AMKASYN KE/KW
Product Description
Cold Plate
KW-CPxxx

Version: 2023/25
Part no.: 200043
Translation of the "Original Dokumentation"

AMKmotion
MEMBER OF THE ARBURG FAMILY

Imprint

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Change	**Letter symbol**
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Product Version:

Product	Firmware Version (Part no.)	Hardware Version (Part no.)
KW-CP340	--	2.02 (46870)
KW-CP510	--	2.03 (46872)
KW-CP680	--	2.03 (46874)
KW-CP1000	--	2.02 (46877)
KW-CP340R	--	2.02 (46871)
KW-CP420R	--	2.02 (46876)
KW-CP510R	--	2.03 (46873)
KW-CP680R	--	2.02 (46875)
KW-CP1035R	--	2.02 (46878)
KW-CP680-V	--	1.00 (200610)
KW-CP680R-V	--	1.00 (200619)

Purpose: The document at hand describes the KE/KW cold plates with liquid cooling.

Reservation: We reserve the right to modify the content of the documentation as well as the delivery options for the product.

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For fast and reliable troubleshooting, you can help us by informing our Customer Service about the following:

- Type plate data for each unit
- Software version
- Device configuration and application
- Type of fault/problem and suspected cause
- Diagnostic messages (error messages)

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Content

1 For your safety

1.1 Representation of the safety indications

Any safety information is configured as follows:

⚠ SIGNAL WORD	
	**Type and source of risk** Consequence(s) of non-observance **Steps to prevent:** • ...

1.2 Classes of hazard

Safety and warning messages are graduated into classes of hazard (according to ANSI Z535). The class of hazard defines the potential risk of harm and is described by a single word, if the safety information is ignored. The signal word is followed by a safety alert symbol (ISO 3864, DIN EN ISO 7010). In accordance with ANSI Z535, the following signal words are used to define the class of hazard.

Safety alert symbol and signal word	Class of hazard and its meaning
⚠ DANGER	DANGER indicates a hazardous situation which, if not avoided, **will** result in death or serious injury
⚠ WARNING	WARNING indicates a hazardous situation which, if not avoided, **could** result in death or serious injury
⚠ CAUTION	CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, **could** result in minor or moderate injury
NOTICE	NOTICE is used to address preventions to avoid material damage, but not related to personal injury.

1.3 Danger symbols used

Warning symbol	Meaning
	Warning: dangerous area!
	Warning: dangerous electric voltage!
	Warning against crushing hazard!

1.4 General safety instructions

- The electricity, mechanical movements and high temperatures in electrical drive systems present hazards that can result in fatal injuries and material damage. These hazards are present while starting up and operating the unit, and also during servicing or maintenance work.

- Personnel must have read and understood the safety instructions before installing and operating the unit. In the documentation included with the product, the usage warnings pertain to direct hazards and must therefore be followed directly when operating or handling the unit by the operator.
- Compliance with all of the instructions given in the documentation included with the product will ensure safe and fault-free operation of the unit and is a prerequisite for asserting warranty claims.
- AMK Arnold Müller GmbH & Co. KG shall not be held liable for any damages ensuing from using the unit in a manner contrary to the intended use, from faulty installation or from using the unit beyond the specified operating characteristics and conditions.
- Do not start the system in which the AMK products are installed (begin of intended use) until you can determine that all relevant standards, laws and directives have been complied with.

1.5 Intended use

The KW-CPxxx(R) cold plates are intended for installation in a switch cabinet. The KE/KW modules are mounted on the cold plate in order to deduct the heat accumulated in operation.

1.6 CE mark

AMKmotion products have been constructed using the "State of the Art" and are safe to operate. AMKmotion issues an EU declaration of conformity for each of its products in which the standards and guidelines relevant for the product are listed. AMKmotion also designates the products with the CE mark which signifies conformity to the standards. Since these standards are listed in the Official Journal of the EU, it can be assumed through their application that the product meets the basic safety and health requirements of the harmonization regulation, the so-called presumption of conformity applies.

1.7 Requirements for the personnel and their qualification

Only authorised and qualified personnel may work on and with the AMKmotion .

Specialised personnel must:

- Perform mechanical and electrical work that is described in this documentation, such as mounting and connecting
- Observe all information in the documentation accompanying the product in order to work with the product safely and in an error-free manner
- Understand and know hazards that occur when handling the product
- Know connections and functions of the system
- Be familiar with the control concept in order to operate the
- Be authorised to switch circuits and devices on and off, earth and label them
- Observe local specific safety requirements

1.8 5 Safety rules

In particular on drive systems, the instructions pertaining to safety and the following five safety rules have to be kept in the specified sequence:

1. Switch off electrical circuits (also electronic and auxiliary circuits).
2. Secure against being switched on again.
3. Determine that there is no voltage.
4. Ground and short circuit.
5. Cover or close off neighboring parts that are under voltage.

Reverse the measures taken in reverse order after completing the work.

1.9 Warranty

- All information in the documents accompanying the product must be complied with for a safe and trouble-free operation.
- The assertion of warranty claims is excluded if the information in the documents is not observed completely.
- Hardware and firmware may not be modified except by personnel authorized by AMKmotion and after consultation with AMKmotion.
- The company AMKmotion GmbH + Co KG is not liable for damages from unintended use, incorrect installation or operation, exceeding rated values and non-observance with the environmental conditions.

2 Product overview

2.1 Product description

The power loss of the power electronics of the KE/KW modules is deducted using the liquid-cooled cold plates via the module's rear wall.

The cold plate consists of a heat sink made of an AlMgSi 0.5 aluminium composite with integrated cooling channel or moulded stainless steel pipes. The heat is deducted via the water that is conducted through the cooling plate.

The power loss of the control electronics is not dissipated through the cold plate. The heat created in the cabinet must be removed with the switch cabinet cooling.

2.2 Ordering data

2.2.1 Cold plates

KE/KW cold plates with side-way coolant connection

Product name	Coolant connection	Order number
KW-CP340	sideways right	O704
KW-CP510	sideways right	O706
KW-CP680	sideways right	O708
KW-CP1000 *)	sideway left	O717

*) Not for new applications

KE/KW cold plates with rear coolant connection

Product name	Coolant connection	Order number
KW-CP340R	rear	O705
KW-CP420R	rear	O710
KW-CP510R	rear	O707
KW-CP680R	rear	O709
KW-CP1035R	rear	O734

KE/KW cold plates with stainless steel pipes

Product name	Coolant connection	Order number
KW-CP680-V	sideways right	O782
KW-CP680R-V	rear	O783

For compact power supplies and compact inverters with a module width of 425 mm, cold plates KW-CP680 (AMK part no. O708), KW-CP510 (AMK part no. O706) respectively KW-CP510R (AMK part no. O707) must be exclusively used with a **revision from 2.03 on**!

2.2.2 Accessories

Product name	Order number
Slot nut	18139
KE/KW fastening set (20 slot nuts + 20 screws M6 x 20)	49994

2.3 Delivery

- Please check whether the delivered parts correspond with the delivery note. If the delivery is incomplete, please contact your nearest AMK representative.
- Check the components for signs of transport damage after their arrival. Do not install and operate any damaged components.
- If there is any transport damage, immediately inform the delivering freight carrier and inform your AMK representative.

2.3.1 Scope of delivery

KW-CPxxx(R) cold plate for liquid cooling w/o fastening material.

