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INNOVATIVE PRESSURE COMPETENCE

TECHNOMAT

Water treatment process

- ✓ Softening
- ✓ Desalination
- ✓ Demineralisation
- ✓ Measuring
- ✓ Checking
- ✓ Documenting
- ✓ pH measurement
- ✓ Conductivity measurement
- ✓ Oxygen measurement
- ✓ Temperature measurement
- ✓ Standards/Guideline

Professionally controlling the water quality in hot water heating systems in accordance with EN 12828, VDI guideline 2035, EN 1717 and EN 1988-100

In most cases, untreated/drinking water is inappropriate for refilling your heating system!

Its properties limit the extent to which untreated raw/drinking water can be used to fill/top up your heating system. The quality of the water you use to top up your heating system has a decisive influence on stone formation, calcification and corrosion. Hard and/or corrosive water will shorten the service life of heat generators, heat exchangers and the entire heating system, resulting in heat loss, malfunctions and reduced efficiency.

The substances dissolved in raw/drinking water are divided into cations and anions.

Cations are positively charged ions and are referred to as hardness components or carbonate hardness. Magnesium and calcium cations are mainly responsible for stone formation and calcification.

Anions are negatively charged ions and are known as neutral salts or non-carbonate hardness. Chloride, sulphate and nitrate anions are mainly responsible for corrosion.

Sheet 1 describes the prevention of stone formation and calcification. Sheet 2 describes the prevention of corrosion.

Factors according to VDI Guideline 2035 Sheet 1 and Sheet 2

Factors characterising water for heating systems:

Degree of hardness · pH · conductivity · oxygen content

The degree of hardness is created by the salts dissolved in the raw/drinking water. These are mainly magnesium bicarbonates, calcium bicarbonates and sulphates dissolved from the soil. The more salts are dissolved in the raw/drinking water, the harder/more alkaline the water is.

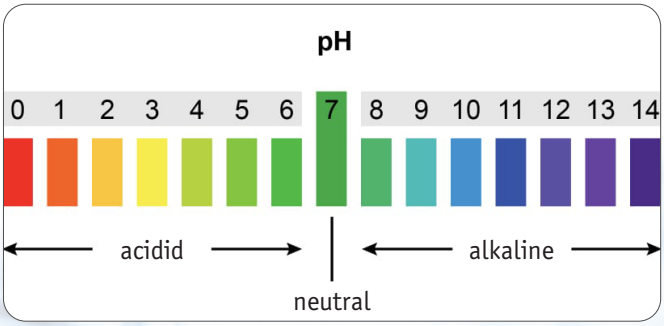
A distinction is made between two types of hardness:
Temporary and permanent hardness, also known as total hardness.

Temporary hardness is determined by the amount of bicarbonates (cations).

Permanent hardness is determined by the amount of chlorides, sulphates, sulphates (anions) and other factors.
Total hardness is designated and measured in degree of German hardness (°dH). A degree of German hardness of 1 (1°dH) equals 7.19 mg/l of magnesium oxide or 10 mg/l of calcium oxide.

A new unit is given in alkaline earth ions, in mmol/l (millimoles per litre). 1 °dH equals 0.179 mmol/litre.

To avoid topping up your heating system with water that is too hard/alkaline, try to respect the guide values of VDI 2035 and to take account of the total heating capacity (kW), the system volume (Va) and the manufacturer's specifications.



Requirements and solutions in accordance with VDI Guideline 2035 Sheet 1 and Sheet 2

Due to its hardness-forming properties, **the pH value** should be kept within the range of the guide values specified for the various materials.
It is used to determine the soft/acidic or hard/alkaline properties of the water. The pH of water for heating systems should range between >8.2 and approx. 10.0 in the neutral or slightly alkaline range.
The manufacturer's specifications must be observed. Each material has its own corrosion characteristics and therefore also its own pH limits.
Water that is too hard/alkaline promotes stone formation and calcification. Water that is too soft/acidic attacks the surface layers the materials of use develop as a natural means of corrosion protection. In this respect, the guideline values of VDI 2035 should be observed.

Browse the products of our **TECHNOMAT WAB water treatment and NOVA / DUO NOVA pressuriser stations** to discover our **solutions**.

