

# **Gardner**

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# **Denver**

**TAMROTOR Compressors**

## **Enduro 12**

### **Repair instructions**

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## To the user

Enduro air end is an oil injected single stage screw, which is designed for industrial air compressors.

Each Enduro air end is designed for its own capacity range.

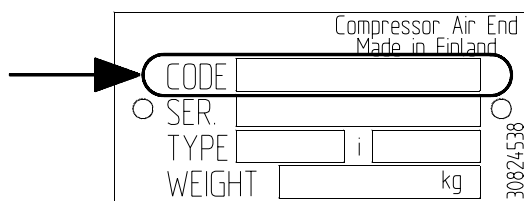
**Don't exceed the max. pressure, power and rotation speed and don't use lower than the minimum rotation speed given in the technical data.** The warranty of the air end is not valid if these values are exceeded.

Only the use of original spare parts guarantees long and reliable lifetime.

This instruction makes you acquainted with the repair of Enduro air end.

**Read these instructions carefully before starting the repair work.**

When ordering spare parts, please, give the codenumber from the plate connected to the air end.



## Safety

Read always the safety instructions of the equipment, where the air end is used!

The cleanness in all repair work is of great importance. All the foreign particles in the air end shorten the life time of the bearings and the rotors.

### Before starting the repair work

1. Disconnect the electric supply.  
(in diesel driven compressors take care that the motor cannot be started)
2. Make sure that there is no pressure in the oil receiver and close the valve between the compressor and the air line.
3. The air end and oil is hot immediately after the compressor has been stopped. Give time for cooling.

### Before starting the compressor

1. Assure that the oil used is correct (see oil recommendation), and that the oil level is correct.
2. Make sure that the rotation direction is correct by starting the compressor momentarily.  
Max starting time 2 seconds.



**Running the compressor unit in the wrong direction causes damage.**

## Technical data

Rotor size		
- male $\phi$	mm	120
- female $\phi$	mm	95,1
Lobe combination		4/5
Male rotor driven		
Displacement volume	l/rev	1,2191
Male rotor speed		
- min	rpm	1820
- max	rpm	6300
Tip speed (male)		
- min	m/s	11
- max	m/s	40
Input power		
- max	kW	45
Working pressure		
- min	bar	3
- max	bar	13
Oil injection quantity	l/min	50 - 70
Weight	kg	about 56

**On the repairing of the compressor air end use always special tools.**

## **Disassembly**

1. Clean the outside surfaces of the compressor unit from all dirt.
2. Place the compressor unit on a steady surface where the repair work can be carried out.
3. Remove the output end cover(18) mounting screws(24 and 25), and remove the cover.
4. Remove the sealing housing cover(2) screws(1), and remove the cover.
5. Mount a special tool to the drive shaft and lock it to the compressor unit body.
6. Open the shaft nuts(17 and 23) and make sure that the special tool prevents the shaft from turning. Use special tool. Do not use pneumatic impact tool.
7. Remove the pressure flange(13) mounting screws(20).
8. Remove the tool mounted to the drive shaft.
9. Remove the pressure flange by using the threads in the flange.  
(In older models remove the pressure flange by lightly tapping the drive shaft with a copper drift.  
Note! Do not use a screw driver to pry off the flange.)
10. Remove the rotors from the body.  
**Note!** Handle the rotors with care.
11. Note the positions of the ball bearings(15 and 22).
12. Remove the outer bearing races (tap out with a drift) from the bearing housings.  
**Note!** A puller must be used for the bearing(9).
13. Remove the inner ring(5) of the shaft seal (warm up to about 100 ... 150 °C).
14. Use a puller to remove the inner races of the bearings, or place the rotor vertically and quickly heat up the race to make it fall off.
15. Remove the shaft seal(6) from its housing.

