



CENTRAL WATER HEATING SYSTEMS

Rules for determining the heating requirement for heating drinking water in residential constructions DIN 4708 Part 2

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1 Scope

This standard is valid as the basis for the uniform determination of the heating requirement in central drinking water heating systems in residential constructions whose water heaters are heated directly or indirectly. They can be combined with heat generators for heat supply or can be intended exclusively for heating drinking water (see also DIN 4753 Part 1).

This standard does not apply if an above-average simultaneity in the utilization of the water heating unit is to be expected according to the position and purpose of the building to be supplied (e.g. in factory dwellings) or if the central water heating system is intended only for supplying a self-contained dwelling unit (dwelling).

2 Relevant Standards

DIN 4471	Bath tub, cast iron, overview
DIN 4701	Heating systems; rules for calculating the heating requirement of buildings
DIN 4708 Part 1	Central water heating systems, terms and basis of calculation
DIN 4708 Part 3	Central water heating systems; rules for testing the capacity of water heaters for residential units
DIN 4753 Part 1	Water heating systems for drinking and process water; design, fitting and testing

For explanations, refer to DIN 4708 Part 1

Standards Commission for Heating, Ventilation and Air Conditioning (NHR) at the DIN German Institute for Standardization e.V.

3 Terms

For other terms refer to DIN 4708 Part 1 and Part 3.

3.1 Requirement characteristic N

The requirement characteristic N is the result of the determination process for the requirement for heated drinking water. It is identical to the number of unit dwellings in the construction project, but it does not necessarily correspond to the number of dwellings.

3.2 Occupation figure p

The occupation figure p is the number of persons per dwelling.

3.3 Unit dwelling

The unit dwelling is a dwelling size determined from statistical values, for which the number of rooms r , occupation figure p and requirement for hydrants w_v are agreed upon and whose requirement characteristic is $N = 1$. (Refer to DIN 4708 Part 1 Appendix A.)

3.4 Number of rooms r

The number of rooms r is the number of rooms of a dwelling which must be taken into consideration when calculating the requirement characteristic N .

3.5 Number of dwellings n

The number of dwellings n is the number of dwellings of a construction project, in which the number of rooms, the occupation figure and the sanitary fittings are the same.

3.6 Number of hydrants ν

The number of hydrants ν is the number of hydrants for heated water per residence, which must be taken into consideration when calculating the requirement characteristic N .

3.7 Requirement for hydrants w_ν

The hydrant requirement w_ν is the quantity of heat needed to draw heated water from a hydrant.

4 Determining the requirement characteristic N

4.1 Calculation reference documents

4.1.1 Information on the construction project

Determining the requirement characteristic N requires the following documents and information from the building owner or architects:

- Floor plans of all floors in the building which are to be supplied centrally with heated water, at least on a scale of 1 : 100, showing all hydrants.
- Information on the type, number and size of sanitary devices in order to determine the number of hydrants ν and requirement for hydrants w_ν .
- Information on the number of persons per dwelling. As a minimum, the statistical values given in Table 1 are to be used as the basis of calculation.
- If the occupier is to influence fittings in the construction project individually in respect of the number and type of hydrants, the building owner must supply corresponding information.

If the calculation results in a requirement characteristic N of about 1, but it is known or suspected that more than one bath will be needed in the near future for reasons of sanitary fittings (e.g., the physical separation of bath and shower), the selected power of the heater must be greater than calculated.

4.1.2 Number of dwellings n

The respective number of identical dwellings n_i can be seen from the drawings.

4.1.3 Number of rooms r

The number of rooms r of each dwelling group n_i can be seen from the drawings. It refers to the number of living rooms of a dwelling. Secondary rooms such as the kitchen (not kitchen-living area!), entrance hall, corridor, bath and storage room are not taken into consideration.

4.1.4 Number of occupants p

The data regarding the actual occupation of the individual dwellings, but at least the values of statistical occupation, must be used as given in Table 1.

The data on the statistical number of occupants p of each dwelling is arrived at from the number of rooms used in the calculation r^1 .

¹⁾ >From current information of the Federal Statistics Office on the occupation density of dwellings.

Table 1

Number of rooms r	Number of occupants p
1	2,0 ²⁾
1 1/2	2,0 ²⁾
2	2,0 ²⁾
2 1/2	2,3
3	2,7
3 1/2	3,1
4	3,5
4 1/2	3,9
5	4,3
5 1/2	4,6
6	5,0
6 1/2	5,4
7	5,6

²⁾ If the residential building to be provided has mainly 1- and/or 2-room dwellings, the occupancy number p for these dwellings is to be raised by 0.5.

4.1.5 Number of hydrants ν

When determining the hydrants to be included in the calculation ν for heated water, it is assumed that only the hydrants within a dwelling are to be taken into consideration. According to the sanitary fittings of the dwelling, a distinction is made between residences with standard fittings (see Table 2) and residences with comfort fittings (see Table 3).

4.1.6. Features for assessing sanitary fittings in residences and their inclusion in determining the requirements

When determining the requirement, a distinction is made between:

- Residences with normal fittings
- Residences with comfort fittings.

