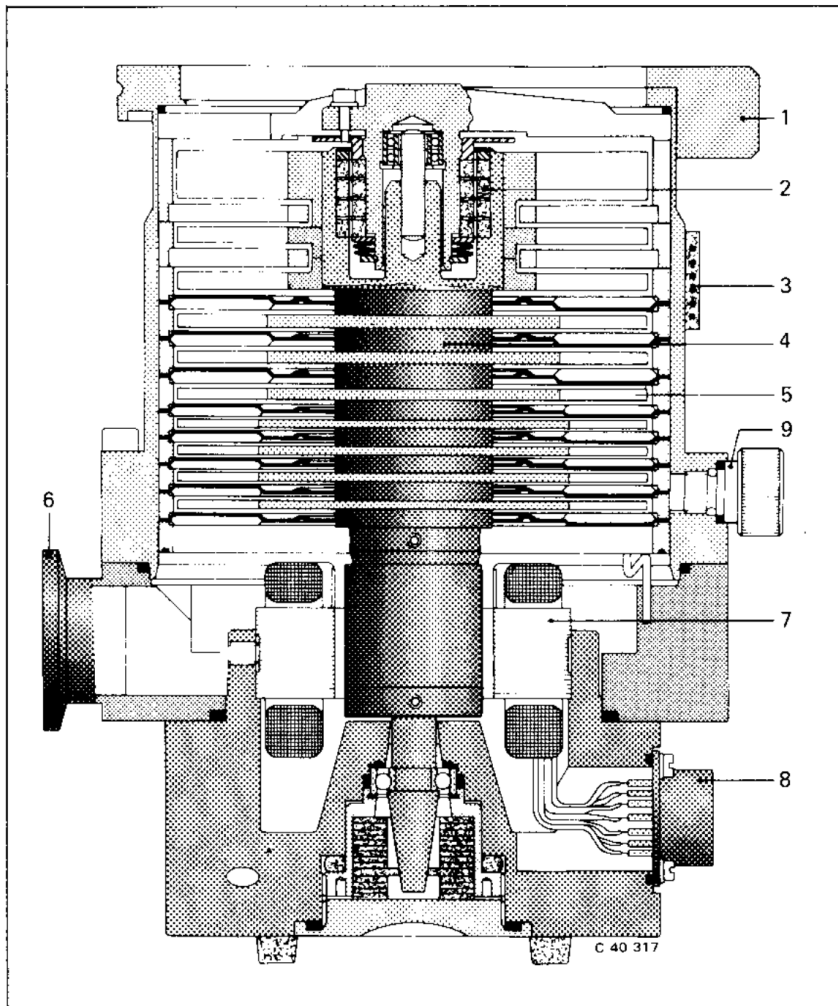




Section through the
TPH/TPU 240

- 1 HV or UHV connection flange
- 2 Permanent magnetic bearing
- 3 Heater
- 4 Stator
- 5 Rotor
- 6 Backing pump connection
- 7 Motor
- 8 Electrical connection
- 9 Venting connection

[Series overview](#)

[TMU 521 bearing replacement](#)

[Spreadsheet](#)

TPD 020

From Danielson pump station

Similar to TPD 022

Smaller connector than others

Dataplate

- Type: TPD 020
- DV 63, ISO-K
- Nr: PM P01 855 / R-789
- Operating agent: TL011, 4 mL
- Made in Germany
- Volume flow: 18 l/s

