

Diaphragm accumulators



Installation and repair
instructions

EN: Translation / original language: German

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1. Document information

This document contains important information and instructions on how to repair HYDAC diaphragm accumulators, type SBO...-...A6/... .

The information provided in these instructions refers to the operating conditions, designs and applications described in the documents included with the product. For applications, operating conditions and/or designs not described, please contact the relevant technical department.

Other relevant documents with further safety and product information:

Number	Title
3.000	HYDAC Accumulator Technology
3.100	Diaphragm accumulators
3.100.BA	Operating instructions diaphragm accumulators
3.501	Charging and testing unit
3.501.BA	Operating instructions charging and testing unit
3.551	Safety and shut-off block
3.552	Safety equipment for accumulators

2. Product information

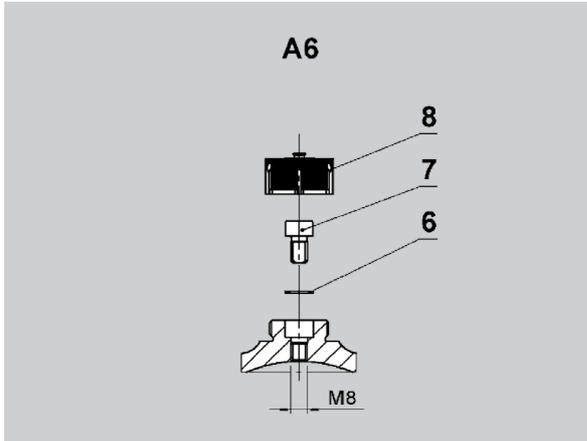
Diaphragm accumulators are pressure vessels (hydraulic accumulators) with a nitrogen filling that is separated from the operating medium by a diaphragm.