Electrical conductivity should be kept as low as possible because it accelerates corrosion.
It is the total salt content of the water and is designated and measured in µS/cm (microsiemens). Conductivity is based on cations and anions. Go by the following rule of thumb but remember to verify its practicality.

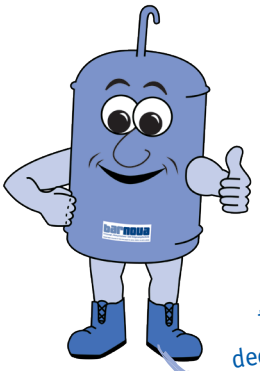
Multiply 1°dH by 30 to obtain the conductivity in µS/cm.

Since the conductivity of the water for heating systems leads to corrosion, it should be as low as possible. From a content of approx. 100 µS/cm or higher, aim for a low oxygen concentration of >0.02 mg/l. An oxygen content of 0.1 mg/l in the heating water is generally recommended. If the conductivity of the water is lower, a higher oxygen content can also be tolerated. In this respect, the guideline values of VDI 2035 should be observed.

Browse the products of our **TECHNOMAT WAB water treatment and NOVA / DUO NOVA pressuriser stations** to discover our **solutions**.

The oxygen content should be kept as low as possible because it accelerates corrosion.
On the one hand, a high oxygen content in the heating system produces brown sludge, which is known as haematite. On the other hand, a low oxygen content produces magnetite, a black, magnetic sludge.
Both lead to deposits in all areas of the heating system, resulting in malfunctions and damage. In this respect, the guideline values of VDI 2035 should be observed.

Browse the products of our **TECHNOMAT NOVA and DUO NOVA pressuriser stations, our TECHNOCAT vacuum degassing**, and **TOPCAT PLUS sludge and air separator** to discover our **solutions**.



Tip:
Use our water treatmentsystems together with our pressuriser and degassing stations to obtain a powerful integrated solution!

Water treatment process

IMPORTANT:

Electrical conductivity is made up of cations and anions. Liquids containing ions can conduct electricity and are therefore electrolytes.

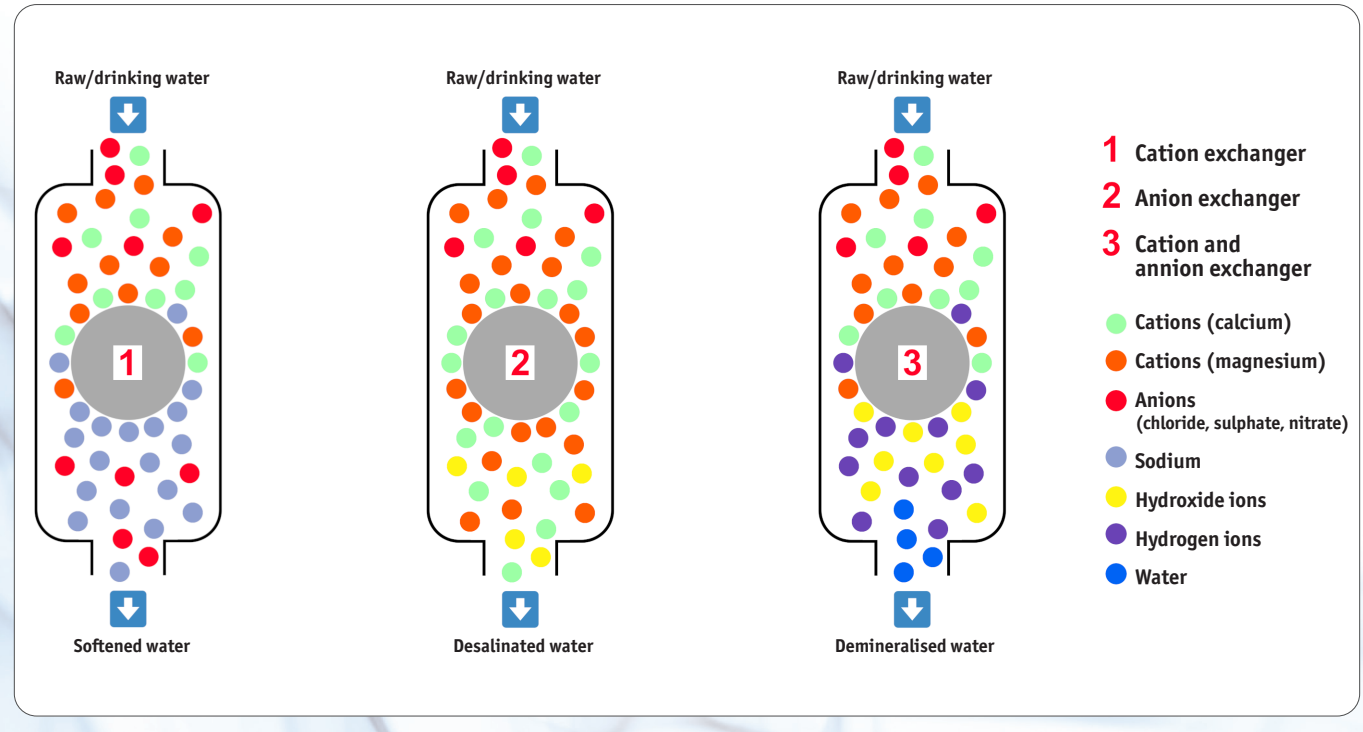
Softening is an ion exchange process in which the **cations**, magnesium and calcium are removed from the water and replaced with sodium. The water runs through a cartridge/tank filled with a cation exchange resin. This resin needs to be renewed or regenerated when it is exhausted.
As the anions are not removed in this process and the conductivity remains virtually unchanged, the result is referred to as **saline water**.
A high conductivity also means a high corrosion potential.