Controller: TCP 035

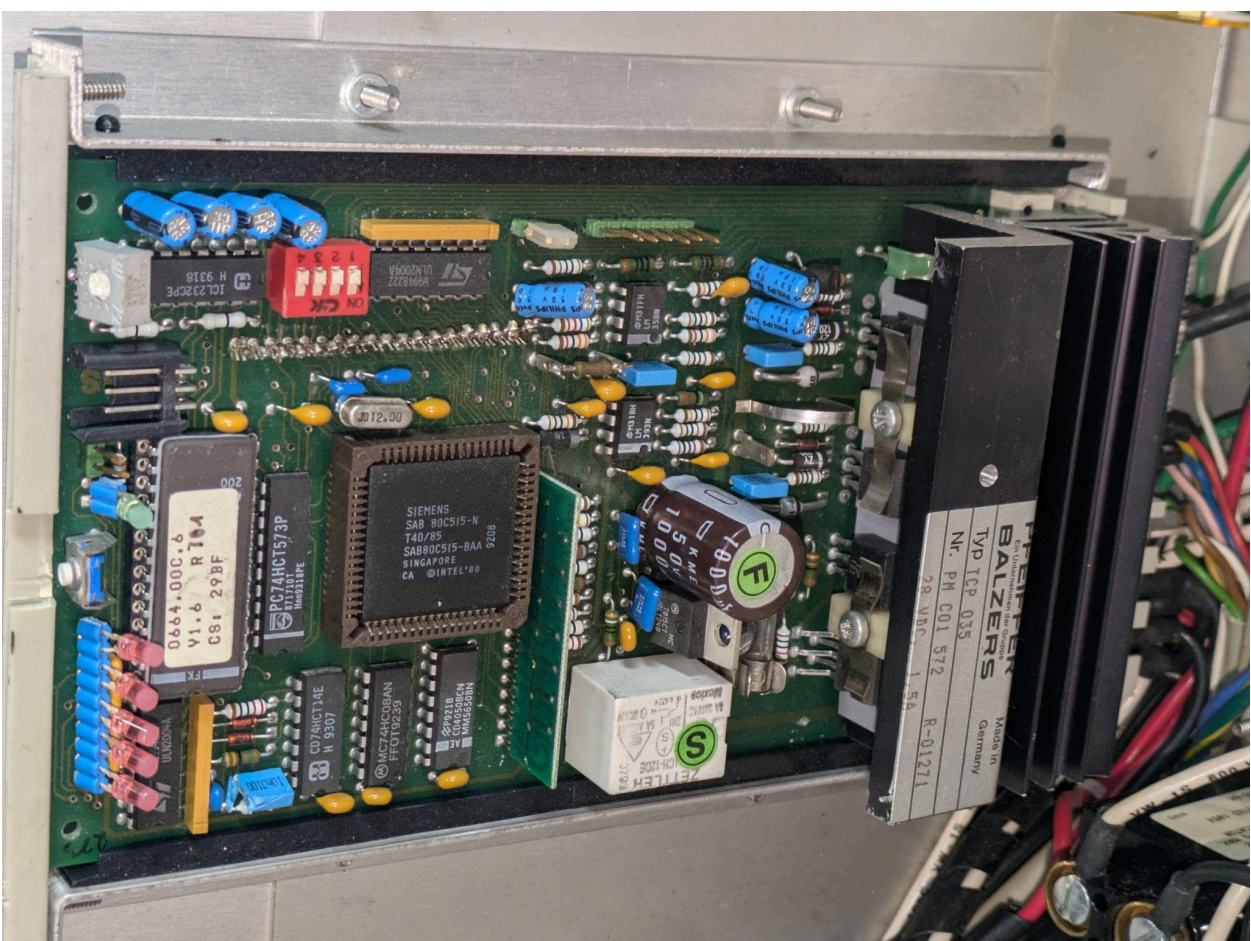
TCP 035

Controller

- TCP 035

- 28V
- Turns on after 2 seconds
- Green LED when at full speed
- Red lights turning on after chatter / fails to be happy at full speed
- No lights on in between (not even a power light)

The Electronic Drive Unit TCP 035 has been designed as an integratable component and serves to drive and monitor PFEIFFER turbomolecular pumps with single phase direct current motors (1500 Hz).



8.4. Error Code Table

Folgende Fehler werden angezeigt:

Error Nr.	LED (illuminates)					Type of Error ¹⁾	Error Description	Error Elimination
	H1	H2	H3	H4	H5			
E001	•	•				B,S	UB > 43 V	Check operations voltage
E002			•			B,S	UB < 26 V, in operation < 22 V	Check operations voltage
E003	•	•	•			B,S	I operations, current threshold exceeded	–
E004	•	•		•		S	Pump identification resistance $R_f > 2K8$	Incorrect pump type
E005	•	•		•		B	Excess temperature, pump	Cool down pump
E006	•		•	•		B	Excess temperature, TCP	Cool down TCP
E007	•	•	•	•		B	Rotor blocked	Pump defect, inform Service
E008	•				•	B	Excess rotation speed	TCP defect, inform Service
E009	•	•			•	B	Excess temperature, transformer	Cool down TCP
E010			•		•	B,S	Turbo OFF	–
E011	•	•	•		•	B	Start-up time elapsed	Repair leak, check backing pump
E012	•			•	•	B	Pumping station malfunction	Check backing pump and water cooling
E013	•	•		•	•	B,S	Watchdog reset	–
E014	•		•	•	•	B,S	Interruption A (X8)	–
E015	•	•	•	•	•	S	Motor or cable malfunction	Check cable
E016		•*				B,S	Keypad lock ON ²⁾	–
E017				•	•	B	Pumping station OFF ²⁾	–

• LED illuminates
* LED flashes

1) B = Operation
S = Self-test

2) Switching ON/OFF only via the serial interface

TPU 240

Notes:

- Very inexpensive due to snapped outlet flange. Turns out otherwise it worked fine
- 6" conflat flange
- Disassembled at one point for fun

Repair:

- Cut KF25 half nipple to roughly the shape of the snapped port
- Score surface
- Apply coating of Hysol 1C
- Let cure
- Apply second coating of Hysol 1C
- Let cure

Oil

moved info to vacuum page

TL 011

- Density: 0.947 kg/dm³ at 20 °C
- Viscosity: 10.5 mm²/s at 40 °C
- 2024-08-15: Ideal has 1L for \$367
 - [Link](#)
 - Looks like they used to have 250 mL for \$165 but [link is now dead](#)
 - <https://www.idealvac.com/en-us/Turbo-Pump-Bearing-Oil/pl/4-82-1127>
 - Cambridge Mill Products CMP-500 Turbo Oil Leybold, Pfeiffer, & Varian Oil Bearing Pumps, 1 Liter Cambridge Mill Products CMP-500 turbo vacuum oil is designed to be used as a lubricant in older oil bearing turbos. This CMP-500 turbo bearing oil is good for use in older Leybold, Pfeiffer, & Varian oil bearing turbo pumps. CMP-500 is sold in a 1 liter bottle. Fit Turbo Pump Models: Edwards: EXT 70, 200, 250, 255, 351, 551 Leybold: TMP-150, TMP-360,