## Inspection and repair of components

1. Wipe and wash all components thoroughly clean.
2. Check the parts:

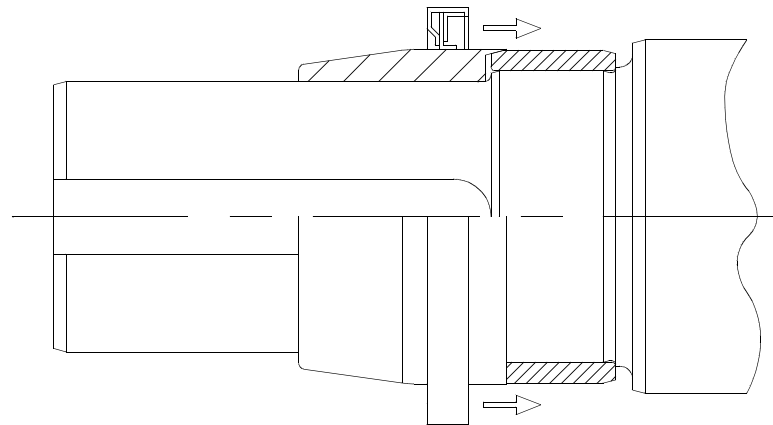
Part	Do not reuse if
Rotors	- ends have seizure marks
	- contact surface marks are uneven
	- rotors have scratches or dents
	- bearing seats are worn
	- rotors have touched body or end flanges
Body	- rotors have touched body
	- body shows signs of overheating (blue colour)
Discharge flange	- flange shows signs of overheating (blue colour)
	- rotors have touched flange
	- O-ring groove is damaged

3. Always fit new bearings and sealings.  
Use original spare parts.

## Assembly

1. Install the bearings(7 and 9) to the body.  
Use Loctite 601 to lock the bearings in place and use assembling tool.  
Lubricate the bearings.
2. Using the special installing tool, mount the inner races of the bearings(14 and 21, and 7 and 9) onto the rotors (warm up the races to about 100 °C). Use Loctite 601.
3. Insert the rotors into the body and lock the drive shaft with the special tool.
4. Install the bearings(14 and 21) to the pressure flange. Use special tool.  
Use Loctite 601 to lock the bearings in place.  
Lubricate the bearings.
5. Use grease when installing the O-rings(12 and 19) into their grooves. Mount the pressure flange.
6. Install the pins(11, 2 pcs) to the pressure flange.
7. Tighten the screws(20) to 180 Nm.  
Tighten crosswise.
8. Install the pressure flange ball bearings(15 and 22). Use special tool.  
**Note!** Thick side of inner race upwards.
9. Install the shaft nuts(17 and 23) with their own tools.  
Apply Molykote 1000 to the threads.

10. Adjust end float:
  - Tighten the shaft nuts lightly so that the clearance between the rotor ends and the pressure flange disappears. Do not overtighten.
  - Open the nuts (approx. 8 - 12°) so that the clearance between the rotor ends and the pressure flange is 0.03 to 0.05 mm. Move the rotors up and down to measure the clearance. Use a dial gauge. Note that the shaft nuts need no separate locking.
11. Mount the output end cover(18) with the sealing(16), and tighten the screws(24 and 25) to 25 Nm.
12. Install the dust ring(4) and the shaft seal(6) into the sealing housing(2).  
Use Loctite 542.  
**Note!** The shaft seal lip should face inwards.
13. Apply an approx. 10 mm band of Loctite 601 to where the shaft seal inner sleeve will be located on the shaft. Warm up the inner sleeve(5) to about 150 °C. Use the installing tool to mount the warmed-up sleeve on the shaft.
14. Install the shaft seal mounting tool into the rotor axle against the shaft seal inner ring and install the sealing housing carefully into its position (see drawing). Remember also to install the sealing.  
**Note!** The oil hole from the body to the sealing housing must be open.
15. Tighten the sealing housing screws(1) to 25 Nm.
16. Pour in some oil through the intake and rotate the drive shaft a few times. Plug and seal all openings. Protect the drive shaft against corrosion.



