Rainwater Harvesting System

Hya-Rain/Hya-Rain N

Type Series Booklet

KSB

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Type Series Booklet Hya-Rain/Hya-Rain N

Contents

Building Services: Water Supply

Rainwater Harvesting System

Hya-Rain / Hya-Rain N

Main applications

- Rainwater harvesting
- Service water supply systems
- General irrigation systems
- Spray irrigation systems

Fluids handled

- Service water
- Rainwater (not containing abrasive substances)

Operating data

Table 1: Operating properties

Characteristic		Value
Flow rate	Q [m³/h]	≤ 4
	Q [l/s]	≤ 1,1
Head	H [m]	≤ 43
Fluid temperature	T [°C]	≥ 0
		≤ +35
Operating pressure	p_d [bar]	≤ 6
Start-up pressure of the pump	p [bar]	≤ 2,5
Suction lift	H_s [m]	≤ 7
Inlet pressure of the pump	p_{inl} [bar]	≤ 1
Inlet pressure of mains water back-up system	p [bar]	≤ 4
Max. mains water back-up flow rate at 4 bar	[l/s]	~ 1

Design details

Design

- Angled tank designed for wall mounting
- Mains water storage tank to EN 1717, storage volume approx. 13 l
- Float valve for mains water supply (approx. 2.7 m³/h)
- System enclosure
  - IP54 enclosure (control unit)
  - IP44 enclosure (pump)

Pump set

- 230 V ± 10 %
- DOL starting
- Thermal class F
- Thermal motor protection with automatic reset and start-up

Bearings:

- Grease-packed deep groove ball bearings sealed for life

Electrical connection

- 230 V, 50 Hz, 800 W
- Power input in stand-by mode: 2.5 - 3 Watt
- 1.5 m power cable with shockproof plug

Designation

Example: Hya-Rain N

Table 2: Designation key

Code	Description	
Hya-Rain	Type series	
	Hya-Rain	With float switch
	Hya-Rain N	With fill level display and sensor

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Configuration and function

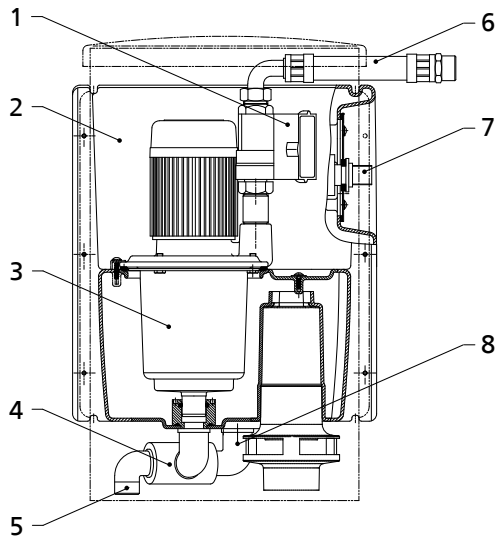

Fig. 1: Sectional drawing

1	Pump control unit	5	Suction nozzle, rainwater storage tank
2	Angled tank	6	Discharge outlet
3	High-pressure pump	7	Mains water supply
4	Three-way valve	8	Suction nozzle, mains water storage tank

Design

A multi-stage self-priming high-pressure pump (3) is installed in an angled tank (2) designed for wall mounting. Via a three-way valve (4) the high-pressure pump is connected to a suction nozzle (5) leading out of the system for connection to a rainwater storage tank.

Function

The high-pressure pump (3) withdraws fluid handled from the rainwater storage tank via the suction nozzle (5). A second suction nozzle (8) leads to an integrated mains water storage tank, which contains approximately 13 l of water. The water in the mains water storage tank is automatically replenished with drinking water and/or service water via a float valve. If the sensor fitted in the rainwater storage tank indicates that the tank is empty, the rainwater harvesting system will automatically switch to the mains water storage tank via a three-way valve (4). It will withdraw water from the mains water storage tank until the rainwater storage tank contains a sufficient amount of water again. Once the rainwater storage tank contains enough water again, this condition is signalled to the rainwater harvesting system, which will then automatically switch back to withdrawing water from the rainwater storage tank. The pump set is started and stopped when a consumer installation is opened and closed.