TMP-220, TMP-450 Pfeiffer: TPH/TPU 050, 060, 062, 064, 071, 100, 110, 170, 190, 240, 260, 270, 330, 510, etc.
Varian: V80, V200, V300, V450

- 100 mL for 22 euro
 - [Link](#)
 - Out of stock

AP303 Turbo Pump Oil Typical Properties:

Typical Property	Unit	Test Method	AP303
Colour	HU	ISO 2211	125
Density at 20°C	kg/dm ³	ISO 3675	0.97
Kinematic Viscosity at 40°C	mm ² /s	ISO 3104	29
Kinematic Viscosity at 100°C	mm ² /s	ISO 3104	5.3
Viscosity Index	-	-	116
Flash Point	°C	ISO 2592	260
Pour Point	°C	ISO 3016	<-50
RPVOT	min	ASTM D2112	397
4 Ball Wear Scar Diameter	mm	ASTM D4172	0.72
Vapour Pressure @ 80°C	Torr	-	3.1x10 ⁻⁷

<https://apiezon.com/products/oils-fluids/apiezon-ap303-oil/>

Manufactured from high quality polyol ester base stock AP303 oil is a robust and proven lubricating oil for use in turbomolecular pump bearings.

<https://www.dymarchem.com/vacuum-products-division/synthetic-mechanical-pump/>

Dymavac 500: is a turbo pump oil that is chemically identical to Leybold HE500 and Balzers TL-011 Turbo Pump Oils.

Ultimate pressure @ 172 ° C – 0-1 mm

Viscosity @ 54 ° C – 8.7 cSt

Leybold Leybonol LVO 250 Ester Oil for Turbovac Standard and Corrosive Apps. 300 ml. Replaces HE-500

Have braycote 815Z PFPE oil

- Have some of this I got in a lab cleanout
- Looks like this could plausibly work?
- [new price](#): \$4621 for 245 mL (1 lb)...ouch
- \$18,861 per liter
- The composition of this product is a mixture of small PTFE particles (which won't dissolve in anything) and a perfluorinated polyether liquid. We have found that Castrol® Fluoroclean™ HE is an effective solvent for the liquid component of the formulated composition and aids in the removal of the grease from places where it is no longer needed or wanted.
- No units in below chart...

TEST METHOD	DESCRIPTION	RESULT
D 287	Specific Gravity @ 16/16°C (60/60°F)	1.8531
	Pounds per Gallon @ 16°C (60°F)	15.430
D 445	Kinematic Viscosity, cSt	
	@ 99°C (210°F)	45
	@ 38°C (100°F)	148
	@ -40°C (-40°F)	6,500
	@ -54°C (-65°F)	10,855
D 2270	Viscosity Index	350
D 97	Pour Point, °C (°F)	-72 (-100)
BOC	Evaporation Loss, % wt 72 hrs, 232°C (450°F)	0.36
D 664	Acid Number, mgKOH/g (end point, pH=8.2)	0.01
Knudsen	Vapor Pressure, torr	
	@ 20°C (68°F)	4×10^{-13}
	@ 100°C (212°F)	2×10^{-9}

2024-08-15

Notes

- Middle shaft has a hex key. Reverse threaded
- Found lots of black dust from (SiC?) bearings
- Bearing dimensions
 - 13 mm OD
 - w/ rubber: 16.4 mm
 - 3.95 mm ID
 - shaft: 4.00 mm
 - 5 mm high
 - Alpine ALP34TPH
 - <https://alpinebearing.com/ball-bearings/alp34tph/>
 - For TPH-50
- Spirit summary
 - Probably want 100k RPM rated
 - OEM probably [Alpine Bearings](#). Expect ~\$200
 - Ex: [TPH180](#)
 - Lubricant: Pfeiffer TLO11
 - Alt: bocabearings
- After reassembly / cleaning
 - Hear some chatter as its spinning up
 - Is this due to oil / bearing health or outgassing?
 - Needs to outgas to properly test

Pump down test

- 10:30 PM
 - 9.5E-3 rough
 - 7E-4 spun up

- Doesn't appear to be timing out or hitting full speed?
 - No green light on controller
- 10:45 pm
 - 1.1E-2 rough
 - 1.4E-3 @ 90 sec turbo
 - Dipped E-4 briefly, then up => sensor heater?
- Think pump was assembled incorrectly => slight leak
 - Reassembled correctly
 - Now see the old behavior (get pretty good vacuum but then errors out)
 - Two edge LEDs on => "excess rotation speed"
 - weird error

[McMaster ball bearings](#)

53k RPM max => not a good idea

2018 catalog

B022RK

TPD022 repair kit

\$575.00

Spirit:

It's tensioned by the mag and top housing

They're all proprietary

Get a micrometer, measure the dimensions

The OD and ID should be standard, the length might not be but it can be adjusted with spacers

Alpine Bearings should sell original replacements for around \$200, bocabearings should have something in that size for a sane price but likely not fast enough rated, and in that case you can go to one of my Chinese suppliers

Although you can just chance it with a bearing that's rated at something like 80krpm instead of 100 and it'll likely still work fine

Spirit — Today at 8:11 PM

Making felt wicks is easy, all you need is synthetic felt that doesn't fray. Cut out an identical number of circles, and one separate disk with the little oil fingers. Position it at the same height in the stack. The oil finger disk is really important, because that's how the conical nut pumps oil into the bearing(it's a centrifugal pump).