The fastening set for the assembly of the KE/KW modules, which consists of 20 slot nuts and 20 cylinder screws, can be ordered separately (AMK part no. 49994)

2.4 Technical data

2.4.1 Cold plate with cooling connection on the side

Cold plate	KW-CP340	KW-CP510	KW-CP680	KW-CP680-V
AMK part no.	O704	O706	O708	O782
Maximum removable power	1500 W	2300 W	3000 W	3000 W
Ambient temperature	0 ... 40 °C	0 ... 40 °C	0 ... 40 °C	0 ... 40 °C
Coolant connection	sideways right	sideways right	sideways right	sideways right
	G 1/4 " internal thread			
Water flow	1.5 bar; 10 l/min			
Dimensions (B x T x H)	345 x 25 x 330 mm	515 x 25 x 330 mm	685 x 25 x 330 mm	680 x 25 x 330 mm
Material of the coolant pipe	AlMgSi 0.5	AlMgSi 0.5	AlMgSi 0.5	X5CrNi1810
Cooling surface (B x H)	340 x 320 mm	510 x 320 mm	680 x 320 mm	680 x 320 mm
Weight	approx. 6 kg	about 8 kg	about 11 kg	about 11 kg

Cold plate	KW-CP1000 *)
AMK part no.	O717
Maximum removable power	3000 W
Ambient temperature	0 ... 40 °C
Coolant connection	sideway left
	G 1/4 " internal thread
Water flow	1.5 bar; 10 l/min
Dimensions (B x T x H)	1005 x 25 x 330 mm
Material of the coolant pipe	AlMgSi 0.5
Cooling surface (B x H)	1000 x 320 mm
Weight	approx. 16 kg

*) Not for new applications

2.4.2 Cold plate with cooling connection on the rear side

Cold plate	KW-CP340R	KW-CP420R	KW-CP510R	KW-CP680R
AMK part no.	O705	O710	O707	O709
Maximum removable power	1500 W	1900 W	2300 W	3000 W
Ambient temperature	0 ... 40 °C	0 ... 40 °C	0 ... 40 °C	0 ... 40 °C
Coolant connection	rear	rear	rear	rear
	G 1/4 " internal thread			
Water flow	1.5 bar; 10 l/min			
Dimensions incl. coolant connection (B x T x H)	345 x 40 x 330 mm	421 x 40 x 330 mm	515 x 40 x 330 mm	685 x 40 x 330 mm
Material of the coolant pipe	AlMgSi 0.5	AlMgSi 0.5	AlMgSi 0.5	AlMgSi 0.5
Cooling surface (B x H)	340 x 320 mm	416 x 320 mm	510 x 320 mm	680 x 320 mm
Weight	approx. 6 kg	about 7 kg	about 8 kg	about 11 kg

Cold plate	KW-CP680R-V	KW-CP1035R
AMK part no.	O783	O734
Maximum removable power	3000 W	3000 W
Ambient temperature	0 ... 40 °C	0 ... 40 °C
Coolant connection	rear	rear
	G 1/4 " internal thread	
Water flow	1.5 bar; 10 l/min	
Dimensions incl. coolant connection (B x T x H)	680 x 40 x 330 mm	1040 x 40 x 330 mm
Material of the coolant pipe	X5CrNi1810	AlMgSi 0.5
Cooling surface (B x H)	680 x 320 mm	1035 x 320 mm
Weight	about 11 kg	about 18 kg

3 Environmental conditions

Ambient conditions apply according to EN 50178, table 7 and EN 61800-2, chapter 4.1.2

3.1 Transport and storing

- Transport and store the device in its original packaging and use shock-absorbing padding.
- Store the device in a clean and dry location where it is protected against weather conditions.
- Transport and storing temperature: -25 °C up to +75 °C
- Protect the device against condensation and prevent sudden changes in temperature and humidity.
- Protect the device against salt fog, industrial fumes, corroding liquids, vermin and mildew.
- Storing conditions acc. to EN61800-2 for up to 1 year and a maximum height of 2000 m above NHN

3.1.1 Operations

- Ambient temperature in operation: +5 °C to +40 °C
- Relative humidity: 5% to 85 %, non-condensing
- Installation altitude: ≤ 1000 m above NHN.
  If installed at altitudes of 1000 m up to max. 2000 m above NHN, the nominal data has to be lowered by 1 % per 100 m.
- Shock resistance acc. to EN 60068-2-27: 15 g for 11 ms
- Vibration resistance acc. to EN 60068-2-6: 1 g at 10 - 150 Hz

4 Disposal

Clarify with your local waste disposal company which materials and chemicals need to be separated and how to dispose of them. Observe the local regulations for disposal.

Examples of materials to be disposed of separately:

Components

- Electronic scrap, e.g., encoder electronics
- Iron scrap
- Aluminium
- Non-ferrous metal, e.g., motor windings
- Insulating materials

Chemicals

- Oils (disposal as hazardous waste, in acc. with the pertinent legislation; in Germany, the Waste Oil Ordinance (AltölV) applies)
- Grease
- Solvents
- Paint residue
- Coolant

5 Assembly

5.1 For your safety

⚠ DANGER	
	**Risk of injury from crushing, cutting and hitting.** When transporting and mounting sharp-edged and / or heavy components, there is a risk of crushing, cutting and bruising of the persons involved. Suspended loads can fall down and people suffer fatal injuries. **Steps to prevent:** • Utilize suitable assembly and transport equipment, such as hoists and carriages. • Wear protective clothing, e.g. safety gloves and boots, during the assembly. • Use only appropriate tools during the assembly. • Make sure that there are no persons or body parts located under suspended loads during the transport or assembly. • Prevent catching and crushing by mechanical devices.

5.2 KW-CPxx cold plates

The cold plate is fitted on the mounting plate in the switch cabinet.

Fastening: 4 screws M8 (KW-CP340 / 420 / 510 / 680(R)) or 8 screws M8 (KW-CP1000 / -CP1035R).

The assembly must be carried out on a flat surface (flatness ≤ 0.3 mm). The cold plate must not be braced during the assembly.

If several cold plates are assembled on top of each other, an upward and downward minimum distance of 100 mm each must be observed. The distances between signal and power cables must be complied with. Furthermore, please take note of the fact that the electronic components are cooled by internal fans, and that the air inlet temperature must not exceed 40 °C even in the top row.

The cold plates can be placed seamlessly next to each other on the sides, provided that the coolant connection is on the back. In case of a connection on the side, an according distance for the installation of the coolant circuit must be provided.

5.3 Cooling circuit

5.3.1 Requirements for the cooling circuit

NOTICE	
Material Damage!	**Damage to the cooling plate due to electrolysis** The cooling plate is made of an AlMgSi 0.5 aluminium alloy. If components such as supply line pipes and heat exchangers that are made of more precious materials (e.g. copper) are used within the cooling circuit, they can be affected and damaged due to electrolytic processes. **Steps to prevent:** • Only use components made of the same or a comparable aluminium alloy within the cooling circuit • Use cold plates with a moulded stainless steel pipe (KW-CP680x-V) in components made of copper or other high-grade metals within the cooling circuit. The material of the coolant pipe of these plates is X5CrNi1810 (stainless steel 1.4301)

If the following conditions have been fulfilled, the maximum permitted surface temperature of 40 °C at the deduction of power loss from the KE/KW modules is not exceeded

- The cooling back plate consists of a AlMgSi 0.5 aluminium composite. If possible, the same type of materials should be used for the water circulation. In components made of copper or other high-grade metals within the cooling circuit, cooling plates with a moulded stainless steel pipe (KW-CP680x-V) should be used. The material of the coolant pipe of these plates is stainless steel X5CrNi1810 (1.4301)
- Before startup of the machine/system, the operator must check the cooling circuit for leaks in acc. with EN50178! (Test pressure of the aluminium plates: 8 bar, cooling plates with stainless steel pipe: 3 bar)
- A closed water circulation must be installed.
- The water flow quantity must amount to approx. 10 l/min
- The water pressure must amount to approx. 1.5 bar.
- The water must have a temperature of < 30 °C at the inlet.
  The user must ensure that the temperature of the cold plate is not reduced below the dew point (Siehe Dew point table auf Seite 11.). A thawing of the cold plate is not permitted!

The following reference values apply for the properties of the circulating water in cold water systems:

- pH value 7 - 9
- electr. conductivity < 300 mS/m
- A corrosion inhibitor (e.g., Nalco 77381 made by Nalco Deutschland GmbH) must be added to the coolant.
  The dosage and other data on water quality can be found in the product data sheets by the inhibitor supplier.
- If needed, water additives must be used as anti-freeze agents and against algal formation.
- In general, the instructions of the manufacturer of the heat exchanger have precedence.