Monitoring equipment

For monitoring purposes and for protecting the pump set against dry running, the system is equipped with a pump control unit in the discharge line. When the pressure falls below approx. 2.5 bar (factory setting) the pump control unit starts up the pump set. When a consumer installation is closed, the pump control unit will stop the pump set after an after-run time of 10 seconds. A lift check valve prevents the fluid handled from flowing back. The pressure is indicated by a fitted pressure gauge.

Materials

Table 3: Overview of available materials (pump set)

Part No.	Description	Material
101	Pump casing	Stainless steel
160	Discharge cover	Grey cast iron with anti-corrosive coating
230	Stage casing	Noryl
230	Impeller	Noryl
171	Diffuser	Polypropylene
210	Shaft	Stainless steel
801	Motor housing	Aluminium
433	Shaft seal / mechanical seal	Carbon/ceramics
719	Expansion joints	PN 10[1)]

Table 4: Overview of available materials (mains water storage tank)

Part No.	Description	Material
1591	Mains water storage tank	PE-LLD
1741	Valve with electric actuator	Brass
1710	Piping	Plastic / brass[2)]
1741	Float valve	Plastic / stainless steel[2)]

1 DVGW-approved / TÜV-approved and 10-year warranty
2 KTW-approved for contact with drinking water

Product benefits

- Very low noise operation (≤ 50 dB)
- Integrated dry running protection
- Automatic switching to mains water if the rainwater storage tank is empty
- User-friendly indication of operating pressure
- Terminals for connecting a booster pump
- Programmable mains water replacement function / functional check run (Hya-Rain N only)
- Ready-to-connect, easy installation and commissioning
- Float switch for rainwater storage tank
- Space-saving compact design
- Comprehensive range of accessories for connection to the mains water supply as well as to the consumer line

Product information

Product information as per Regulation No. 1907/2006 (REACH)

For information as per chemicals Regulation (EC) No. 1907/2006 (REACH), see https://www.ksb.com/ksb-en/About-KSB/Corporate-responsibility/reach/ .

Certifications

Table 5: Overview

Label	Effective in:	Comment
DVGW CERT Anschlusssicher W 546	Germany	AS-0605AS2173 Mains water protected against any pollution from backflow in accordance with EN 1717 (air gap)

Selection information

Checking the priming ability

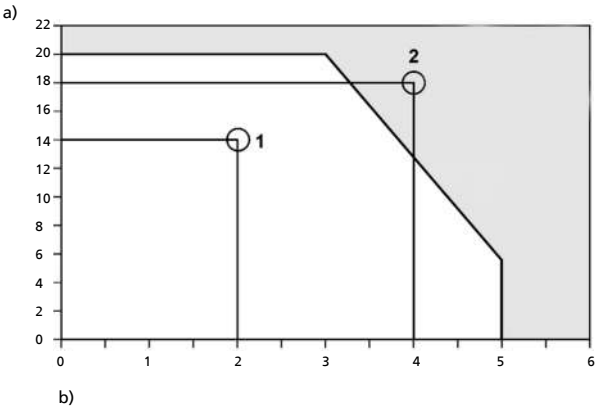

Fig. 2: Diagram for checking the priming ability

a)	Suction line length [m]
b)	Level difference (H_{geo}) [m]

Example 1:

Suction line length 14 m, level difference (H_{geo}) = 2 m

The rainwater harvesting system can overcome the suction line losses.

Example 2:

Suction line length = 18 m

Level difference (H_{geo}) = 4 m

The rainwater harvesting system cannot overcome the suction line losses. A booster pump has to be used.