Q: do the wicks go bad? You can't just clean them out?

A: They go bad, I've not been able to clean them out even with ultrasonic and solvents

Just regular synthetic arts&crafts felt works fine

oh wait they're 4x13x5

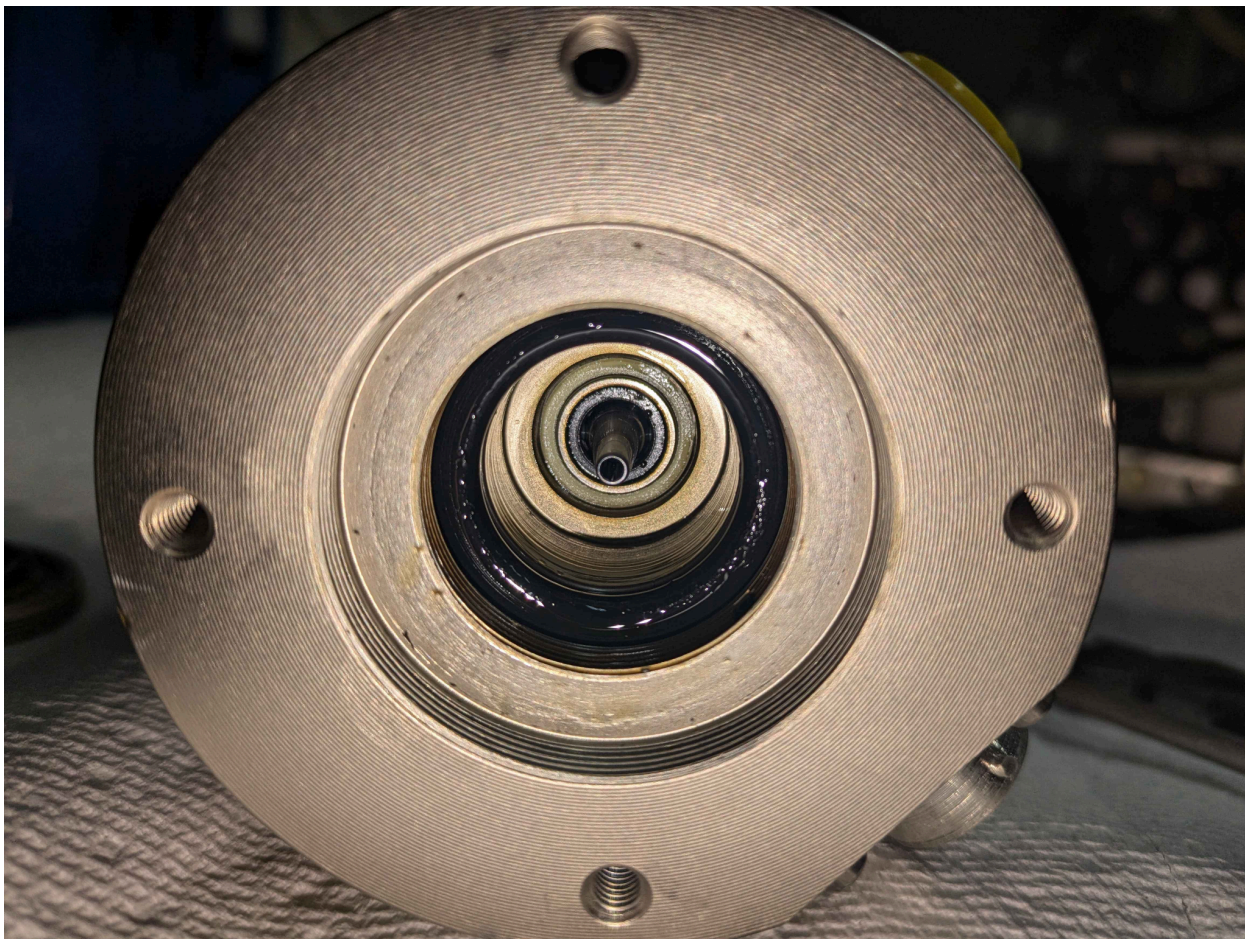
that's a 624 size

email will@xzbearing.com, tell him Andrey sent you, ask for a P7 bearing in that size(but verify that it actually is in that size), rated for 90-135krpm, ceramic balls, no shields, with a separator

if he has them, buy at least 5-10 pieces, because some of them aren't awesome, but you can bin them down by apparent crunchiness to one that feels perfect, and it'll still be way cheaper than Alpine