Normal fittings are deemed to exist, if the devices mentioned in Table 2 are present.

Table 2. Normal fittings

Sr. No.	Existing fitment per dwelling	to be used for demand determination according to section 4.2:
1	Bath:	
1.1	1 Tub bath 1600 conforming to DIN 4471 (acc. to table 4 Sr. No. 1)	
	Or:	
	1 shower stall with/without mixer unit and normal shower (acc. to Tab. 4 Sr. No. 5)	1 Tub bath 1600 conforming to DIN 4471 (acc. to table 4 Sr. No. 1 or No. 2)
1.2	1 Washing counter (acc. to Table 4 Sr. No. 9)	is not considered
2	Kitchen:	
	1 Kitchen washing	is not considered

Comfort fittings are deemed to exist, if other or more comprehensive fittings than those indicated in Table 2 for normal fittings are present in every dwelling.



Table 3. Comfort fittings

Sr. No.	Existing fitment per dwelling	to be used for demand determination according to section 4.2:
1	Bath:	
1.1	Bath tub ³⁾	As available, acc. to Table 4 Sr. No. 2 to No. 4
1.2	Shower stall ³⁾	as available, including any additional facility acc. to Table 4 Sr. No. 6 to No. 8, if the arrangement allows an equivalent use
1.3	Washing counter ³⁾	remains unconsidered
1.4	Bidet	remains unconsidered
2	Kitchen:	
2.1	Kitchen wash basin	is not considered
3	Guest room:	Per Guest room:
3.1	Bath tub or	as available, acc. to Table 4 Sr. No 1 to No. 4, with 50 % of hydrants requirement w_v
3.2	Shower stall	as available, including any additional facility acc. to Table 4 Sr. No. 5 to No. 8 with 100 % of the hydrants requirement w_v
3.3	Washing counter	with 100 % of hydrants requirement w_v acc. to Table 4
3.4	Bidet	with 100 % of the hydrants requirement w_v acc. to Table 4

³⁾ Size different from the normal fitment

4.1.7 Hydrant requirement w_v

The hydrant requirement w_v of the heated water hydrants used in the calculation can be obtained from Table 4. Table 5 should also be taken into consideration.

4.1.8 Unit dwelling

The total heat requirement of all dwellings to be supplied is converted into unit dwellings.

The following features are agreed-upon for the unit dwelling:

Number of rooms $r = 4$

Number of occupants $p = 3.5$ (3 to 4)

Hydrant requirement $w_v = 5820$ Wh/ water drawn to fill a bath tub.

4.2 Calculation procedure

The requirement characteristic N is determined from the information given in section 3.1 according to the formula:

where

$$N = \frac{\Sigma (n \cdot p \cdot v \cdot w_v)}{p \cdot w_v} = \frac{\Sigma (n \cdot p \cdot v \cdot w_v)}{3.5 \cdot 5820} \quad (1)$$

where

$$p \cdot w_v = 3.5 \cdot 5820 \text{ as values for one unit dwelling.}$$

The pre-printed form is used for the calculation (Table 5).

The dwellings to be provided with heated water are to be entered in the columns 1, 2 and 3 of the form (Table 5).

Table 4. Hydrant requirement w_v (Heat quantity in Wh for heated water for one draw)

Sr. No.	Naming of the hydrant or of the sanitary fittings	Symbol	Withdrawal quantity per use ⁵⁾ l	Hydrants requirement w_v Withdrawal	
				Wh	kcal
1	Bath tub 1600 acc. to DIN 4471	NB 1	140	5820	5000
2	Bath tub 1600 acc. to DIN 4471	NB 2	160	6510	5600
3	Small room tub and stage tub	KB	120	4890	4200
4	Large room tub (1800 mm x 750 mm)	GB	200	8720	7500
5	Shower stall ⁶⁾ with mixer and normal shower	BRN	40 ⁴⁾	1630	1400
6	Shower stall ⁶⁾ with mixer and luxury shower	BRL	75 ⁴⁾	3020	2600
7	Shower stall ⁶⁾ with 1 head- and 2 side showers	BRK	100 ⁴⁾	4070	3500
8	Individual shower head additional shower stall	BR	30 ⁴⁾	1160	1000
9	Washing counter	WT	17	700	600
10	Bidet	BD	20	810	700
11	Hand washbasin	HT	9	350	300
12	Rinsing place for kitchen	SP	30	1160	1000

⁴⁾ Corresponds to a use period of 6 minutes

⁵⁾ In case of bath tubs at the same a use content

⁶⁾ Only to be taken into consideration, if bathroom and shower stall are spatially separated

For bath tubs whose volumes vary considerably, the hydrant requirement is w_v according to the formula $w_v = c \cdot v \cdot \Delta t$ to be determined in Wh and used in the calculation.



5 Application

5.1 Choosing the water heater

According to the demand characteristic N determined in section 2, the water heater is to be chosen according to the power characteristics shown in the manufacturer's documentation, N_L .