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2.1 Drawings

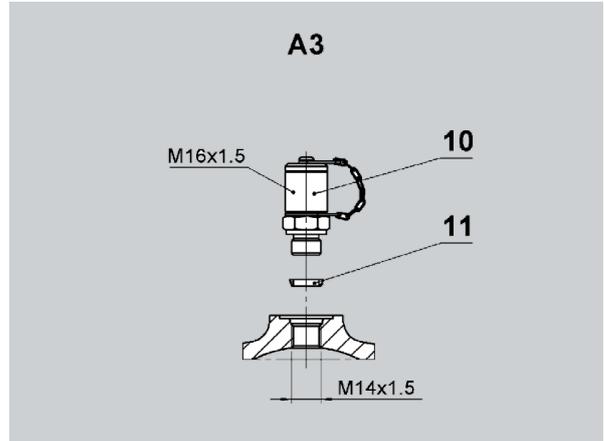
Screw- thread with drain function

Standard gas port



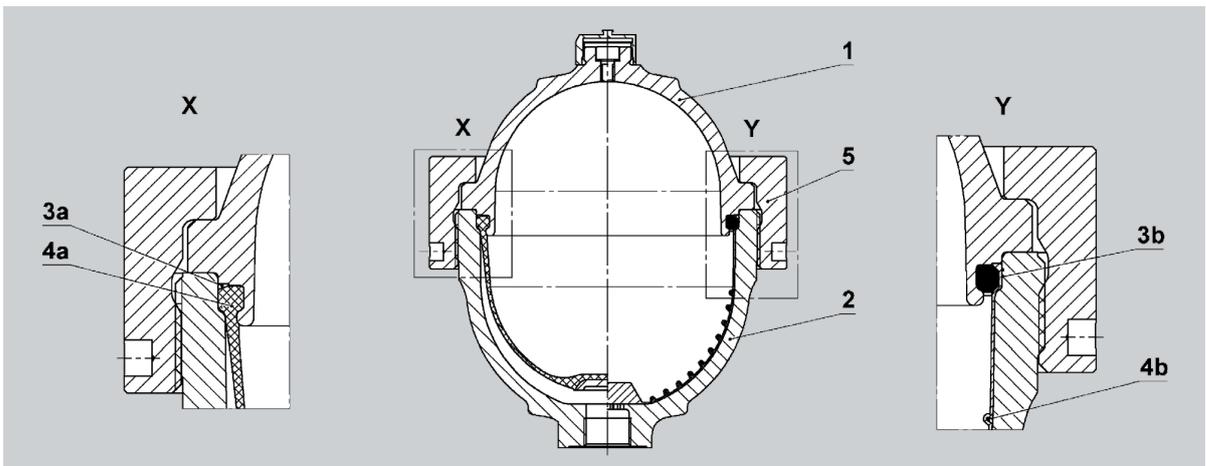
Screw-in thread

Here: Minimes gas charging valve



Other versions possible

Screw-mounted diaphragm accumulator



Designation	Item	Description	Item
Accumulator upper section	1 ¹⁾	Spigot nut	5 ¹⁾
Accumulator lower section	2 ¹⁾	Gasket ring	6
Support ring	3a	Locking screw	7
O-ring	3b	Protective cap	8
Elastomer diaphragm	4a	Minimes gas charging valve	10
100% PTFE diaphragm	4b	O-ring 11x2.4	11

¹⁾ Not available as a spare part

2.2 Torque values

Item	Nominal volume [l]	Series SBO ... (U)	M _A [Nm]	
			Carbon steel	Stainless steel
5	0.1	500	200	–
	0.25	500	280	200
		750	–	300
	0.6	450	400	300
	1.3	400	480	–
	2	250	440	400
	2.8	400	500	–
	4	400	550	–
	10	210	600	–
7	0.1 ... 10	–	20	
10	0.1 ... 10	–	45	

2.3 Spare parts and accessories

Spare parts

Carbon steel, others on request

Nominal volume [l]	Description	Part no.				
		PTFE	NBR	ECO	FKM	IIR
0.1	Spare parts kit	–	3042668	3182526	On request	On request
0.25		3504798	3042709	3042712	3042714	3042713
0.6		3550388	3042710	3042715	3042717	3042716
1.3		3446897	3042681	3042682	3042684	On request
2		3464205	3042711	3042719	3042721	3042720
2.8		–	3042700	3042701	3042704	3042702
4		–	3042705	3042706	3042708	3042707
0.1 – 4	Spare parts set for gas side	–	3262845	–	–	–

Spare parts kit consisting of:	Item	Spare parts set, gas side consisting of:	Qty.	Item
Support ring	3a	Gasket ring	20	6
O-ring	3b	Locking screw	20	7
Elastomer diaphragm	4a	Protective cap	20	8
100% PTFE diaphragm	4b			
Gasket ring	6			
Locking screw	7			

Accessories

Tool	Nominal volume [l]	Part no.
Soft-face mallet, size 60	0.1–4	1007364
Hook wrench Ø 6, size 95–155 mm	0.1	3501316
Hook wrench Ø 8, size 95–155 mm	0.25 – 0.6	3501317
Hook wrench Ø 10, size 200 mm	1.3–2	3501318
Hook wrench Ø 10, size 252 mm	2.8	3501319
Hook wrench Ø 10, size 287 mm	4	3501320
Torque wrench 8–40 Nm	–	1008156
Torque wrench 140–760 Nm	–	1013419
3/8" insert for 6 mm hex screw	–	1008154
Steel hammer	–	1007029
Crane lugs	–	368123
HYDAC charging and testing unit FPU	See other applicable documents: "3,501" [►Sec. 1]	

Seal for pressure testing Material	Nominal volume [l]						
	0.1	0.25	0.6	1.3	2	2.8	4
NBR	2119508	2104064	376829	367059	368307	2104969	2115727

3. Safety

3.1 Basic guidelines

Intended use

- Hydraulic accumulators are intended for use in hydraulic installations and are exclusively designed to store and then discharge pressure fluids.
- Hydraulic accumulators are dimensioned, designed, manufactured and placed on the market on the basis of national and international regulations. The national regulations that apply at the place of installation must be observed for initial start-up and operation.

The owner's obligations

- The owner is responsible for the hydraulic accumulator being used as intended and for these regulations being complied with.
- The documentation supplied with the hydraulic accumulator must be kept in a safe place for the installation inspection and any periodic inspections.

Personnel qualifications

- All work on the hydraulic accumulator must only be carried out by suitably trained staff.
- Incorrect installation or handling can lead to serious accidents. The relevant protective measures must be taken (e.g. for aggressive operating media).