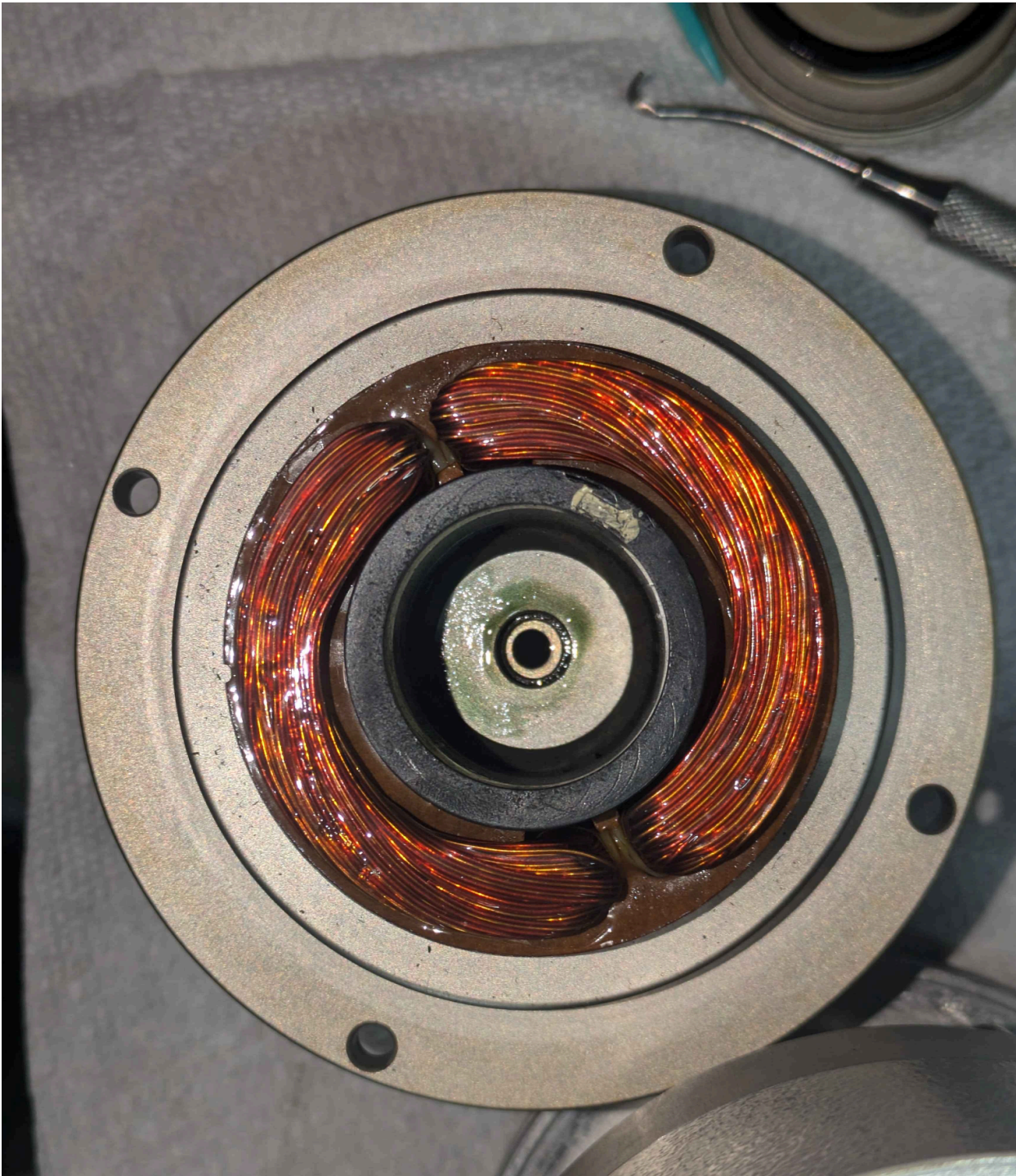


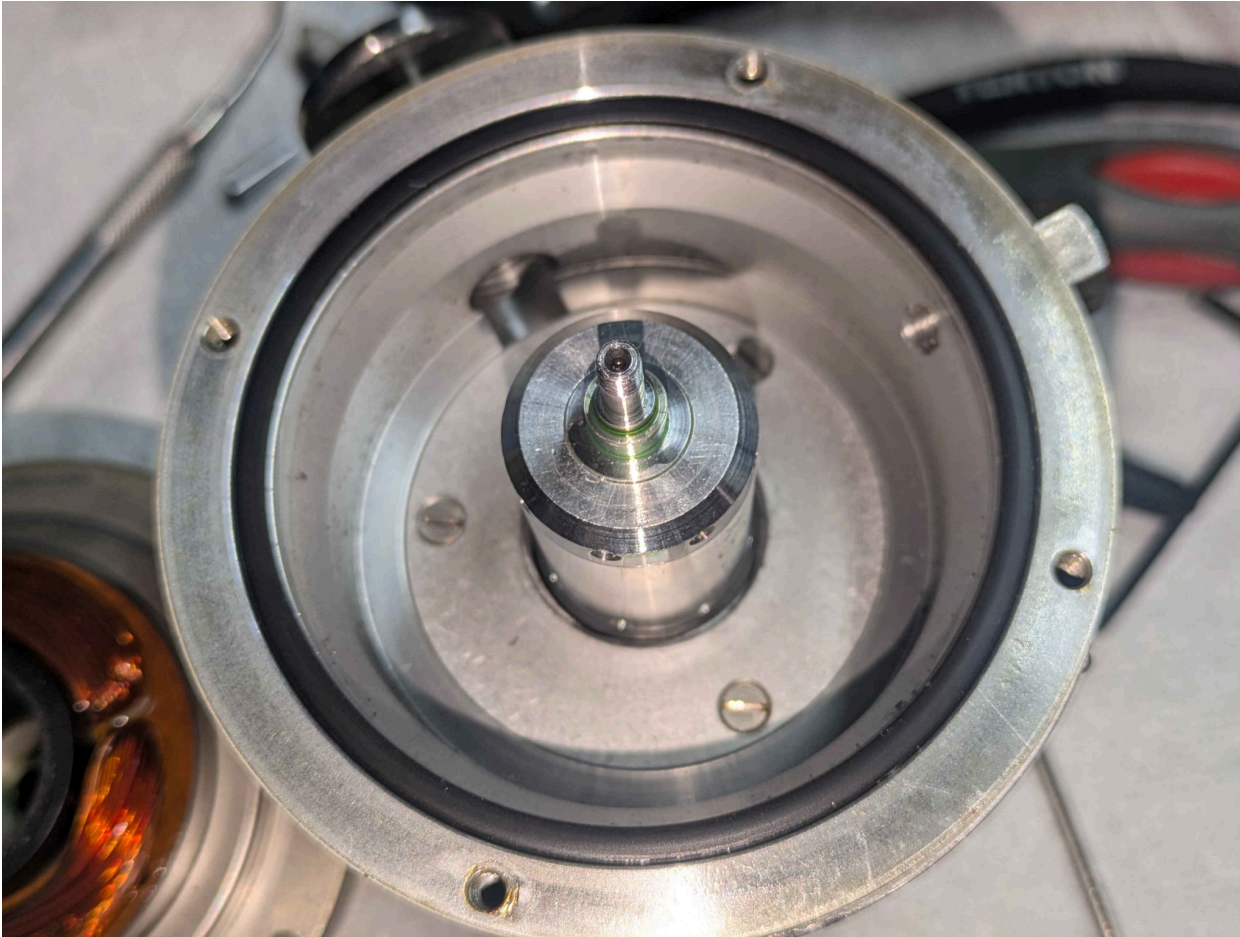












2024-08-21

TPH 060 triage. TLDR:

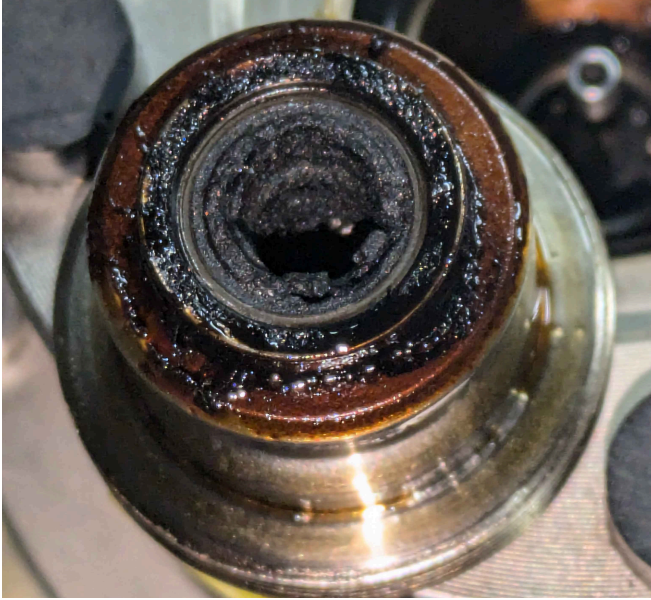
- Bearing complete failure

- Retention ring popped out
- Burned to a crisp
- Dust everywhere and mixed with pump oil
- Chattering on pump case
 - Filled with aluminum / titanium dust

Next steps if want to fix:

- Strip down / clean
- Order new bearing







2024-08-22

TPH 060 bearing

12.96 mm OD

3.9 mm ID

6.0 mm height

Proper bearing from Alpine would be expensive for such an abused pump. Great excuse to try out xz