5.3.2 Installation of the cooling circuit

Depending on the cold plate, the coolant is connected either on the right or left side, or on the back through two G 1/4" internal threads and the matching conduit fittings.

The coolant input is connected at the lower fitting. The coolant output is connected at the upper fitting.

Tightening torque for G 1/4": max. 20 Nm

5.3.3 Dew point table

NOTICE	
Material Damage!	**Material damage when dew forms!** Dew may result in electrical shorts. **Steps to prevent:** • Observe the dew point table! • Keep the switch cabinet doors closed when in operation! • Switch off the cooling circuit when the systems are idle! • Check the temperature of the coolant after longer downtimes (cold production plants)! • At high levels of humidity, it is recommended to use a dehumidifier!

The dew point table specifies at which surface temperature condensate forms. This depends on the temperature of the air and the relative humidity.

Dew point table in °C

Example: Ambient temperature: 32 °C, humidity: 60 %
The temperature of the cooling circuit may not be less than 23 °C, else condensate will form!

Ambient air temperature in °C	Dew point in °C at a relative humidity of										
	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
2	-7.70	-6.26	-5.43	-4.40	-3.16	-2.48	-1.77	-0.98	-0.26	0.47	1.20
4	-6.11	-4.88	-3.69	-2.61	-1.79	-0.88	-0.09	0.78	1.62	2.44	3.20
6	-4.49	-3.07	-2.10	-1.05	-0.08	0.85	1.86	2.72	3.62	4.48	5.38
8	-2.69	-1.61	-0.44	0.67	1.80	2.83	3.82	4.77	5.66	6.48	7.32
10	-1.26	0.02	1.31	2.53	3.74	4.79	5.82	6.79	7.65	8.45	9.31
12	0.35	1.84	3.19	4.46	5.63	6.74	7.75	8.69	9.60	10.48	11.33
14	2.20	3.76	5.10	6.40	7.58	8.67	9.70	10.71	11.64	12.55	13.36
15	3.12	4.65	6.07	7.36	8.52	9.63	10.70	11.69	12.62	13.52	14.42
16	4.07	5.59	6.98	8.29	9.47	10.61	11.68	12.66	13.63	14.58	15.54
17	5.00	6.48	7.62	9.18	10.39	11.48	12.54	13.57	14.50	15.36	16.19
18	5.90	7.43	8.83	10.12	11.33	12.44	13.48	14.56	15.41	16.31	17.25
19	6.80	8.33	9.75	11.09	12.26	13.37	14.49	15.47	16.40	17.37	18.22
20	7.73	9.30	10.72	12.00	13.22	14.40	15.48	16.46	17.44	18.36	19.18
21	8.60	10.22	11.59	12.92	14.21	15.36	16.40	17.44	18.41	19.27	20.19
22	9.54	11.16	12.52	13.89	15.19	16.27	17.41	18.42	19.39	20.28	21.22
23	10.44	12.02	13.47	14.87	16.04	17.29	18.37	19.37	20.37	21.34	22.23
24	11.34	12.93	14.44	15.73	17.06	18.21	19.22	20.33	21.37	22.32	23.18
25	12.20	13.83	15.37	16.69	17.99	19.11	20.24	21.35	22.27	23.30	24.22
26	13.15	14.84	16.26	17.67	18.90	20.09	21.29	22.32	23.32	24.31	25.16
27	14.08	15.68	17.24	18.57	19.83	21.11	22.23	23.31	24.32	25.22	26.10
28	14.96	16.61	18.14	19.38	20.86	22.07	23.18	24.28	25.25	26.20	27.18
29	15.85	17.58	19.04	20.48	21.83	22.97	24.20	25.23	26.21	27.26	28.18
30	16.79	18.44	19.96	21.44	23.71	23.94	25.11	26.10	27.21	28.19	29.09
32	18.62	20.28	21.90	23.26	24.65	25.79	27.08	28.24	29.23	30.16	31.17
34	20.42	22.19	23.77	25.19	26.54	27.85	28.94	30.09	31.19	32.13	33.11
36	22.23	24.08	25.50	27.00	28.41	29.65	30.88	31.97	33.05	34.23	35.06
38	23.97	25.74	27.44	28.87	30.31	31.62	32.78	33.96	35.01	36.05	37.03
40	25.79	27.66	29.22	30.81	32.16	33.48	34.69	35.86	36.98	38.05	39.11
45	30.29	32.17	33.86	35.38	36.85	38.24	39.54	40.74	41.87	42.91	44.03
50	34.76	36.63	38.46	40.09	41.58	42.99	44.33	45.55	46.75	47.90	48.98

The use of a dehumidifier in the switch cabinet is recommended in case of high levels of humidity.

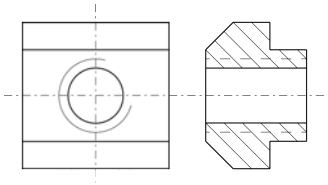
5.4 KE/KW modules

The KE/KW modules are mounted directly on the cold plate without heat transfer paste.

Note the following during assembly:

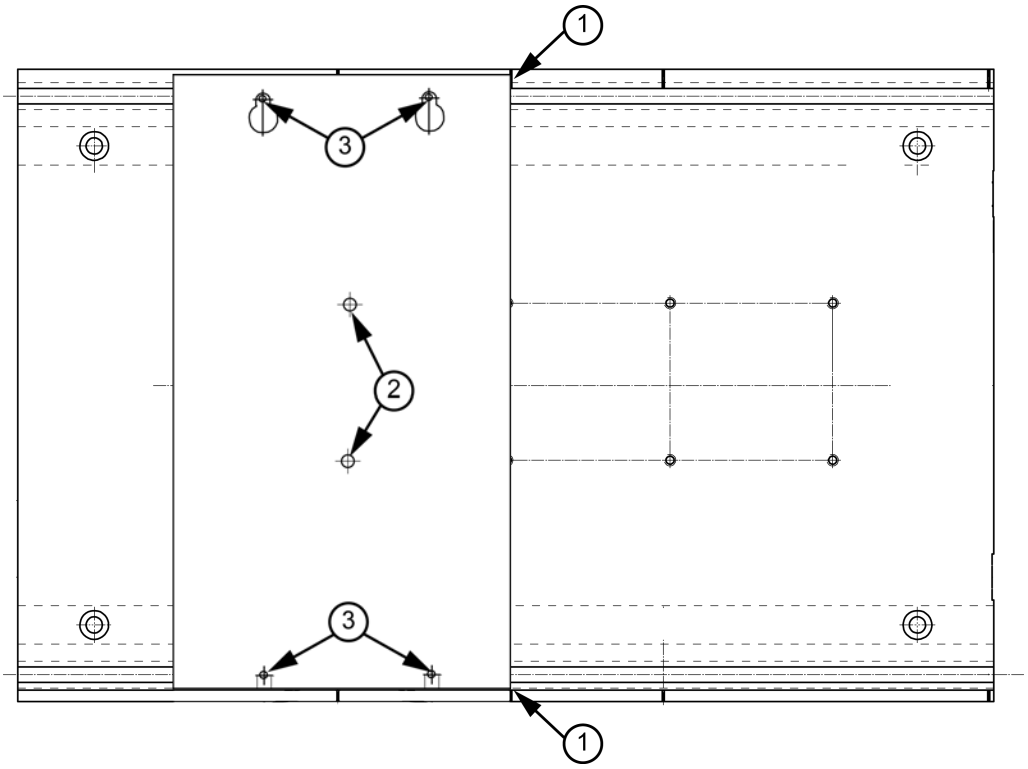
- The protective cardboard on the bearing face of the modules needs to be removed.
- Both the assembly surface of the cold plate as well as the bearing faces of the modules must be clean and scratch-free.
- The bearing faces of the KE and KW modules are arched by 0.3 mm so that a fully covered surface between module and cold plate is ensured after assembly.