Lightning protection

- Electrical installations must be protected against overvoltage (compulsory since 14 December 2018) (see DIN VDE 0100-443 (IEC60364-4-44:2007/A1:2015, modified) and DIN VDE 0100-534 (IEC 60364-5-53:2001/A2:2015, modified). Whenever modifications are made to existing installations, retrofitting a surge protective device (SPD) in accordance with VDE is mandatory.
- A maximum cable length of 10 metres should not be exceeded between the surge protective device (usually type 1, internal lightning protection) installed at the service entrance and the equipment to be protected. For longer cables, additional surge protective devices (type 2) must be provided in the sub-distribution board upstream of the equipment to be protected or directly in the equipment itself.
- The associated lightning protection concept must be provided by the operator or by a suitable provider commissioned by the operator. Surge protective devices can be offered for the control units on request.

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Technical data

Table 6: Selection table

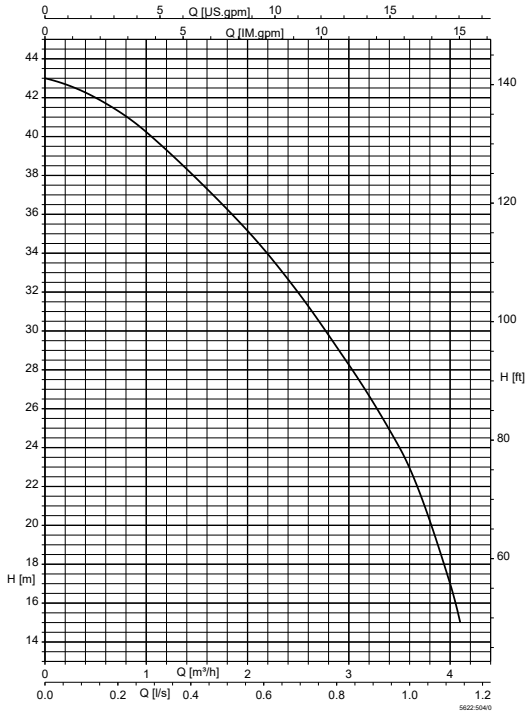
Type series	2800 rpm, 1~ 230 V		Mains water storage tank	Suction lift Suction losses	Dimensions of electric cable with plug		Float switch with 20-metre cable	Water level indication with sensors	Booster pump connection options	Mat. No.	[kg]
	P_1	I_N									
	[W]	[A]	[l]	[m]	[m]	[mm²]					
Hya-Rain	800	3,7	13	7	1,5	3 × 1,0	✘	-	✘	29130437	26,5
Hya-Rain N	800	3,7	13	7	1,5	3 × 1,0	-	✘	✘	29130438	25,5

Mains water back-up flow rate: The mains water back-up flow rate depends on the mains pressure and the cross-section of the mains water supply pipe.

Noise level: Depending on the operating data of the system, the noise level will be approx. 48 - 50 dB(A).