## Lubricants and tools that you need

### Lubricants

Lubricating oil	SAE 10W
Grease	Molykote 1000

### Cement

Cement	Loctite 601
Cement	Loctite 542

### Mounting tool set

#### **Mounting tool set for Enduro 12 compr. unit 308 365 88**

bearing inner race mounting tools:  
inlet end, male rotor roller bearing  
inlet end, female rotor roller bearing  
discharge end, male rotor bearings  
discharge end, female rotor bearings

bearing mounting tools to body:  
inlet end, male rotor roller bearing  
inlet end, female rotor roller bearing

bearing mounting tools to pressure flange:  
male rotor roller bearing  
female rotor roller bearing

special tool for locking rotors

drift for pins

lock nut wrench:  
male rotor  
female rotor

mounting tool for shaft seal inner ring	034 248 38
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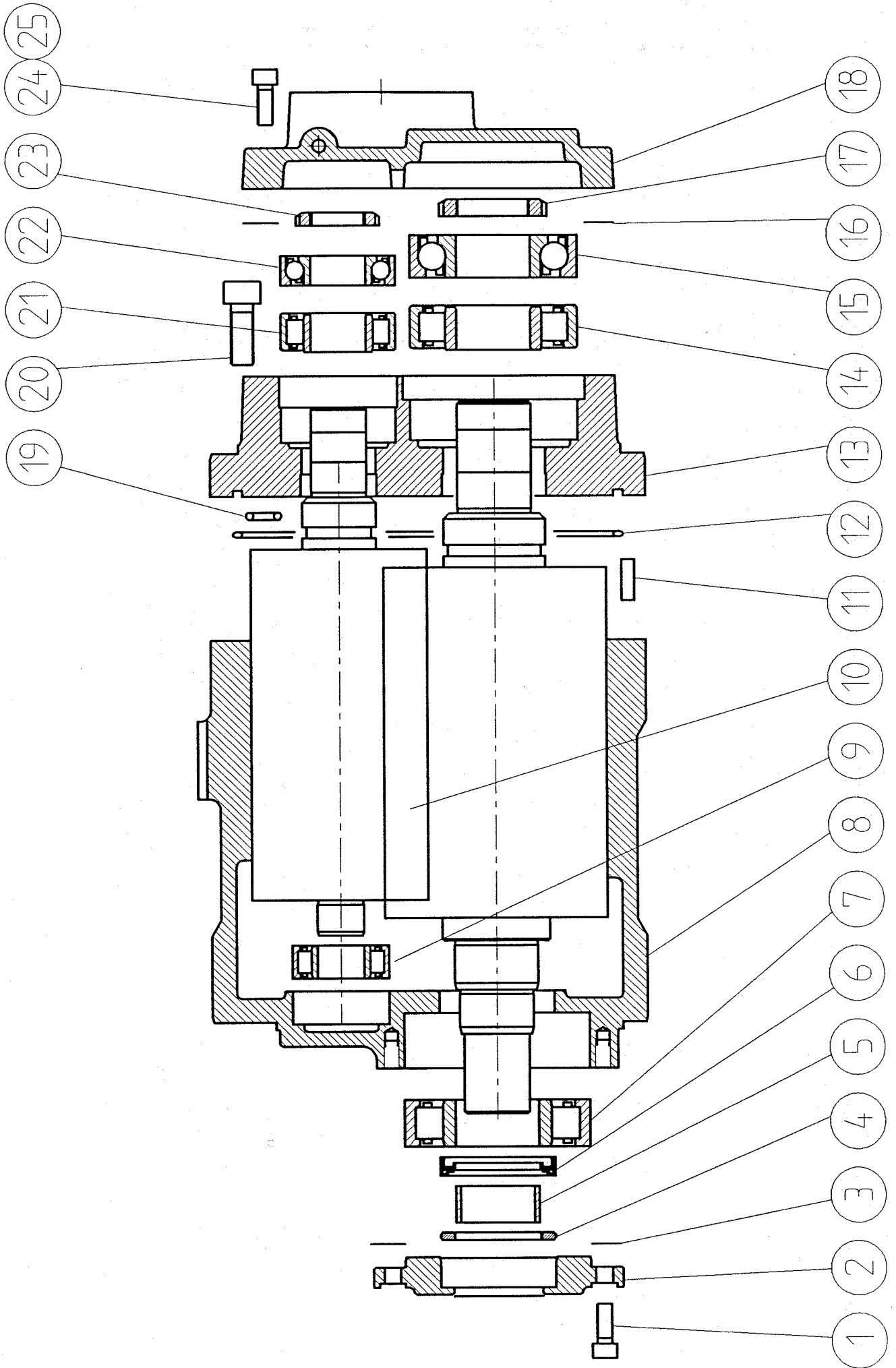
shaft seal mounting bushing	034 247 08
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shaft seal mounting tool	034 160 08
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**Varaosat  
Reservdelar  
Spare parts**