- The cold plates have one T-slot on top and bottom, respectively, according to DIN 508 for the fastening of the KE/KW modules. The required number of slot nuts must be inserted into the slot through the mounting hole. The slot nuts have an M6 internal thread M6 x 20 fastening screws.



The fastening set for the assembly of the KE/KW modules, which consists of 20 slot nuts and 20 cylinder screws, can be ordered separately (AMK part no. 49994)

- The slot nuts are aligned according to the module position and width. Markings that identify the module position are located on the upper and lower edges of the cold plates (1).
- Threaded bores for the assembly of KE and KW modules with centre screw connections (170 mm / 255 mm / 425 mm width) are located in the cold plate.
- If available, the **centre screws** (2) must be tightened first during assembly: Tightening torque 5 Nm (Tool: Allen size 4).
- Afterwards, the fastening screws (3) of the modules are tightened: Tightening torque 8 Nm (Tool: Allen size 5).



The KW-CP420R cold plate does not contain threaded bores for centre screw connections. It is suitable solely for the use of use of the KE/KW modules with a width of 55 mm and 85 mm.

For compact power supplies and compact inverters with a module width of 425 mm, cold plates KW-CP680 (AMK part no. O708), KW-CP510 (AMK part no. O706) respectively KW-CP510R (AMK part no. O707) must be exclusively used with a **revision from 2.03 on**!

6 Operation

6.1 For your safety

⚠ WARNING	
	**Warning against pressurised lines!** Closed cooling circuits are under high pressure. Opening the circuit while it is under high pressure can result in injuries from escaping coolant. The sudden pressure change can cause lines to rip loose or make uncontrolled movements. **Steps to prevent:** • Never open a line system that is under high pressure! • Drain the coolant at the provided point, e.g. drain valve. Pay attention to the instructions of the manufacturer of the cooling device. • Collect the cooling liquid in a proper containment. Store or dispose it according to the local instructions. • Wear adequate protective clothing, e.g. goggles, gloves, safety shoes.

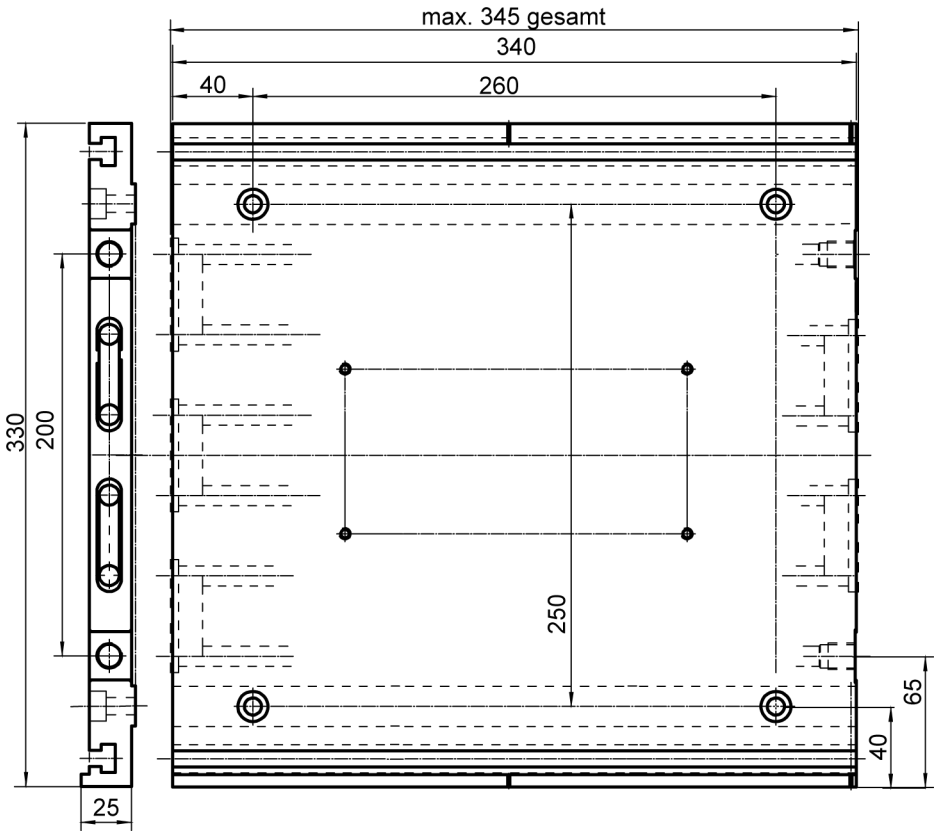
6.2 Maintenance

- The liquid-cooled cold plates are maintenance-free.
- The instructions of the manufacturer of the heat exchanger must be observed.

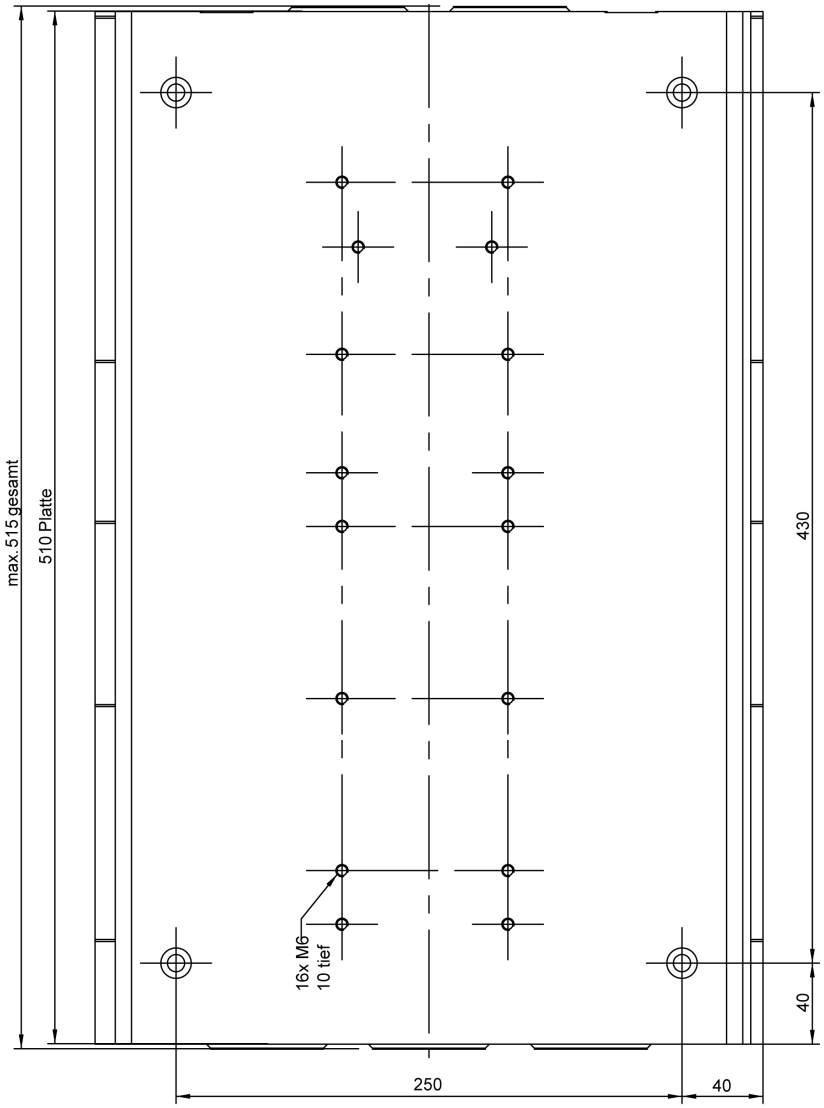
7 Dimensional drawings

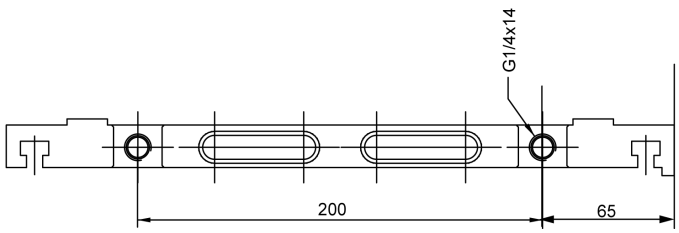
7.1 Cold plates with cooling connection on the right hand side