will@xzballbearing.com

Give Andrey the referral

49

47

44

43

34

35

27- Rubber leg

34- Operating fluid reservoir

35- O-Ring

38- O-Ring

43- Venting screw

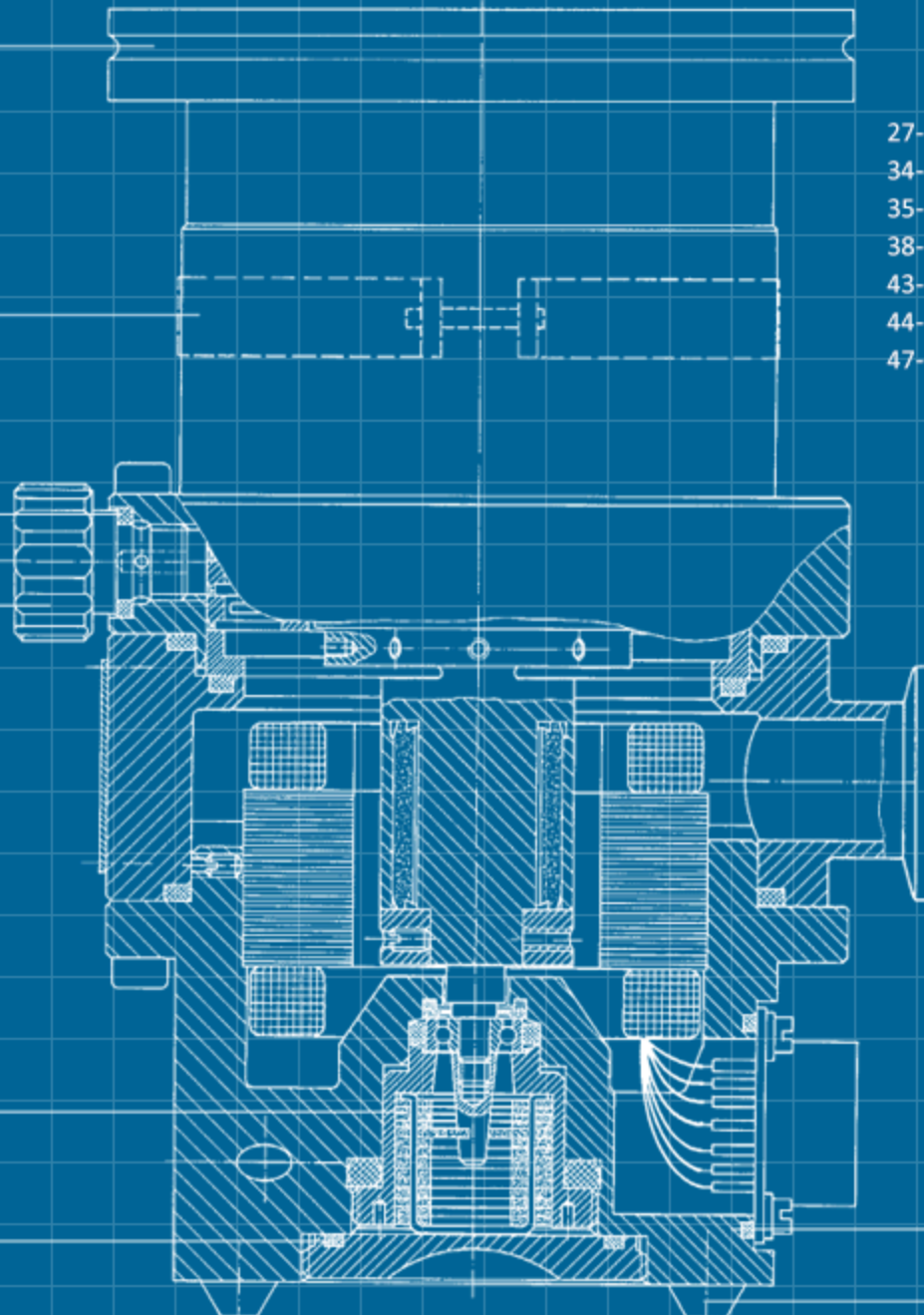
44- Quad-Ring

47- Heating jacket

50

38

27



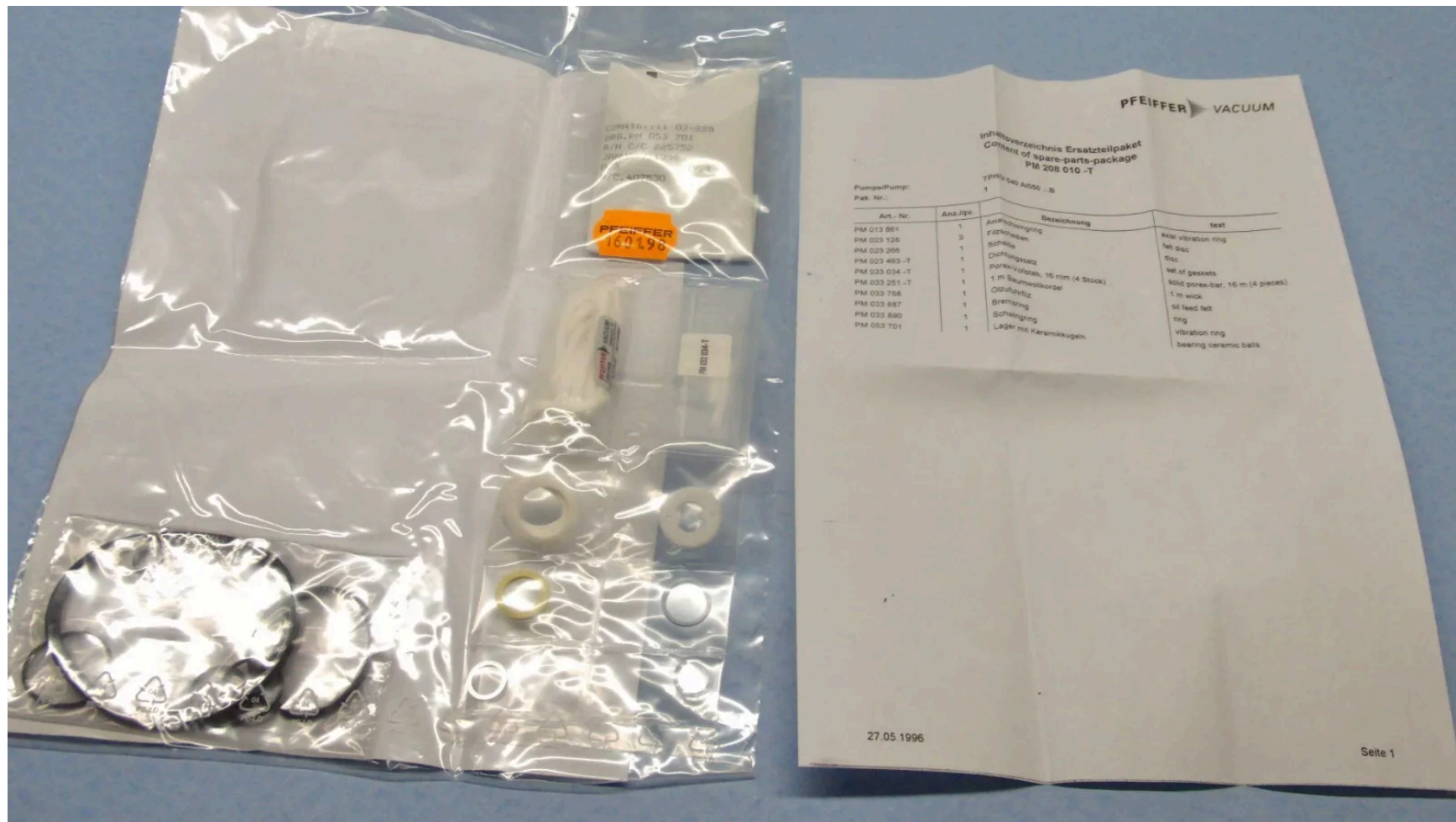
FIXME

transfer over

<https://siliconpr0n.org/wiki/doku.php?id=equipment:vacuum:balzers:turbo>

ebay rebuild kit

Turbo Pump Rebuild Kit Pfeiffer Balzers 040 050 Vacuum PM 208 010-T Ceramic



Telefon (0 64 41) 8 02-0
Telefax (0 64 41) 8 02-2 02

PFEIFFER

VACUUM

ERS. -PAKET 1, TPH/U 040 A/ 050
TURBOPUMP

02.98

PM 208 010 -T

RMNR 730102

Pfeiffer Vacuum GmbH · Emmeliusstrasse 33 · D-35614 Asslar

C2M4TGTY11 0J-228

DRG. PM 053 701

R/N C/C 225752

JANUARY. 1998

P. 3

QTY. 1

R/C. 407530

PFEIFFER
1601.98

Pumpen-
Pak. Nr.:

Art.

- PM 013 B
- PM 023 1
- PM 023 1
- PM 023
- PM 033
- PM 033
- PM 03
- PM 03
- PM 0
- PM 0
- PM 1

PFEIFFER
1601.98

PFEIFFER
VALVUM
Pumpen-
Pak. Nr.:

PM 033 034-T



Inhaltsverzeichnis Ersatzteilkpaket
Content of spare-parts-package
PM 208 010 -T

Pumpe/Pump:
Pak. Nr.:

TPH/U 040 A/050 ...B
1

Art.- Nr.	Anz./qu.	Bezeichnung	text
PM 013 861	1	Axialschwingring	axial vibration ring
PM 023 128	3	Filzscheiben	felt disc
PM 023 266	1	Scheibe	disc
PM 023 463 -T	1	Dichtungssatz	set of gaskets