Further legal information

See: www.hydac.com

3.2 Safety hazards

WARNING

Gases under pressure

After discharging and/or completely draining the hydraulic accumulator (e.g. to depressurise the hydraulic system before work is carried out), the accumulator can build up an amount of pressure again if the lines are later shut off on the fluid side.

All the fluid-side lines connected to the hydraulic accumulator must be depressurised and after that the lines must remain open. Only then may the hydraulic accumulator be removed from the hydraulic system.

Before working on the hydraulic accumulator itself, the gas side of the hydraulic accumulator must be depressurized and remain open. Ensure that the gas side is depressurized. Only then may the appropriate work (e.g. disassembly of the hydraulic accumulator) be carried out.

DANGER

Danger of fatal injury

Before carrying out any work on pressurised attachment parts, the relevant safety precautions must be taken.

When pressurised parts are removed, they may be expelled at great speed.

DANGER

Risk of bursting

On no account must any welding, soldering or mechanical work be carried out on the hydraulic accumulator. This kind of unauthorised work will lead to a loss of operating licence.

DANGER

Risk of explosion

Only nitrogen may be used as a charging gas. NO other gases are permitted.

 **DANGER**

Risk of burns

The accumulator shell can become hot.

 **DANGER**

Risk of suffocation

Nitrogen is released into the surrounding area when draining nitrogen from the hydraulic accumulator or when safety devices respond. Large quantities of nitrogen in enclosed areas cause a lack of oxygen: Vent rooms.

 **DANGER**

Danger of chemical burns

In exceptional cases (e.g. previous damage to the separation element in the hydraulic accumulator), a mixture of nitrogen and operating fluid may escape from the gas-side port. Appropriate protective equipment must be installed to prevent personal injury.

3.3 Equipment and safety devices

For further safety information and relevant equipment (accessories), see other relevant documents: "3.000, 3.501, 3.551, 3.552" [►Sec. 1]

4. Dismantling the hydraulic accumulator

You will find the drawings of the named items in the following sections in "drawings" [►Sec. 2.1].

4.1 Removal

DANGER

- ▶ Before carrying out any work on the hydraulic accumulator, the relevant safety precautions must be taken.
- ▶ Risk of suffocation: Ensure adequate ventilation when discharging nitrogen from the hydraulic accumulator in enclosed spaces.
- ▶ Any hydraulic fluid that may leak out must be collected.
- ▶ Wear noise protection, eye protection and hand protection.

1. Carefully clean the area around the gas-side and fluid-side ports.
2. Fully relieve pressure on the fluid side of the hydraulic accumulator.
3. Unscrew the protective cap 8.
4. Loosen locking screw 7 with an allen key (width across flats 6, DIN ISO 2936) by max. 1/2 a turn.
DANGER Never detach connections on the gas side directly under pressure. Risk of injury.
5. Connect charging and testing unit FPU in accordance with the operating instructions and open the release valve to slowly release the pressure. See other applicable documents: "3.501.BA" [►Sec. 1].
6. Remove screw plug 7.
7. Remove all depressurised lines on the gas-side and fluid-side, and then remove the entire hydraulic accumulator from the system.

4.2 Disassembly

NOTICE

- ▶ It must be ensured that the work area is kept clean at all times.
- ▶ When disassembling or reassembling the hydraulic accumulator, ensure that it is adequately secured, preferably at accumulator lower section 2. Damage is to be avoided.
- ▶ Top part of accumulator 1, bottom part of accumulator 2 and lock nut 5 may be labelled with a serial number. Parts with the same serial number must be assembled subsequently.

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<ol style="list-style-type: none"> 1. Loosen the lock nut 5 with the appropriate hook wrench but not fully, so that there are still two to three thread turns – see ▶Sec. 2.3 "Spare parts and accessories ". 	
<ol style="list-style-type: none"> 2. Detach upper accumulator part 1 from lower accumulator part 2, in an upwards direction. 3. Then fully unscrew and remove lock nut 5. 4. Lift off upper accumulator part 1 in an upwards direction. 	
<p>For diaphragm accumulators with elastomer diaphragm:</p> <ol style="list-style-type: none"> 5. Compress elastomer diaphragm 4a in order to separate it from upper accumulator part 1. 6. Remove support ring 3a. 7. Lift off upper accumulator part 1 in an upwards direction. <p>For diaphragm accumulators with 100% PTFE diaphragm:</p> <ol style="list-style-type: none"> 8. Separate the 100% PTFE diaphragm 4b by pulling it out from the top part of the accumulator 1. 9. Remove O-ring 3b. 	