7.1.1 KW-CP340



7.1.2 KW-CP510





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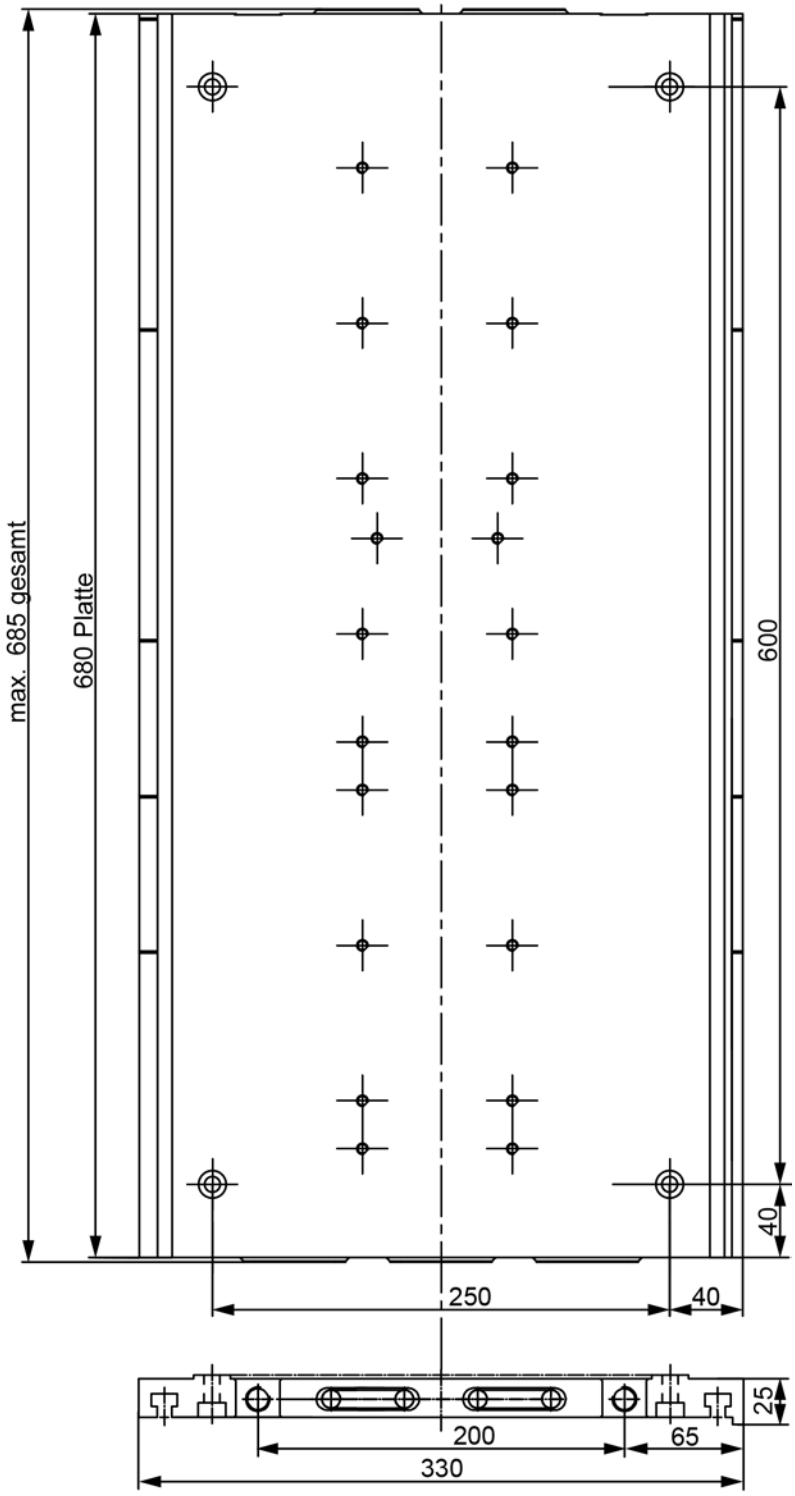
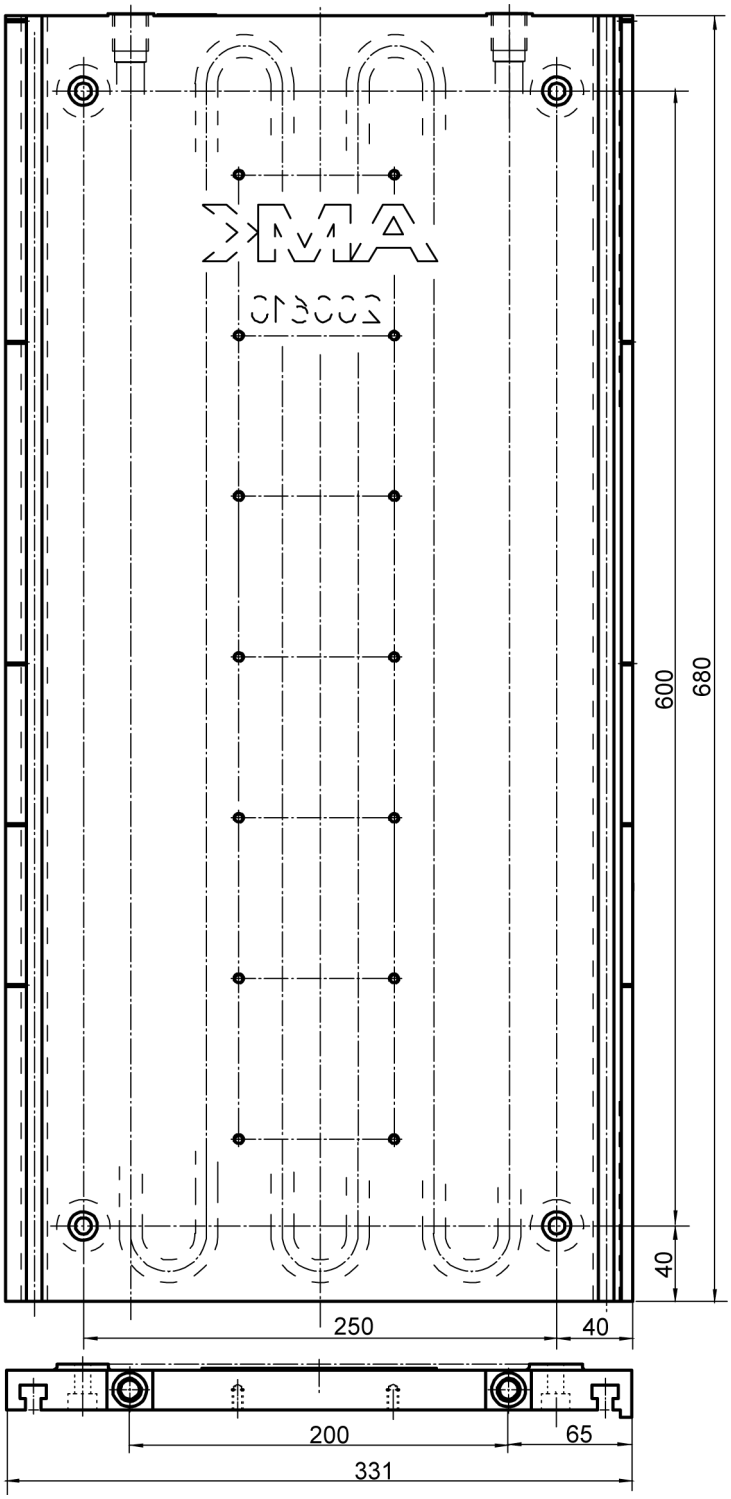
7.1.3 KW-CP680