Characteristic curves

Hya-Rain, n = 2800 rpm



Dimensions and connections

Hya-Rain / Hya-Rain N

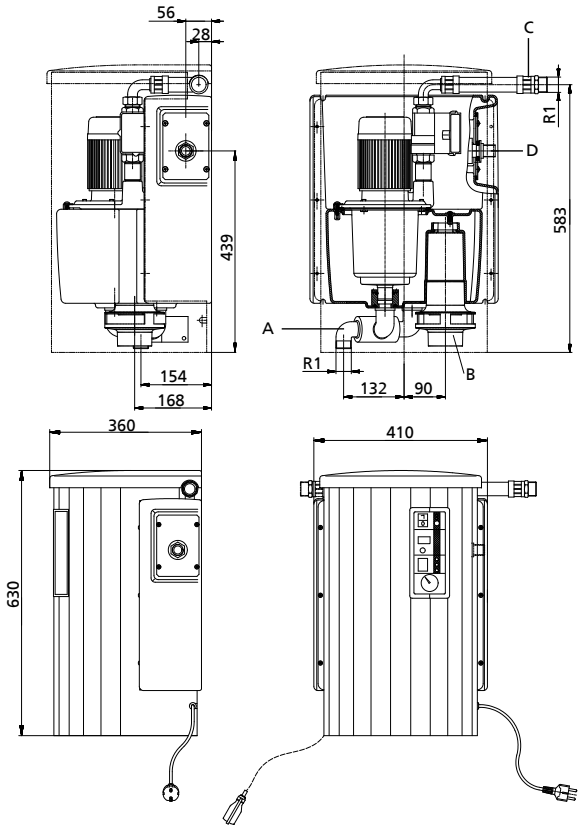


Fig. 3: Dimensions [mm]

A	Suction side	C	Discharge side
B	Overflow, drain line DN 70	D	Mains water connection

Connections

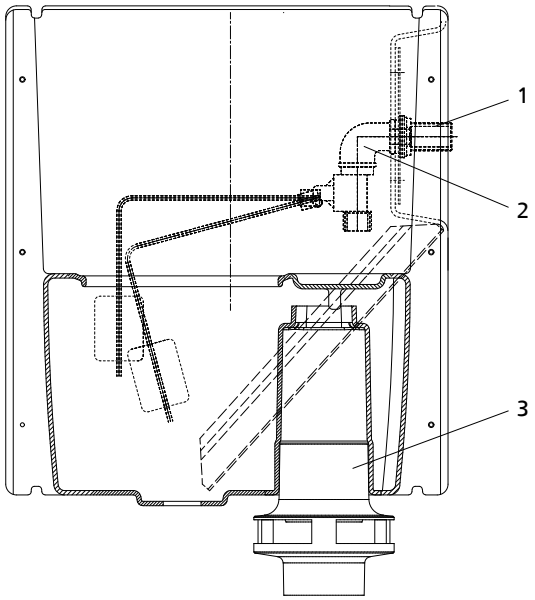


Fig. 4: Connections

1	Mains water connection, with air gap inside the tank
2	Mechanical float valve
3	Overflow[3)] for direct connection of DN 70 drain lines to EN 12056

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3 The overflow must be connected via an air gap to EN 1717, otherwise the DVGW-approval is void.