The power characteristic must be greater than or at least equal to the demand characteristic N (see also section 4.1.1, last paragraph).

5.2 Checking the power rating of the heat generator

5.2.1 General

Heat generators that are used for central heating as well as for water heating must - depending on the ratio of the two heat consumers - have an allowance over and above the boiler power determined according to DIN 4701 Z_K according to the formula:

$$Q_N = Q_K + Z_K \text{ in kW} \quad (2)$$

Here,

Q_N is the rated heating output of the boiler in kW

Q_K is the boiler power for the heat requirement Q_h according to DIN 4701 including the allowance for pipeline losses in kW

Z_K is the boiler allowance for the heating of drinking water in kW.

Depending on the circumstances of the building, the boiler allowance Z_K can be reduced by the allowances applied in the heat requirement calculation based on DIN 4701, edition January 1959, section 2.2.21, if this can be substantiated by the usage characteristics.

5.2.2 Boiler allowance Z_K

The magnitude of the boiler allowance Z_K depends on the construction type of the water heater (storage or throughflow heater) and is determined for each device by the manufacturer within the framework of the power testing according to DIN 4708 part 3, edition October 1979, section 7.5.

or calculated and indicated in the technical documents and obtained from there. In the case of combined boilers, it must be clear which proportion of the indicated nominal heating power is available for heat supply.

The dwellings that are identical with respect to the number of rooms and scope of sanitary equipment are summarized with a serial number (Column 1). The following are to be entered: Column 2: the number of rooms r

Column 3: the number of dwellings n

Column 4: the occupancy number p , either from Table 1 or according to the information obtained from the building owner

Column 5: the result of multiplying

column 3 by column 4

Column 6: the number of hydrants v , which is to be taken into consideration when calculating the demand characteristic N .

Column 7: the short designation (see Table 2) of the number of hydrants used in column 6

Column 8: the hydrant requirement w_v , (see Table 2) of the number of hydrants entered in column 6 and column 7

Column 9: the result of multiplying column 6 by column 8

Column 10: the result of multiplying column 5 by column 9.

The values entered in column 10 are to be added and the result as the numerator in equation (1) for calculating the demand characteristic N . The numbers of dwellings entered in column 3 are to be added and the result entered after Σn . By comparing this with the calculated demand characteristic N the standard of sanitary fittings for the construction project can be identified. In the case of exclusively normal sanitary fittings, the demand characteristic N is greater than or equal to Σn . In construction projects whose sanitary fittings place higher demands on the heated water supply, the requirement characteristic is N greater than Σn .



Table 5. Form

Requirement for heated water in centrally supplied dwellings								Project No: _____		
								Sheet No: _____		
Determination of the demand characteristic N for size determination of the water heater .										
Project _____										
Number of occupants p : according to statistical values according to section 4.1.4										
1	2	3	4	5	6	7	8	9	10	11
Sr. No. of the dwelling groups	Number of rooms r	Number of dwellings n	No. of occupants p	$n \cdot p$	Hydrants (per dwelling)		Hydrants requirement in Wh w_v	in Wh $v \cdot w_v$	in Wh $n \cdot p \cdot v \cdot w_v$	Remarks
					Number of hydrants v	Symbol				
1	1,5	4	2,0	8,0	1	BRN	1630	1630	13 040	
2	3,0	10	2,7	27,0	1	NB 1	5820	5820	157 140	
3	4,0	2	3,5	7,0	2	BRK	4070	8140	56 980	
4	4,0	4	3,5	14,0	1	NB 2	6510	6510	91 140	
					1	BRK	4070	4070	56 980	
					1	BD	810	810	11 340	
5	5,0	5	4,3	21,5	1	NB 1	5820	5820	125 130	
					1	NB 1	5820	2910	62 565	50 % acc. to Table 3
					1	BD	810	810	17 415	
$\Sigma n_i = 25$					$\Sigma (n \cdot p \cdot v \cdot w_v) = 591\,730 \text{ Wh}$					
$N = \frac{\Sigma (n \cdot p \cdot v \cdot w_v)}{3,5 \cdot 5820} = \frac{591\,730 \text{ Wh}}{20\,370} = 29,0$										



6 Sample calculation

The demand characteristic N is used to determine the size of the water heater for the central water heating system of a dwelling construction project with the following dwellings and equipment:

Number of dwellings n	Number of rooms r	Number of occupants p	Equipment Piece/name
4	1,5	2,0	1 shower stall with normal shower 1 washing counter in the bath 1 sink in the kitchen
10	3	2,7	1 bath tub 1600 acc. to DIN 4471 1 washing counter in the bath 1 sink in the kitchen
2	4	3,5	2 shower stalls with shower head and side showers (spatially separated) 1 washing counter in the bath 1 sink in the kitchen
4	4	3,5	1 bath tub 1700 acc. to DIN 4471 1 shower stall with head and side showers in a special room 1 wash counter in bath 1 bidet 1 sink in the kitchen
5	5	4,3	2 bath tubs 1600 as. to DIN 4471 2 wash counter in the baths 1 Bidet 1 sink in the kitchen