Desalination is an ion exchange process in which the **anions**, chloride, sulphate and nitrate are removed from the water and exchanged with hydroxide ions.
In this process, the cations are not removed and the pH value remains virtually unchanged, so that the result is referred to as **low-salt water**.
A high pH also means a high potential for stone formation and calcification.

Demineralisation is an ion exchange process in which the **cations and anions**, magnesium, calcium, chloride, sulphate and nitrate are removed from the water.
The cations are exchanged with hydrogen ions (H+) and the anions for hydroxide ions (OH-). The two react to form water (H_2O).
This is referred to as **demineralised water**.

IMPORTANT:

Periodically check and document the processes, data and values in accordance with VDI regulations. Decide on the correct method on a case-by-case basis taking actual circumstances into account.



DIN EN 1717 and DIN 1988-100 Drinking water standard

DIN EN 1717 describes the protection of drinking water against contamination by backflow and (with reference to DIN 1988) how to ensure the quality of drinking water. It sets limit values for the substances in the water. If the limit values are exceeded, they must be assigned to the respective liquid categories and appropriate safety devices must be installed. The standard distinguishes 5 categories, whereby the higher the category, the more dangerous the medium is for humans.

Categories and required safety equipment:

Category 1 is harmless to humans and therefore **no safety device** is required.

Category 2 is of limited suitability for humans because of its taste, smell, colour or temperature. Therefore, at least one **EA-type system separator** must be installed.

Category 3 is hazardous to humans because it contains one or more substances of lesser toxicity. A **CA-type system separator** must therefore be installed.

Category 4 is hazardous to humans because it contains one or more toxic or very toxic substances or one or more radioactive, mutagenic or carcinogenic substances. A **BA-type system separator** must therefore be installed.

Category 5 is hazardous to humans because it contains microbial or viral pathogens of communicable diseases. An **unrestricted outlet of type AA or type AB** must therefore be installed.

DIN 1988-100 describes the technical rules for drinking water installations and serves as a national supplement to DIN EN 806, as experts believe that it does not have sufficient standardisation depth to ensure the national level of protection and quality in Germany.

To protect the drinking water, observe DVGW worksheets W 550, 551 and W 557 and/or VDI/DVGW guideline 6023.

Installing a system separator in accordance to DIN EN 1717 is mandatory. Your choice of suitable fittings includes system separators BA, FÜLL KOMPAKT or FÜLL COMPLETE. They install in forward direction upstream of the WAB BASIS or WAB BASIS PLUS.

Standard-compliant steps – from planning through to malfunctions

Planning of hot water heating systems in accordance with DIN EN 12828.

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Protecting of drinking water against contamination due to backflow in accordance with DIN EN 1717 and DIN 1988-100.

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Drinking water quality details obtained from water utility and/or water analyses.