Installation information

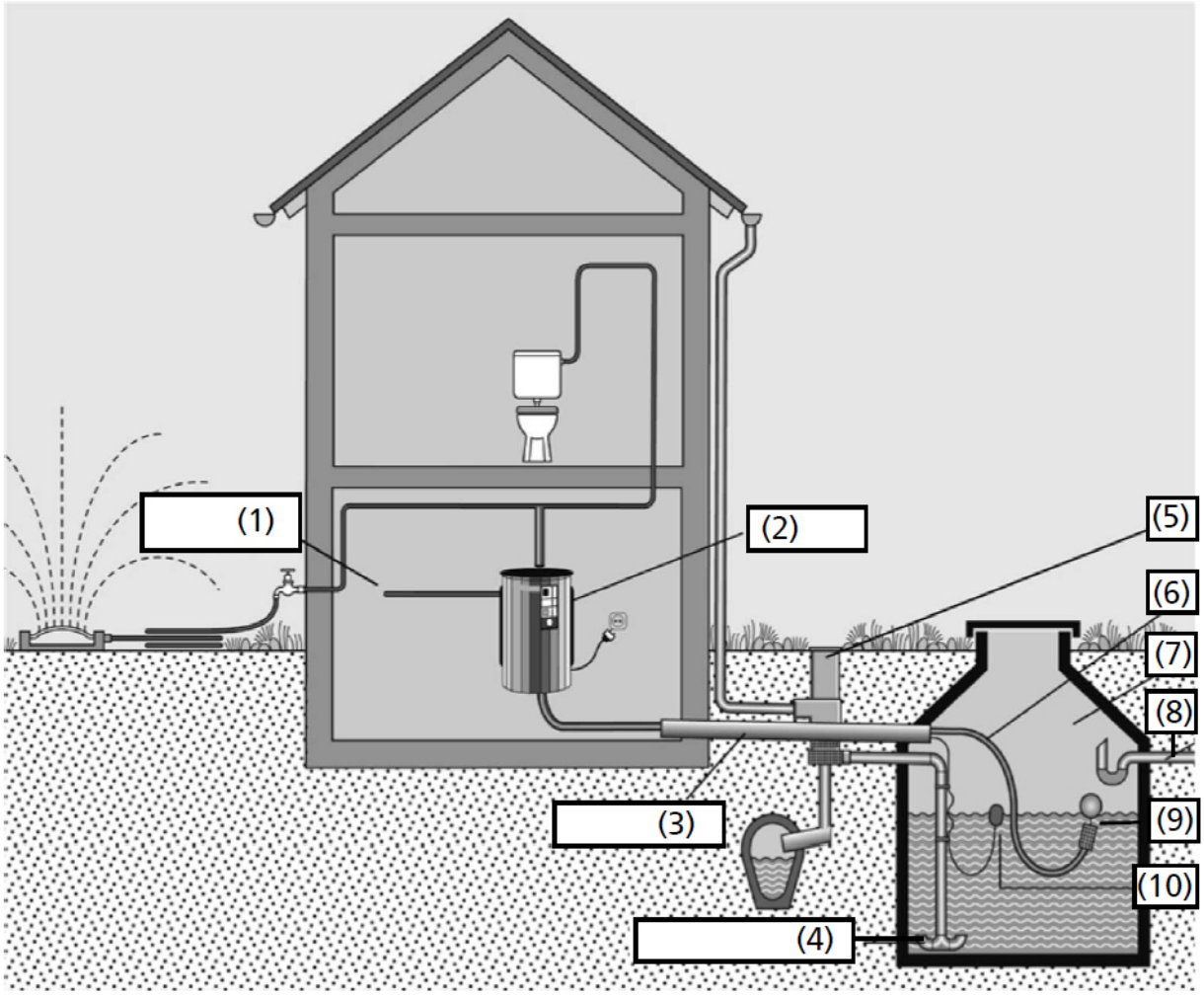

Fig. 5: Example of installation with underground rainwater storage tank outside the building

(1)	Mains water supply	(6)	Suction line
(2)	Rainwater harvesting system	(7)	Rainwater storage tank
(3)	Conduit	(8)	Overflow to public sewer or soak hole
(4)	Calmed inlet	(9)	Floating intake
(5)	Rainwater filter	(10)	Float switch with 20 m electric cable[4)]

Connect the overflow in accordance with EN 1717 to a floor drain or the public sewer system via an air gap. The overflow must not be closed with a plug.

The suction line must be routed with a continuously rising slope from the rainwater storage tank to the Hya-Rain system to provide good suction conditions for the pump.

Fit the float switch so as to ensure a water level of at least 300 mm under the floating intake. This avoids intake of sediment.

If the site conditions do not allow for the suction line to be laid with a continuously rising slope, the use of a booster pump in the rainwater storage tank is recommended. A booster pump can be used with either Hya-Rain or Hya-Rain N.

In the case of lower-lying rainwater storage tanks, the overflowing water can be led into the rainwater storage tank via the conduit accommodating the suction line and the power cable of the float switch.

Rainwater is not suitable for drinking. Easily accessible tapping points must be marked **No drinking water**. Using child-proof security fittings (e.g. removable turning handle) as an additional precaution is recommended.