4.3 Checking individual parts



i NOTICE

- ▶ Material compatibility must be taken into account when cleaning: only use fluids that are compatible with the elastomer and container material.
- ▶ Do not use any aggressive or abrasive cleaning agents.
- ▶ The lubricant used must be appropriate for the elastomer and container material and the application, e.g. no grease containing mineral oil is to be used in the food industry.
- ▶ Do not use a paintbrush.

Pressure vessel

1. Top part of accumulator 1, bottom part of accumulator 2 and lock nut 5 from the outside and inside with a cleaning agent and then dry with a lint-free cloth. The interior must be free of foreign bodies and contaminants.
2. Check interior wall, holes and sealing surfaces for damage (e.g. mechanical damage, corrosion).
3. If external or internal damage is found, the accumulator upper part 1 and accumulator lower part 2 must be submitted to the manufacturer and, if necessary, the relevant inspection authority, for appraisal before it is reused.

Diaphragm

1. Clean diaphragm 4a/4b.
2. Check diaphragm 4a/4b for damage and replace if necessary.

NOTICE Re-vulcanisation or refinishing of diaphragms 4a/4b is not permitted.

The remaining parts

1. Clean the remaining parts (in a cleaning tub, for example).
2. Seals must be replaced.

4.4 Preparation for recurring testing

Pressure test

The pressure tests as part of periodic testing must not be performed with the separation element (diaphragm). Corresponding locking parts and a special seal are available from HYDAC – see ▶Sec. 2.3 "Spare parts and accessories ". The media compatibility of the sealing elements used must be checked.

The pressure test must be coordinated with the approval authority.

4.5 Assembly

Lubricant

Lubricant		Shell/diaphragm Material
Thread	Molykote HSC plus	Carbon steel
	OKS NSF 250	Stainless steel
Diaphragm 4a/4b Support ring 3a O-ring 3b Groove	Divinol Lithogrease G 421	NBR, ECO, FPM, PTFE
	Silicone oil	Butyl
	Operating medium	EPR, EPDM, butyl, PTFE

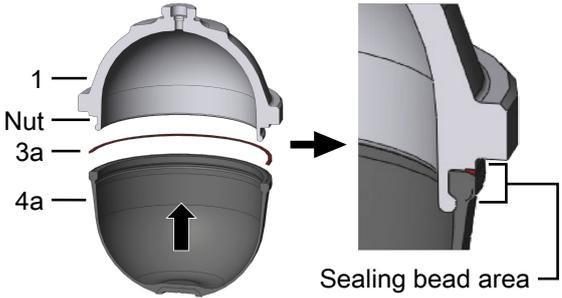
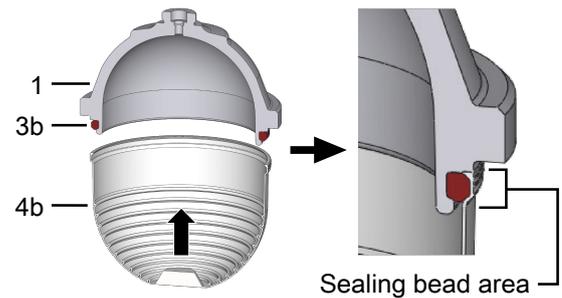
Tab. 1: Lubricant

Warm-up and cool-down times

100% PTFE diaphragm [l]	Heating time [min]	Cooling time [min]
0.25	2	15
0.6	5	30
1.3		
2		

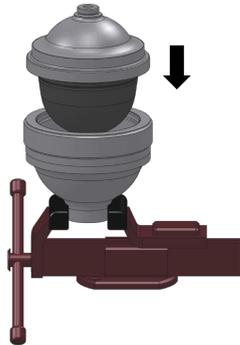
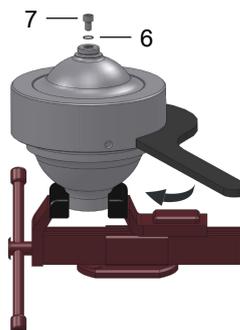
Tab. 2: Warm-up and cool-down times