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Selecting filling and make-up water quality with reference to VDI 2035.

↓

Selecting the appropriate Barnova GmbH components based on technical competence.

↓

Ensuring professional installation, commissioning and handover by a specialised company.

↓

Maintaining a high level of heating water quality and operational safety by regular inspection/servicing and documentation in the system logbook in accordance with VDI 2035 Sheet 2 of the heating system/heating water and as specified in the applicable standards and regulations.

Overview of guide values

The codes of practice define limit values for hardness, pH, conductivity and oxygen content.

Water for heating systems in accordance with DIN 12828 (depending on thermal output)			
Total output in kW	**Total alkaline earth content** in mmol/l (total hardness in °dH)[1]		
	Specific system volume in litres per kW of heating output		
	≤ 20	**> 20 bis ≥ 40**	**> 40**
Specific water content **≤ 50 kW** Heat generators ≥ 0,3 l litres per kW	none	≤ 3.0 (16.8)	< 0.05 (0.3)
Specific water content **≤ 50 kW** Heat generators ≥ 0.3 l per kW[2] (e.g. circulating water heaters) and systems with electric heating elements	≤ 3.0 (16.8)	≤ 1.5 (8.4)	
> 50 kW to ≥ 200 kW	≤ 2.0 (11.2)	≤ 1.0 (5.6)	
> 200 kW to ≥ 600 kW	≤ 1.5 (8.4)	< 0.05 (0.3)	
> 600 kW	< 0.05 (0.3)		

Water for heating systems (independent of heat output)		
Operation at 25 °C	**Electrical conductivity** in µS/cm	**Oxygen content** in mg/l
Low-salt[3]	> 10 to ≤ 100	0.01 - 0.1
Saline	> 100 to ≤ 1500	< 0.02

Appearance
clear, free from depositing substances

System materials	**pH value**
not containing aluminium alloys (steel, Cu)	8.2 bis 10.0
containing aluminium alloys	8.2 bis 9.0

[1] To calculate the specific system volume, use the smallest individual heating output for systems with several heat generators.
[2] For systems with several heat generators with different specific water content, use the smallest specific water content.
[3] Full softening is not recommended for systems containing aluminium alloys, see section 6.4.4 of VDI 2035.

Cartridges and resin cartridges for softening, desalination and demineralisation

Barnova TECHNOMAT WAB BASIS

✓ Basic fitting with one, two or three filter housings for make-up water in accordance with VDI 2035. For softening, desalination and mixed bed resin cartridges for demineralisation

✓ Max. operating pressure: 8.0 bar

✓ Min./max. operating temperature: 0°C/40°C

Designation	Size	Order no.
Barnova TECHNOMAT WAB BASIS I	20"	509061
Barnova TECHNOMAT WAB BASIS II	20"	509062
Barnova TECHNOMAT WAB BASIS III	20"	509063

Barnova resin cartridges

✓ Softening, desalination and mixed bed resin cartridge (demineralisation) for the aforementioned basic fittings

Designation	Flow rate	Order no.
Barnova TECHNOMAT WAB EH	8.000 lx°dH	509064
Barnova TECHNOMAT WAB ES	4.000 lx°dH	509065
Barnova TECHNOMAT WAB MB	6.000 lx°dH	509066

Cartridges

Softening

Cartridges (filled)	Quantity	Order no.
4 litres	14.560 l/°dH	509052
7 litres	25.480 l/°dH	509053
14 litres with pedestal	50.960 l/°dH	509054
30 litres with pedestal	109.200 l/°dH	509070

Desalination

Cartridges (filled)	Quantity	Order no.
4 litres	5.000 l/°dH	509071
7 litres	8.750 l/°dH	509072
14 litres with pedestal	17.500 l/°dH	509073
30 litres with pedestal	37.500 l/°dH	509074

Demineralisation

Cartridges (filled)	Quantity	Order no.
4 litres	3.500 l/°dH	509075
7 litres	6.500 l/°dH	509076
14 litres with pedestal	13.000 l/°dH	509077
30 litres with pedestal	27.850 l/°dH	509078

Replacement resins

Softening

Replacement resins	Quantity	Order no.
4 litres	14.560 l/°dH	509055
7 litres	25.480 l/°dH	509056
14 litres	50.960 l/°dH	509057
30 litres	109.200 l/°dH	509079

