Calculation of the number of Drains required
Example

updated!

How you determine the number of drains required per roof area:

Copy the form on the next page if required.

1. Determine roof area (A)
2. Determine type of roof (C_S)
   The peak drainage coefficient C_S is a measure for the delay of the rainwater drainage. E.g. on intensive green roofs there is the longest delay (C_S=0,2)!]
3. Choose location from the rainfall statistics list and insert the values for $r_{(5,5)}$ and $r_{(5,100)}$.
4. Determine desired size of drains. Use only drains, which fulfill the requirements of the DIN for drainage capacity!
   The following Grumbach drains fulfil the requirements (self-tested):
   Universal drain*, Clamp flange drain, compact collar drain*, collar drain, redevelopment drain, combi drain, balcony drain, garage/balcony drain, stainless steel drain, attica Super drain*, attica Jumbo drain, attica flat drain
5. The "Other amount" field can be used, if none of the informations of 4 is relevant, e.g. if, according to the manufacturer's information, the drainage capacity is below the minimum requirement of the DIN 1986-100:2016-12.
6. Now you have all the required data and you may use the formula.
7. The result is rounded up to the next full unit and you can see the number of drains required.

* the drain capacities for these drains have also been tested by TÜV Rheinland LGA Products GmbH!

Flat roof drainage according to DIN 1986-100

The flat roof drainage according to DIN 1986-100 is important as it also takes extreme rainfall into account. We have the opinion that by conforming to the relatively new standard (valid since March 2002), our drains are fit for the future. According to DIN 1986-100 the roof should be able to withstand a "Once every hundred years rainfall". This refers to the statistical rainfall which occurs every hundred years for five minutes.

Form: Main and emergency Drainage (free level Drainage)

for the calculation of the number of drains required for a particular roof area according to DIN 1986-100: 2016-12

The following data are required for the calculation:

1 **Roof area (A)**	Please insert size of the roof area in [m²].	A = 550 m²

2 **Roof type (C_S)**	**Sealing membrane** (e.g. bitumen)		**Pebble roof**		**Tiled surface**			
	Roof pitch ≤ 3° ≈ 5%		Roof pitch ≤ 3° ≈ 5%		in pebbled area		on stilts	
Please mark	X	C_S=1,0		C_S=0,8		C_S=0,7		C_S=1,0

2 **Roof type (C_S)**	**Green roof extensive**		**Green roof extensive** surface thickness < 10 cm		**Green roof extensive** surface thickness ≥ 10 cm		**Green roof intensive** surface thickness ≥ 30 cm	
	Roof pitch > 5°		Roof pitch ≤ 5°		Roof pitch ≤ 5°		Roof pitch ≤ 5°	
Please mark		C_S=0,7		C_S=0,5		C_S=0,4		C_S=0,2

3 **Location** [$r_{(5,5)}$, $r_{(5,100)}$]	**Town:** *see rainfall statistics for Germany*	$r_{(5,5)}$ *see rainfall statistics for Germany*	$r_{(5,100)}$ *see rainfall statistics for Germany*
Please mark	FRANKFURT AM MAIN	376,7	693,3

4 **Drain size (Q_G)**	DN 50 Q_G=0,9 l/s		DN 70 Q_G=1,7 l/s		DN 100 Q_G=4,5 l/s		DN 125 Q_G=7,0 l/s		DN 150 Q_G=8,1 l/s		Other amount l/s 5
Please mark					X						

	Main drainage (basic drainage)	**Emergency drainage** – from 35 mm accumulation height at DN 50/70/100 – from 45 mm accumulation height at DN 125/150
6 Formula	$n_G = (r_{(5,5)} \times C_s \times A) : (Q_G \times 10000)$	$n_G = \{[r_{(5,100)} - (r_{(5,5)} \times C_s)] \times A\} : (Q_G \times 10000)$
7 **Result: Number and type of drains**	4,6 => 5 DRAINS UNIVERSAL DRAIN VERTICAL DN 100	3,9 => 4 DRAINS UNIVERSAL DRAIN VERTICAL DN 100

Key (Explanations)

- n_G The minimum number of drains, rounded up to full pieces [pc]
- C_S Peak drainage coefficient, depends on type of roof surface and varies between 0,2 und 1,0.
- A size of the roof area [m²]
- Q_G The minimum drainage capacity of the drain acc. to DIN in litres per second [l/s], depends, among other things, on the nominal width of the drain.
- $r_{(D,T)}$ The rainfall $r_{(D,T)}$ is defined as rainfall duration (D in minutes) and annuality (T in years) in litres per second and hectare [l/(s,ha)]. Only $r_{(5,5)}$ and $r_{(5,100)}$ are required here.

Note

The data sheet developed by us, and all our information, have been processed to the best of our knowledge. For further or more complete information, please refer to the relevant DIN standards, which we also used as our main source. Possible errors will not constitute or result in an implied warranty of any kind.
Pages 83 to 85 are to be regarded as non-binding information and should be checked by the user.

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Form: Main and emergency Drainage (free level Drainage)

for the calculation of the number of drains required for a particular roof area according to DIN 1986-100: 2016-12

The following data are required for the calculation:

Roof area (A)	Please insert size of the roof area in [m2].	**A =** **m²**

Roof type (C_S)	**Sealing membrane** (e.g. bitumen)		**Pebbled roof**		**Tiled surface**			
	Roof pitch ≤ 3°≈ 5%		Roof pitch ≤ 3°≈ 5%		in pebbled area		on stilts	
Please mark		C_S=1,0		C_S=0,8		C_S=0,7		C_S=1,0

Roof type (C_S)	**Green roof extensive**		**Green roof extensive** surface thickness < 10 cm		**Green roof extensive** surface thickness ≥ 10 cm		**Green roof intensive** surface thickness ≥ 30 cm	
	Roof pitch > 5°		Roof pitch ≤ 5°		Roof pitch ≤ 5°		Roof pitch ≤ 5°	
Please mark		C_S=0,7		C_S=0,5		C_S=0,4		C_S=0,2

Location [$r_{(5,5)}$, $r_{(5,\ 100)}$]	**Town:** *see rainfall statistics for Germany*	$r_{(5,5)}$ *see rainfall statistics for Germany*	$r_{(5,100)}$ *see rainfall statistics for Germany*
Please mark			

Drain size (Q_G)	DN 50 Q_G=0,9 l/s		DN 70 Q_G=1,7 l/s		DN 100 Q_G=4,5 l/s		DN 125 Q_G=7,0 l/s		DN 150 Q_G=8,1 l/s		other amount l/s
Please mark											

	Main drainage (basic drainage)	**Emergency drainage** – from 35 mm accumulation height at DN 50/70/100 – from 45 mm accumulation height at DN 125/150
formula	**$n_G = (r_{(5,5)} \times C_S \times A) : (Q_G \times 10000)$**	**$n_G = \{[r_{(5,100)} - (r_{(5,5)} \times C_S)] \times A\} : (Q_G \times 10000)$**
Result: Number and type of drains		

Key (Explanations)

- n_G The minimum number of drains, rounded up to full pieces [pc]
- C_S Peak drainage coefficient, depends on type of roof surface and varies between 0,2 und 1,0.
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