Assembling the diaphragm on the top of the accumulator

<p>Procedure for elastomer diaphragms:</p> <ol style="list-style-type: none"> 1. Wet support ring 3a and groove on upper accumulator part 1 with lubricant. 2. Insert support ring 3a and elastomer diaphragm 4a into the groove of upper accumulator part 1. 3. Wet diaphragm 4a with lubricant in the sealing bead area. 	
<p>Procedure for 100% PTFE diaphragms:</p> <ol style="list-style-type: none"> 4. Insert O-Ring 3b into the groove of upper accumulator part 1. 5. Heat 100% PTFE diaphragm 4b in an oven at 150 °C – see Warm-up and cool-down times [►Tab. 2, p. 12]. WARNING Risk of burning – hand protection must be worn. 6. Put the heated 100% PTFE diaphragm 4b immediately over the inserted O-ring 3b on the top part of the accumulator 1. 7. To avoid damage to the 100% PTFE diaphragm 4b, the following cool-down times must be observed before further handling – see Warm-up and cool-down times [►Tab. 2, p. 12]. 8. Wet 100% PTFE diaphragm 4b with lubricant in the sealing bead area. 	

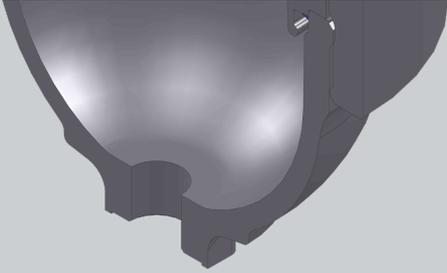
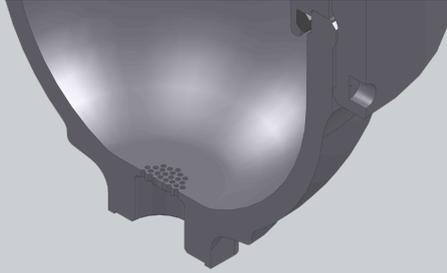
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Completion, independent of the diaphragm material

<ol style="list-style-type: none"> 1. Place the top of the accumulator 1 with diaphragm 4a/4b onto the bottom of the accumulator 2 and press it down using a press (alternatively, tap it using a mallet) until it will go no further – see ►Sec. 2.3 "Spare parts and accessories". 2. Wet the threaded connection of the lock nut 5 and of the bottom of the accumulator 2 with lubricant. 	
<ol style="list-style-type: none"> 3. Tighten lock nut 5 with torque – see ►Sec. 2.2 "Torque values". 4. Wet the seal ring 6 with suitable lubricant and insert. 5. Screw in locking screw 7. 	

Setting the pre-charge pressure

1. Set the required pre-charge pressure by using the charging and testing unit FPU; see other applicable documents: "3.501.BA" [►Sec. 1]
The pre-charge pressure must be configured in accordance with the design of lower accumulator part 2:

Design with one central larger hole	Design with several smaller holes
	
$p_{0, \text{tmax}} \leq 100 \text{ bar}$	$p_{0, \text{tmax}} \leq 200 \text{ bar}$

NOTICE Only charge nitrogen at a moderate speed, as the charging pressure changes with the gas temperature. The pre-charge pressure must be charged at room temperature and checked regularly throughout the charging process.

2. Tighten locking screw 7 after the charging process with a torque – see ►Sec. 2.2 "Torque values".
3. Use leak-detection spray to check lock nut 5 and locking screw 7 for leakage.
4. Close the protective cap 8 tight with your hand only.
5. After the hydraulic line has been connected, it must be completely vented.

5. Disposal

DANGER

- ▶ Before carrying out any work on the hydraulic accumulator, the relevant safety precautions must be taken.
- ▶ Risk of suffocation: Ensure adequate ventilation when discharging nitrogen from the hydraulic accumulator in enclosed spaces.
- ▶ Any hydraulic fluid that may leak out must be collected.
- ▶ Wear noise protection, eye protection and hand protection.

1. Depressurise the fluid side.
2. Release pre-charge pressure.
3. Remove closing elements (e.g. valves/plugs) on the gas side and the fluid side.
4. Disassemble the hydraulic accumulator into its constituent parts and dispose of them according to material type in accordance with national laws and directives.

