW170E-Nautic
LW
1015
8006a
1018
1009
4034
1010
1024
1019
3010
1017
8020
1011
1026
1008
1007
4045/4046
3004
4044/4048
262