4 Included in the scope of supply

Connection example

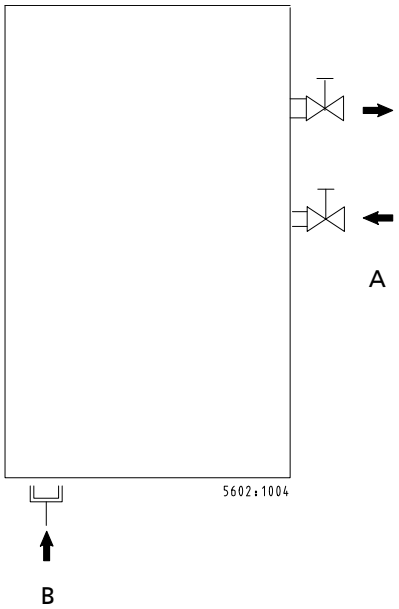

Fig. 6: Connection example

A	Shut-off valves, site-supplied
B	Connection via pipe union

Drilling pattern for wall mounting

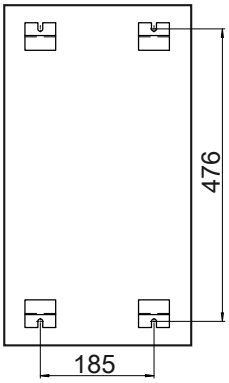

Fig. 7: Drilling pattern for wall mounting, dimensions [mm]

Scope of supply

- Rainwater harvesting system
  - Pump set
  - Cervomatic control unit and monitoring unit
  - Mains water storage tank to EN 1717, storage volume approx. 13 l
  - Terminals for connecting a booster pump
  - Three-way valve with actuator, for automatic switching between rainwater storage tank and mains water storage tank
  - Set of mounting elements for wall mounting (bolts, plug fixings and mounting brackets)
  - Flexible expansion joints for the discharge side as well as for connection to the mains water supply, length approx. 30 / 50 cm
- Bolt hole pattern
- Installation/operating manual

Hya-Rain:

- Float switch, cable length 20 m

Hya-Rain N:

- Sensor, cable length 3 m, including connection box

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Accessories

Pump accessories

Table 7: Overview of pump accessories

Item	Description	Connection	Mat. No.	[kg]
	Suction hose kit without foot valve, with screwed unions, length 7 m Connection of pre-configured end to Hya-Rain (N/Eco), connection of non-configured end with G 1¼ union (01076873) to foot valve	G 1 1/4 - G 1	18040868	4
	Foot valve with suction strainer and spring-loaded lift check valve, opening pressure approx. 2 m of water, stainless steel Required for a tank (reservoir) located at a higher level	G 1 1/4	01068052	0,3
	Foot valve with fine strainer suitable for suction hose (18040868)	-	01076873	0,2
	Screwed union suitable for suction hose (18040868)	G 1¼	01076872	0,02
	Float for suction hose kit, diameter 150 mm	-	19071460	0,1
	Expansion joint PN 10, L = 300 mm	Rp 1	11037177	0,378
	Floating-suction intake valve with fine strainer (length 2 m)	Rp 1	18040795	1,5
		Rp 1 1 1/4	18040796	1,8
	Overflow syphon, diameter 50 mm , for installation with air gap	-	01068180	0,5
	AmaDrainer-Box Mini with AmaDrainer 301	-	29135139	9
	Accumulator (membrane-type accumulator), 8 l Fitting this device on the discharge side reduces the system's frequency of starts.	-	01079764	2,35