6. Customer service

Service, repeat testing and repairs can be carried out at the HYDAC head office or at all national and international HYDAC sales and service centres.

Contact at Headquarters

HYDAC Systems & Services GmbH

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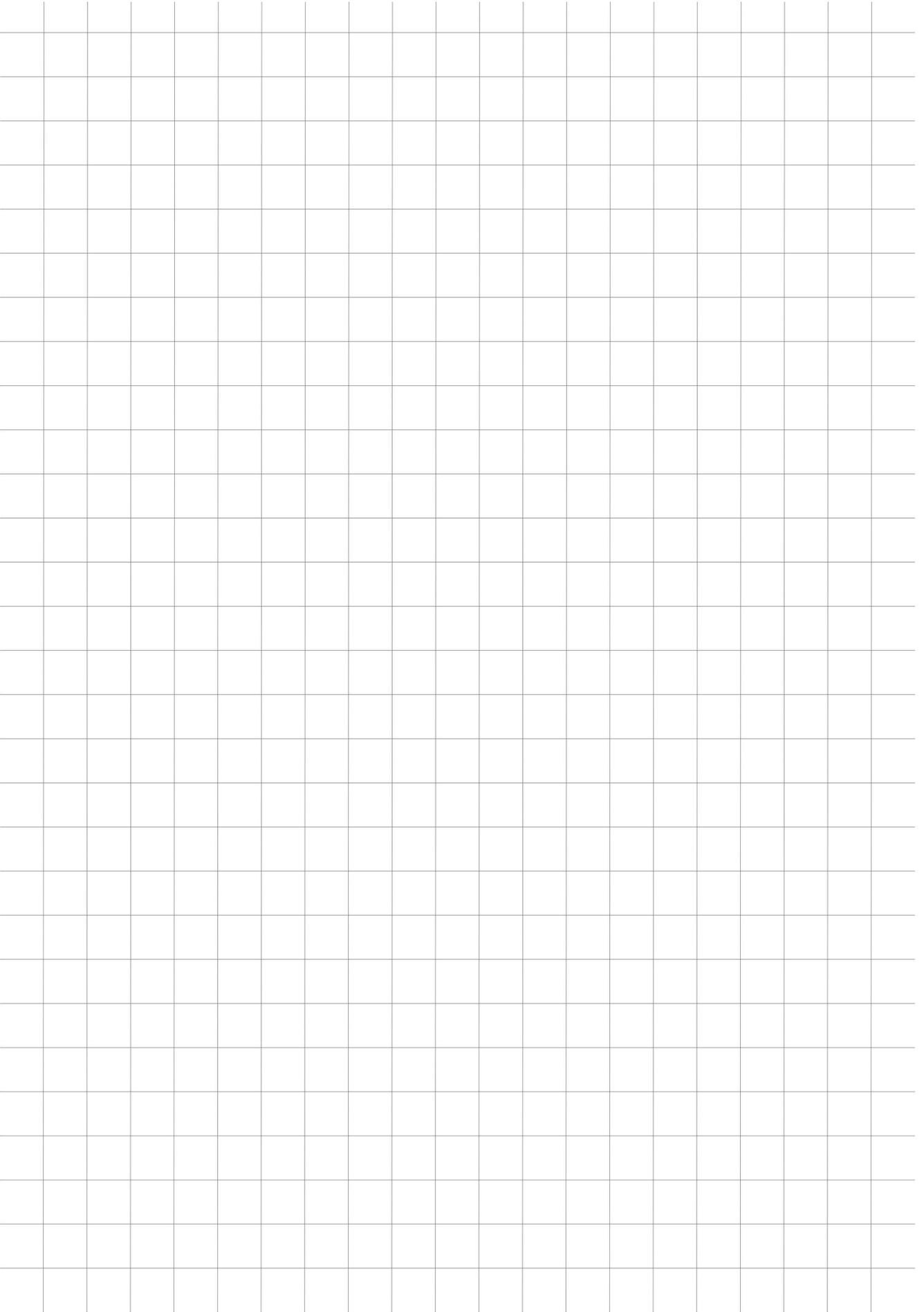
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