Desalination

Replacement resins	Quantity	Order no.
4 litres	5.000 l/°dH	599100
7 litres	8.750 l/°dH	599101
14 litres	17.500 l/°dH	599102
30 litres	37.500 l/°dH	599103

Demineralisation

Replacement resins	Quantity	Order no.
4 litres	3.500 l/°dH	599104
7 litres	6.500 l/°dH	599105
14 litres	13.000 l/°dH	599106
30 litres	27.850 l/°dH	599107

Fittings, devices, sensors and PLCs for softening, desalination and demineralisation analysis

Barnova TECHNOMAT WAB BASIS PLUS

The WAB BASIS PLUS basic water treatment fitting with pH stabilisation is used for digital capacity control of the exchange resin for 4, 7, 14 and 30 litre cartridges for softening, desalination and demineralisation. Used for treating the water for heating systems in accordance with VDI 2035 and DIN EN 1717.

Features digital capacity control, blending device, conductivity control, 2 shut-offs and wall bracket.

Barnova TECHNOMAT WAB BASIS PLUS

Barnova FÜLL KOMPAKT

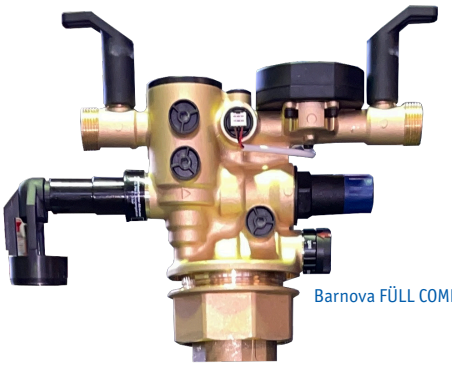
Automatic and compact filler fitting FÜLL in accordance with DIN EN 1717, BA-type system separator, shut-off valve, dirt trap, pressure reducer and measuring nozzle for checking the system separator.

Barnova FÜLL KOMPAKT

Barnova FÜLL COMPLETE

Barnova FÜLL COMPLETE provides all functions of Barnova WAB BASIS PLUS and Barnova FÜLL KOMPAKT in a single fitting.

Installing a system separator in accordance with DIN EN 1717 (see p. 5) is mandatory. Your choice of suitable fittings includes system separators BA, FÜLL KOMPAKT or FÜLL COMPLETE. They install in forward direction upstream of the WAB BASIS or WAB BASIS PLUS.



Barnova FÜLL COMPLETE

Product group 90

Type	Connection	Length	Weight	Order no.
Barnova TECHNOMAT WAB BASIS PLUS	G $^3/_4$"	241	4.4	509051
Barnova FÜLL KOMPAKT	G $^3/_4$"	250	3.5	509013
Barnova FÜLL KOMPAKT PLUS W with water meter	G $^3/_4$"	309	4.0	509018
Barnova FÜLL KOMPAKT PLUS K with contact water meter	G $^3/_4$"	309	4.0	509019
Barnova FÜLL COMPLETE	G $^3/_4$"	320	5.0	509020

Devices and sensors for softening, desalination and demineralisation analysis

Digital multifunctional pH, temperature, salt content, TDS and EC value measuring device	599108

Barnova Sensor

✓ Level sensor for conductivity measurement

Designation	Switching points	Order no.
Barnova TECHNOMAT WAB TDS Mini	10/20 (20/50,80/100) µS/cm	509067
Barnova TECHNOMAT WAB TDS Plus 4-20 mA signal output, compatible with **Barnova WAB II SPS**	10/20 (20/50,80/100) µS/cm	599113

Barnova pH measurement sensor 4-20 mA for continuous pH monitoring. Compatible with pressuriser stations NOVA/DUO NOVA.	509058

Barnova conductivity measurement sensor 4-20 mA for continuous conductivity monitoring. Compatible with pressuriser stations NOVA/DUO NOVA.	509059

PLCs for softening, desalination and demineralisation analysis

Barnova WAB I PLC with on-board conductivity measurement.	599109
Barnova WAB II PLC for one sensor 4-20 mA, pH and conductivity measurement. Compatible with **WAB TDS Plus.**	599110
Barnova WAB III PLC for two 4-20 mA sensors, pH and conductivity measurement. Compatible with **Barnova pH measurement sensor 4-20 mA** and **Barnova conductivity measurement sensor 4-20 mA.**	599111