**Enduro 12  
040 190**



Viite N:o Det.Nr Ref.No	Tilaus N:o Reservdel Nr Order No	Kpl Antal Qty	Nimitys	Benämning	31.07.1996 Description
			<b>KOMPRESSORI- YKSIKKÖ</b>	<b>KOMPRESSOR- ENHET</b>	<b>COMPRESSOR AIR END</b>
			<b>Yhteiset osat</b>	<b>Standard delar</b>	<b>Standard parts</b>
1	446 110 40	6	Kuusiokoloruuvi	Insexkantskruv	Hex.socket screw
2	037 867 18	1	Tiivistekansi	Tätning	Seal cover
3	308 059 08	1	Tiiviste	Tätning	Gasket
4	308 062 18	1	Suojarengas	Skyddsring	Dust retainer
6	308 340 28	1	Akselitiiviste kok.p. sisältää osan 5	Axeltätning smst. innehåller delen 5	Shaft seal assy include item 5
7	801 075 99	1	Rullalaakeri	Rullager	Roller bearing
8	040 189 68	1	Runko	Rotorhus	Rotor casing
9	870 893 59	1	Rullalaakeri	Rullager	Roller bearing
11	815 318 69	2	Jousisokka	Fjäderpinne	Spring pin
12	870 900 19	1	O-rengas	O-ring	O-ring
13	040 188 38	1	Painelaippa	Avloppsgavel	Discharge cover
14	801 076 19	1	Rullalaakeri	Rullager	Roller bearing
15	874 569 49	1	Kuulalaakeri	Kullager	Ball bearing
16	223 187 08	1	Tiiviste	Tätning	Gasket
17	869 128 99	1	Akselimutteri	Axelmutter	Lock nut
19	879 088 49	2	O-rengas	O-ring	O-ring
20	801 471 99	4	Kuusiokoloruuvi	Insexkantskruv	Hex.socket screw
21	870 894 89	1	Rullalaakeri	Rullager	Roller bearing
22	874 572 69	1	Kuulalaakeri	Kullager	Ball bearing
23	872 525 89	1	Akselimutteri	Axelmutter	Lock nut
24	800 592 59	9	Kuusiokoloruuvi	Insexkantskruv	Hex.socket screw
			<b>Poikkeavat osat</b>	<b>Avvikande delar</b>	<b>Differing parts</b>
			<b>040 190 21</b>		
10	308 046 08	1	Roottoripari	Rotorpar	Rotor pair
18	039 647 68	1	Lähtökansi	Avloppskupa	Outlet cover
			<b>040 190 22</b>		
10	308 046 08	1	Roottoripari	Rotorpar	Rotor pair
18	039 651 08	1	Lähtökansi	Avloppskupa	Outlet cover
25	445 824 40	2	Kuusiokoloruuvi	Insexkantskruv	Hex.socket screw
			<b>040 190 23</b>		
10	308 046 01	1	Roottoripari	Rotorpar	Rotor pair
18	039 647 68	1	Lähtökansi	Avloppskupa	Outlet cover
			<b>040 190 24</b>		
10	308 046 01	1	Roottoripari	Rotorpar	Rotor pair
18	039 651 08	1	Lähtökansi	Avloppskupa	Outlet cover
25	445 824 40	2	Kuusiokoloruuvi	Insexkantskruv	Hex.socket screw
*	503 083 30	1	Korjaussarja (sisältää osat / innehåller delar / include parts 3, 6, 7, 9, 11, 12, 14-17, 19, 21-23)	Reparationssats	Repair kit