PM 033 034 -T	1	Porex-Vollstab, 16 mm (4 Stück)	solid porex-bar, 16 m (4 pieces)
PM 033 251 -T	1	1 m Baumwollkorde!	1 m wick
PM 033 758	1	Ölzufuhrfilz	oil feed felt
PM 033 887	1	Bremsring	ring
PM 033 890	1	Schwingring	vibration ring
PM 053 701	1	Lager mit Keramikkugeln	bearing ceramic balls

PM 013 861, axial vibration ring

PM 023 128, felt disc

PM 023 266, disc

PM 023 463-T, set of gaskets

PM 033 034-T, solid porex-bar, 16 m (4 pieces)

PM 033-251-T, 1 m wick

PM 033 758, oil feed felt

PM 033 887, ring

PM 033 890, vibration ring

PM 053 701, bearing ceramic balls



2024-08-23

even after baking o-ring doesn't fit
3 mm diameter
metal lip

- ID: 62.9 mm
- OD: 69.7 mm

old o-ring? 72.5 mm OD? hard to measure

<https://www.globaloring.com/product-category/o-rings-metric-sizes/jis-metric-o-rings/>

<https://www.allorings.com/JIS-O-Ring-Size-Chart>

	3.10	59.40	65.60	G60
	3.10	64.40	70.60	G65
	3.10	69.40	75.60	G70

G65?

Other series not right CS

<https://www.ebay.com/itm/202555215774>

got a G60 as well

2024-09-27

TPD 020

why does this pump have the weird oblong bearing?

do I actually need it? Could I just tighten down more?

precision washers

<https://www.mcmaster.com/90214A154/>
316 Stainless Steel Ring Shim
4 mmd ID
-0.105mm to 0.105mm
8 mm OD

<https://www.mcmaster.com/96945A302/>
4 of these

<https://www.mcmaster.com/96945A303/>
1-2 of these