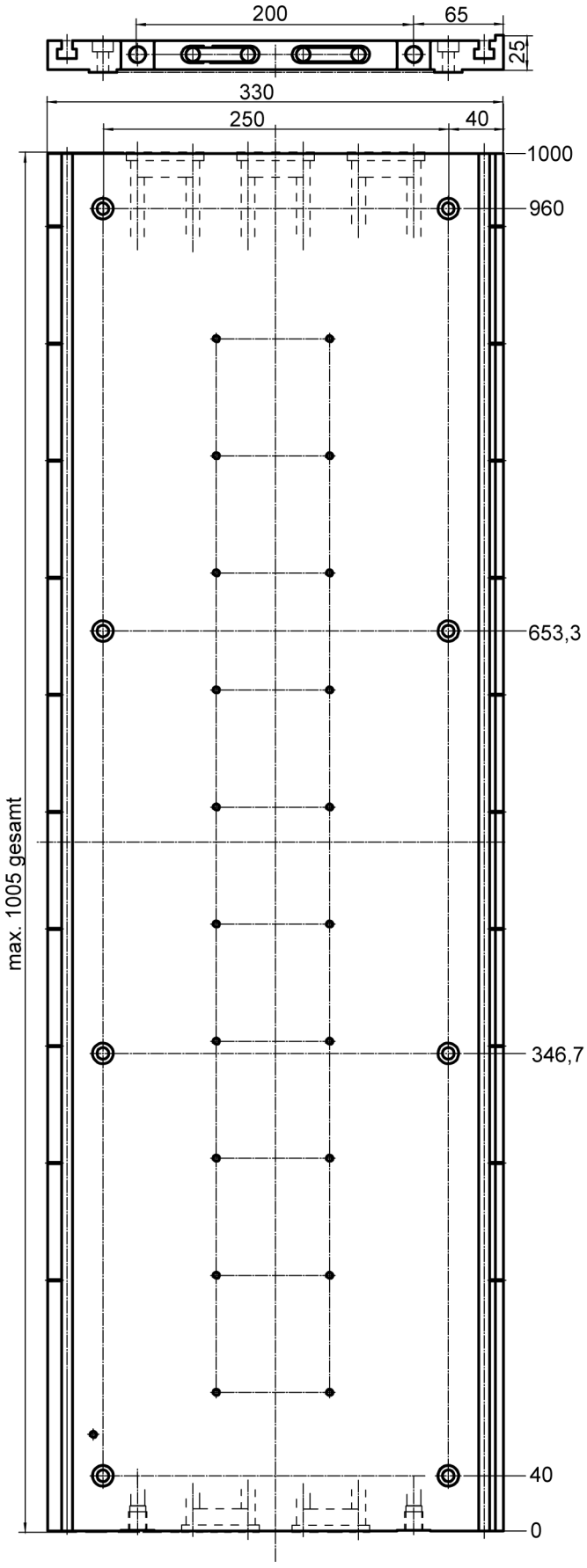
(cross-wise image alignment)

7.1.4 KW-CP680-V



(cross-wise image alignment)

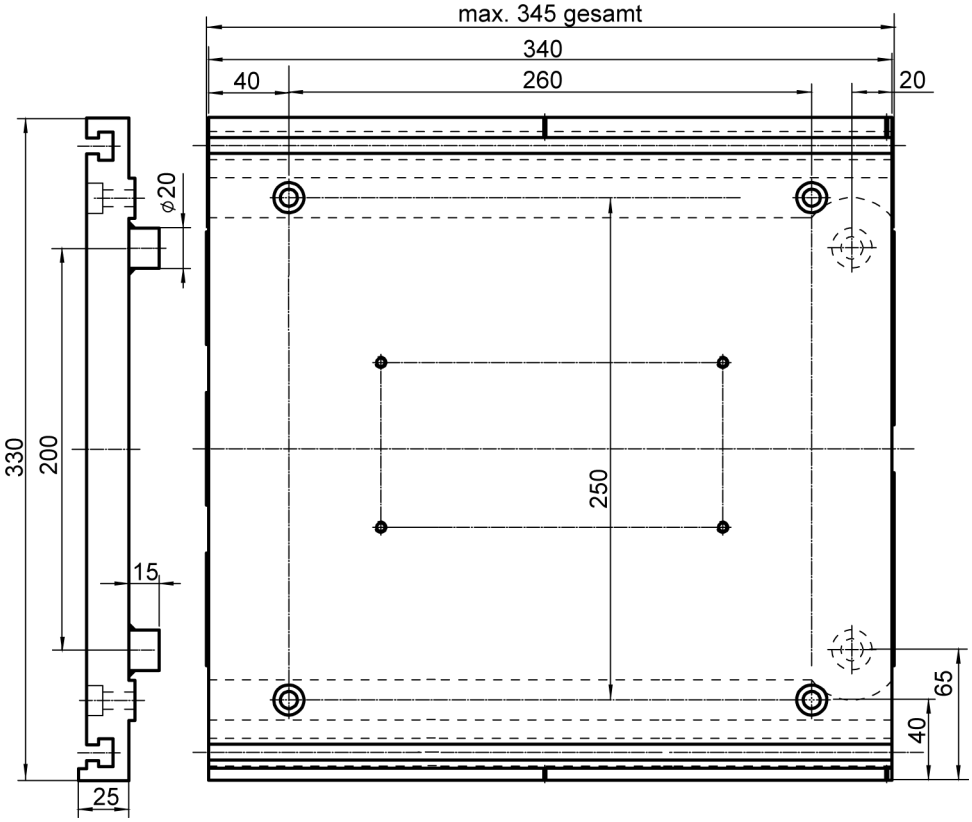
7.2 Cold plate KW-CP1000 with cooling connection on the left hand side



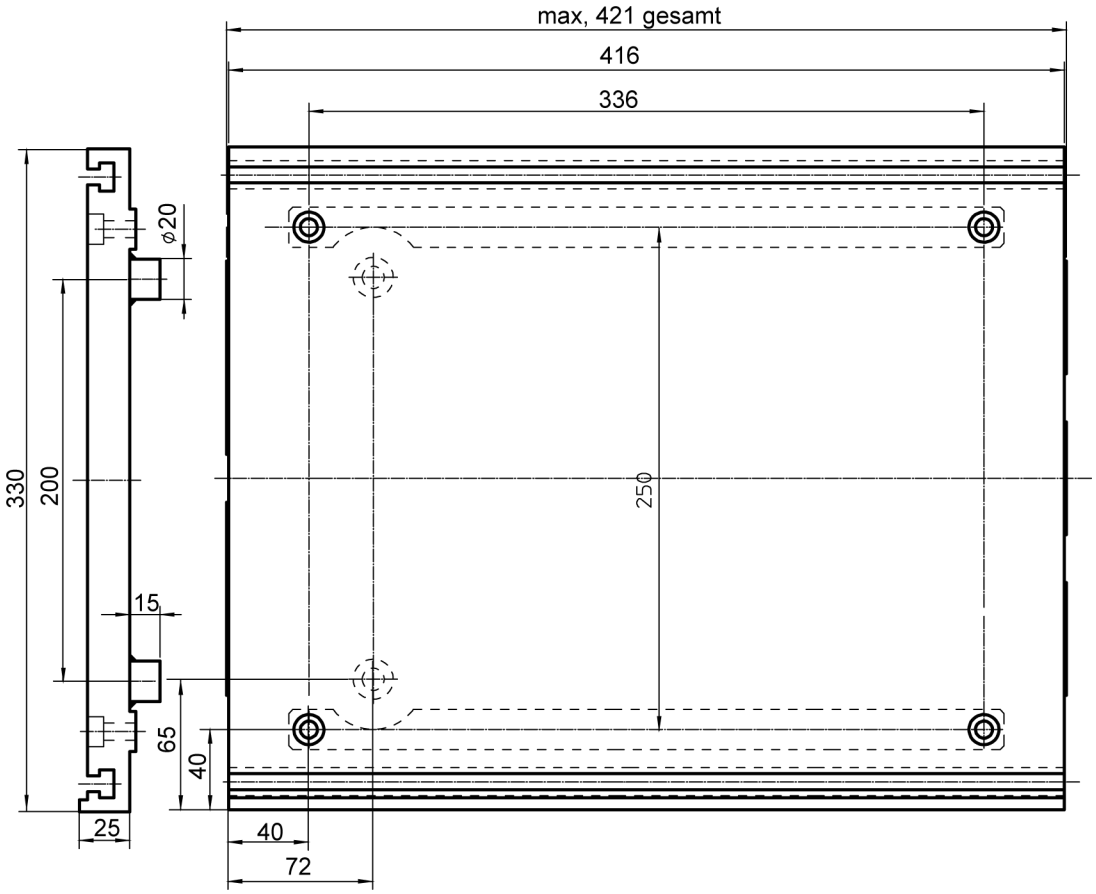
(cross-wise image alignment)