Electrical accessories

Table 8: Overview of electrical accessories

Description	Length	Mat. No.	[kg]
Niveau-Rain K level control equipment, water level indication in %, automatic switching between rainwater and mains water mode, for measuring and displaying the fill level of all tanks. Fitted with a pre-set switch (changeover contact) as a volt-free contact. Suitable for a depth of up to 3 m. Retrofittable for rainwater harvesting systems with float switch. Fluids handled: ▪ Cooling water ▪ Fire-fighting water ▪ Rainwater (not containing abrasive substances) Operating data: ▪ Supply voltage required for the analysing device: 230 V AC ▪ Enclosure of the analysing device: IP52 ▪ Enclosure of the measurement sensor with box: IP65 ▪ Measuring voltage for the measurement sensor: 12 V ▪ Measuring principle: capacitive ▪ Sensor length: 3 m ▪ Power input: 1 W ▪ Maximum current of volt-free contact: 10.0 A, 230 V ▪ Contact: changeover contact ▪ Switching points: 5 % and 7 % ▪ Connection cable (supplied by operator): 2×1 mm², maximum length 50 m Function: The length of the measurement sensor submerged in the fluid handled is calibrated as 100 %. The display shows the fill level changes in percentage increments. The level control equipment can be re-calibrated at any time. When the fill level in the tank falls to 5 %, the rainwater harvesting system automatically switches to mains water mode. If rainfalls make the water level rise to 7 % again, the rainwater harvesting system automatically switches to rainwater mode. Product benefits: ▪ Permanent display of the fill level ▪ Optimum use of stored rainwater ▪ As little as a 2 % rise in the rainwater level will return the system to rainwater mode (40 mm at a water depth of 2 m). At the same water depth a float switch would need 200 to 300 mm. Special variants: ▪ Measurement sensor with longer electric cable on request ▪ Other switching points on request		18040846	1,2
Connection cable for measurement sensors, terminal box and rainwater harvesting system	10 m	19071802	1
	20 m	19071803	2

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System planning example

For planning a rainwater harvesting system and determining the amount of drinking water that can be saved the available rainwater and the required rainwater must be calculated.

Available rainwater

Calculation:

Catchment area × runoff coefficient × filter efficiency factor × average annual rainfall = rainwater yield / year.

Table 9: Description of the values for calculating the rainwater yield

Value	Description
Catchment area	Plan roof area (length × width) in m²
Runoff coefficient	Difference between the amount of rainwater that falls on the roof and the amount of rainwater that reaches the gutter. Proven factor for pitched roofs = 0.75
Filter efficiency factor	Tank (reservoir) filter losses
Average rainfall	Average initial value = 700 mm/year

Example:	Actual values:
Catchment area = 170 m²	Catchment area = _____ m²
Runoff coefficient = 0.75	Runoff coefficient = _____
Filter efficiency factor = 0.9	Filter efficiency factor = _____
Average rainfall = 700 mm	Average rainfall = _____ mm
Calculation:	Calculation:
170 m² × 0.75 × 0.9 × 700 mm = 80,325 l/year	_____ m² × _____ × _____ × _____ mm = _____ l/year

Required rainwater

As an example a 4 person household with a 200 m² garden has been chosen; consumption by washing machine, toilet and garden irrigation has been taken into account.

Example:	Actual values:
Consumption toilet/person/day: 24 l × 4 persons × 365 days = 35,040 l	Consumption toilet/person/day: 24 l × _____ persons × 365 days = _____ l
Consumption washing machine/person/day: 10 l × 4 persons × 365 days = 14,600 l	Consumption washing machine/person/day: 10 l × _____ persons × 365 days = _____ l
Consumption garden irrigation/m²/year: 60 l × 200 m² garden area = 12,000 l	Consumption garden irrigation/m²/year: 60 l × _____ m² garden area = _____ l
Calculation:	Calculation:
35,040 l + 14,600 l + 12,000 l = 61,640 l/year	_____ l +_____ l + _____ l = _____ l/year

Storage volume of the tank (reservoir)

Compare the required rainwater with the available rainwater. Use the lower value of the two for calculating the storage volume. 6 % of the lower value are considered to be an adequate storage volume (design factor). Select the next common tank size up.

It is desirable for the tank to overflow at regular intervals in order for dirt particles floating on the water surface to be removed.

Example:	Actual values:
61,640 l × 0.06 = 3,698 l	_____ l × 0.06 = _____ l

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