WAB I SPS

WAB II SPS

WAB III SPS

Mobile water softeners on request.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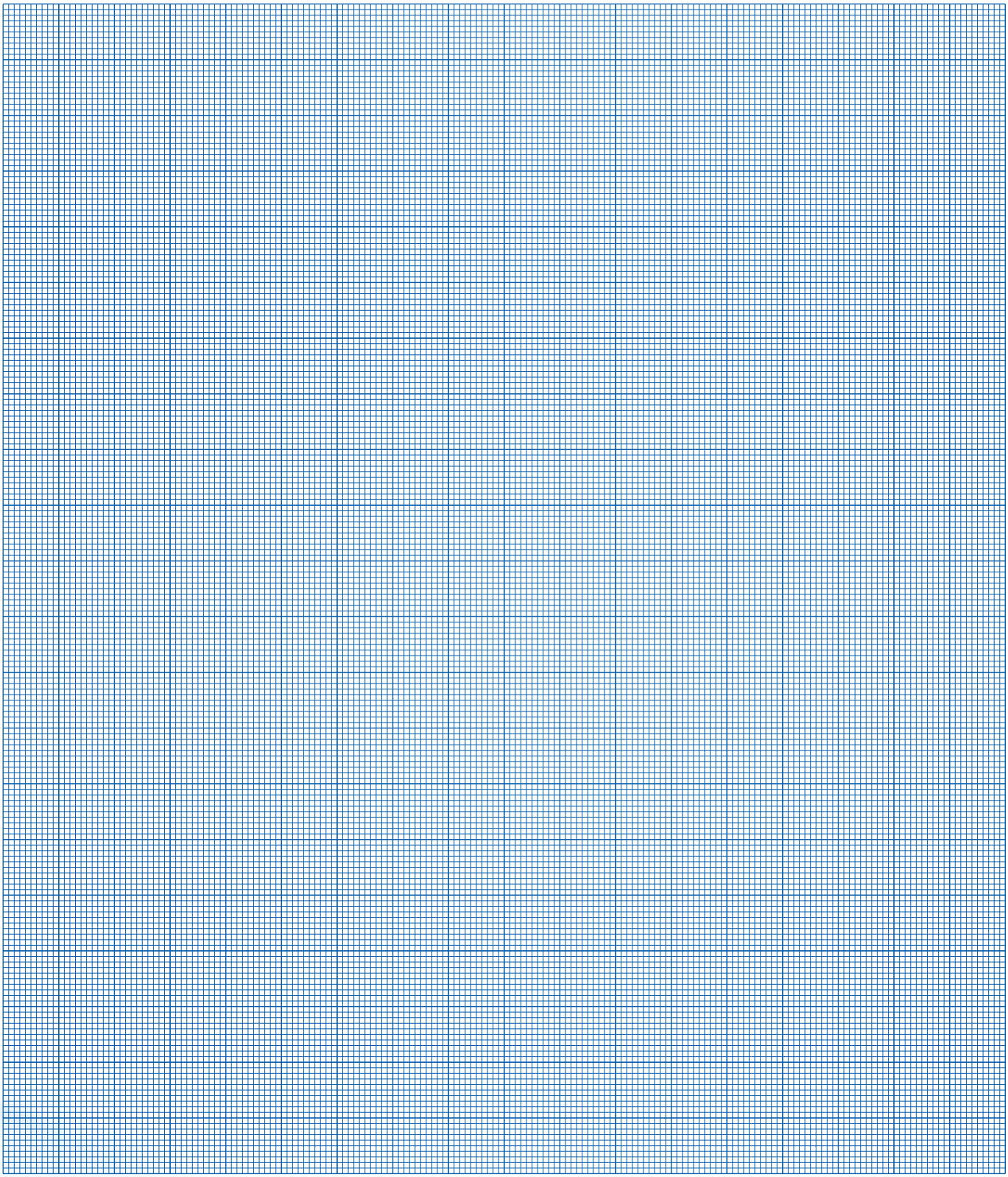
Notes

Notes



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