7.3 Cold plates with cooling connection on the rear side

7.3.1 KW-CP340R

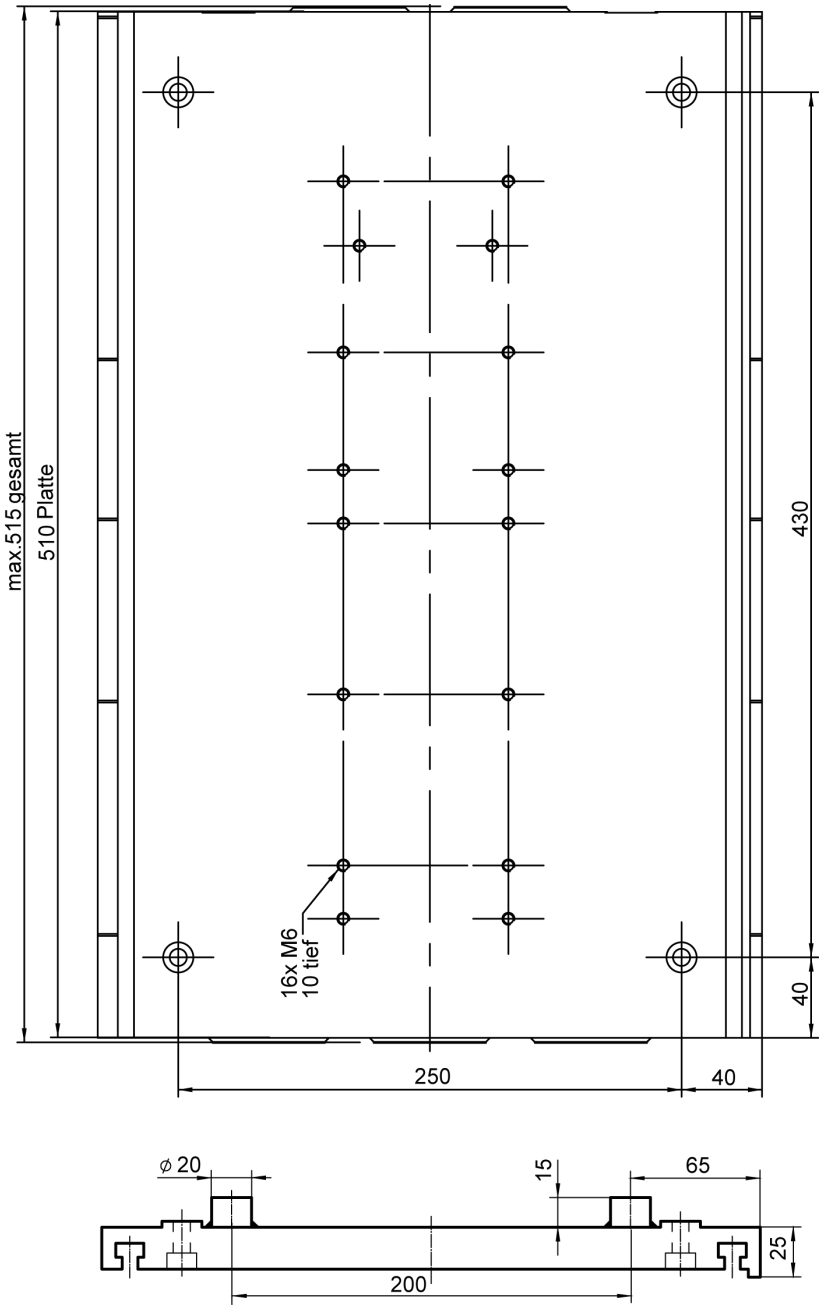


7.3.2 KW-CP420R



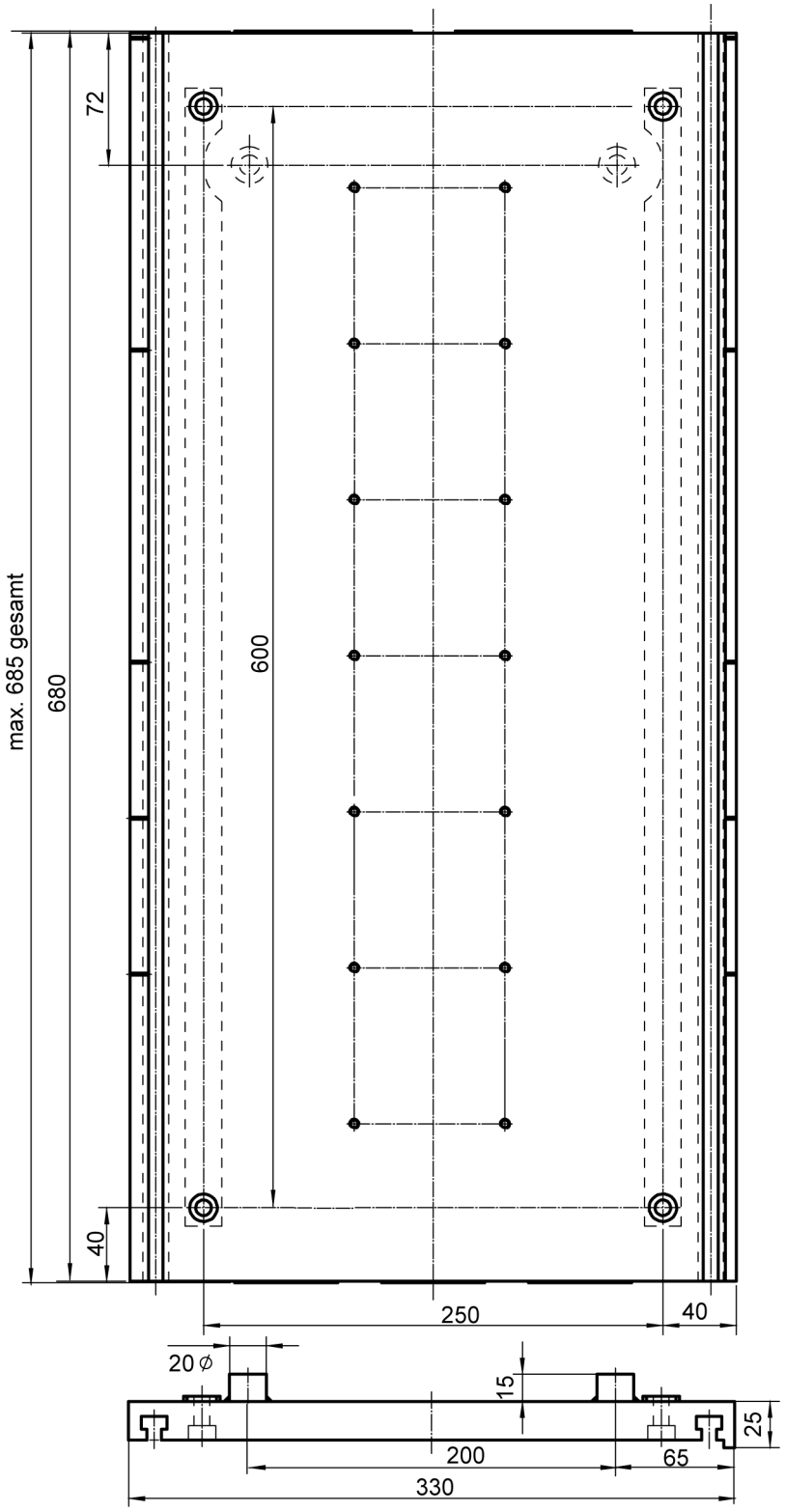
The KW-CP420R cold plate does not contain threaded bores for centre screw connections. It is suitable solely for the use of use of the KE/KW modules with a width of 55 mm and 85 mm.

7.3.3 KW-CP510R



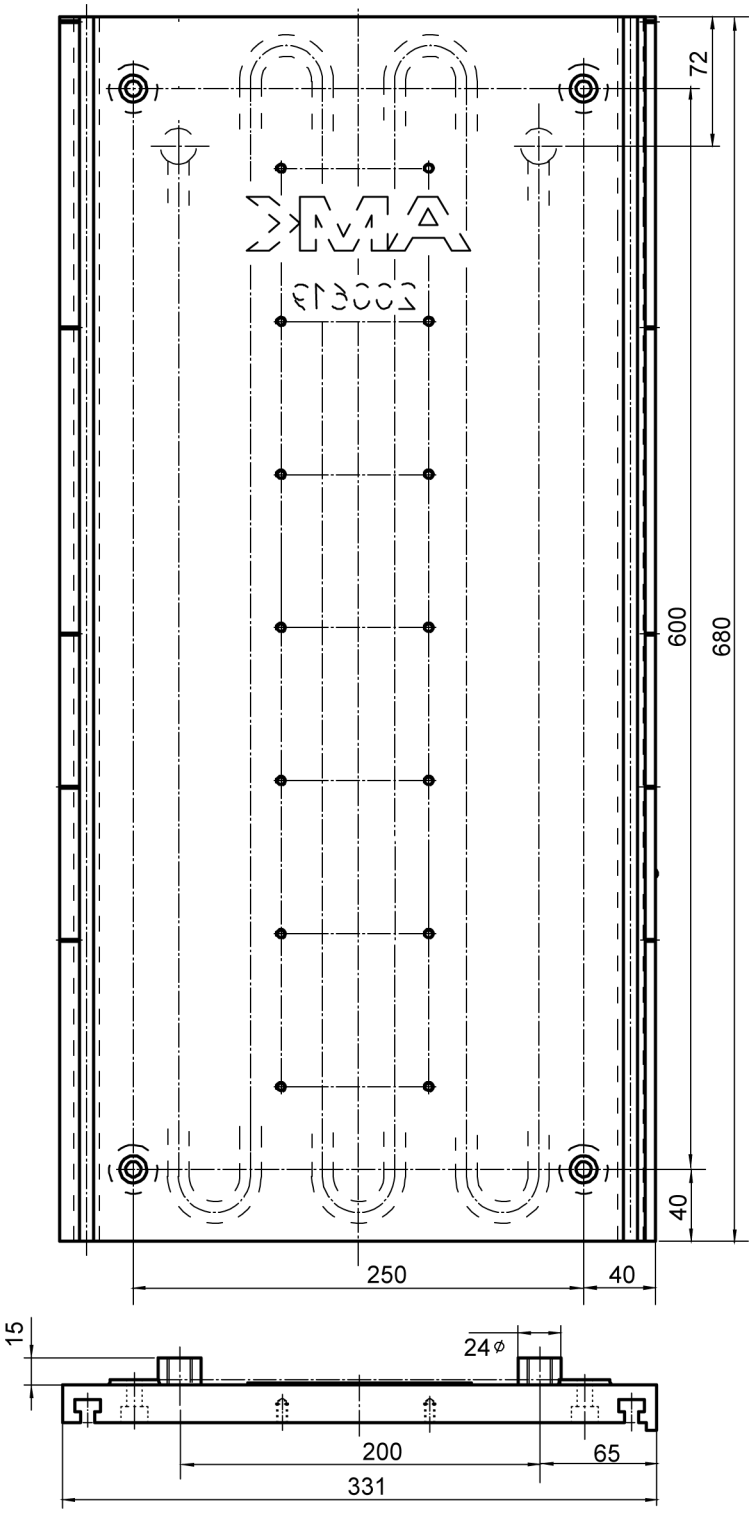
(cross-wise image alignment)

7.3.4 KW-CP680R



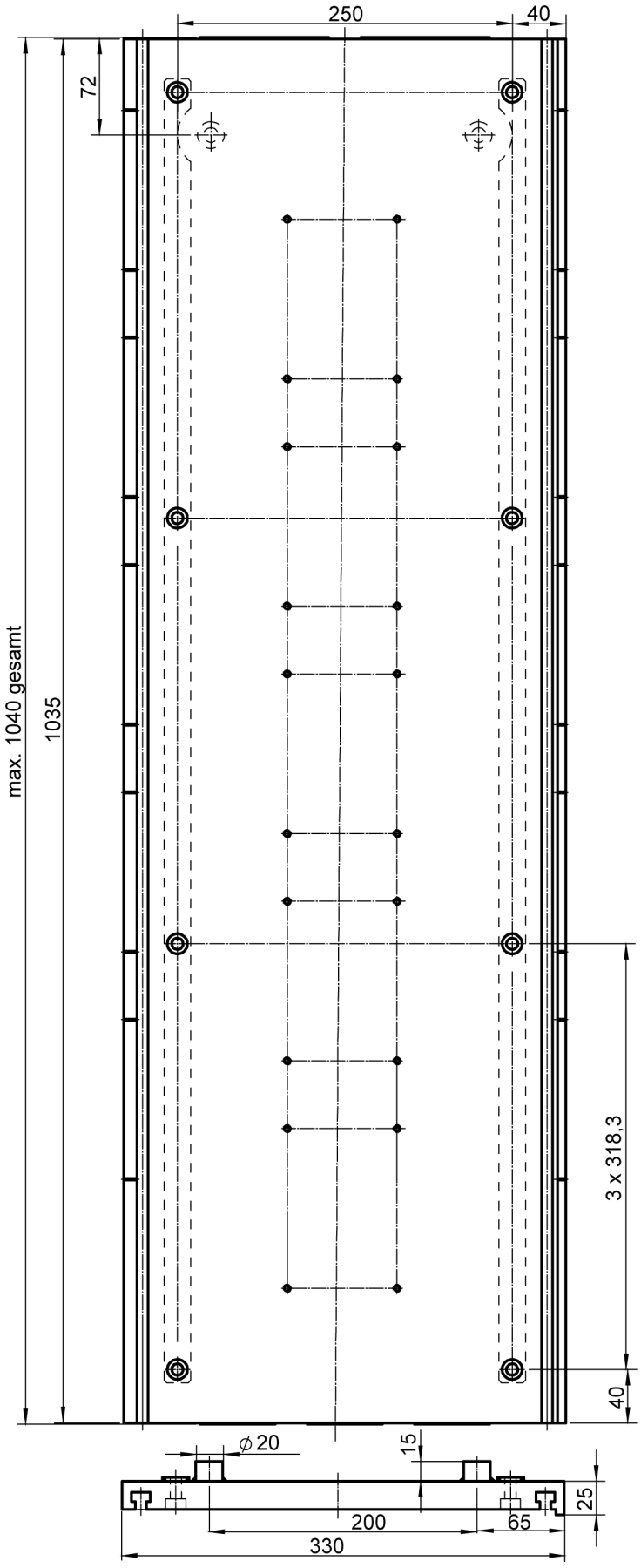
(cross-wise image alignment)

7.3.5 KW-CP680R-V



(cross-wise image alignment)

7.3.6 KW-CP1035R



(cross-wise image alignment)

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or
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Your AMKmotion documentation team

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   (1) very good (2) good (3) satisfactory (4) less than satisfactory (5) poor

2. Is the content structured well?

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3. How easy is it to understand the documentation?

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4. Did you miss any topics in the documentation?

   (1) no (2) if yes, which ones:

5. How would you rate the overall service at AMKmotion?

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