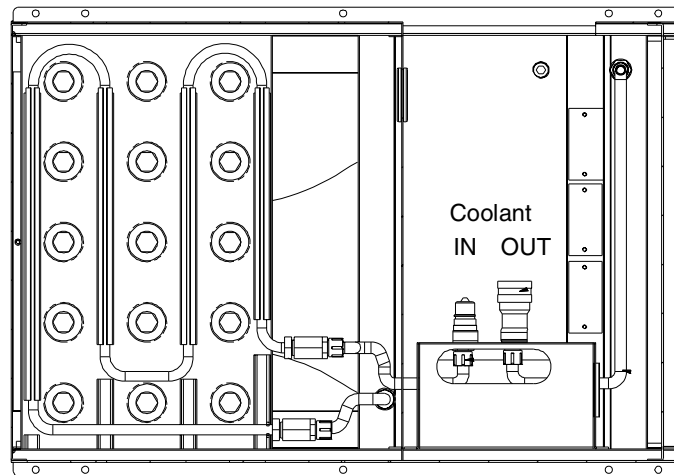


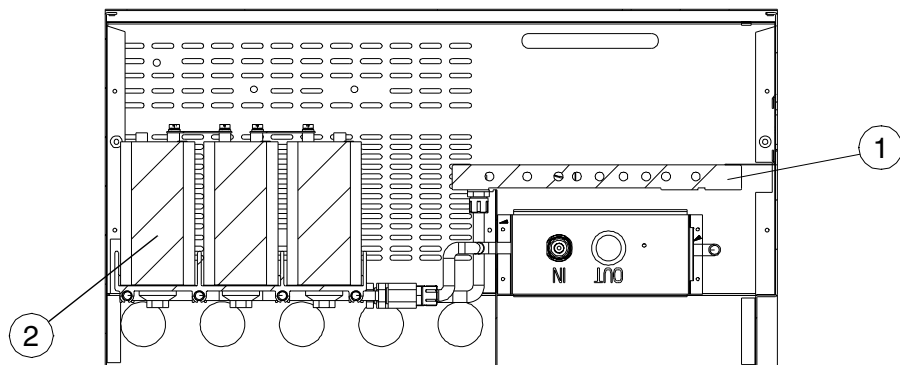
Cooling Principle

The figure below shows the cooling of one phase module. The coolant circulates through the mounting plate of the power stage components (1) and through the capacitor bank.

REAR VIEW



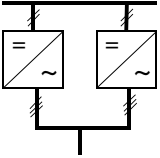
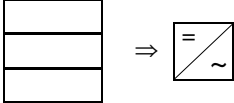
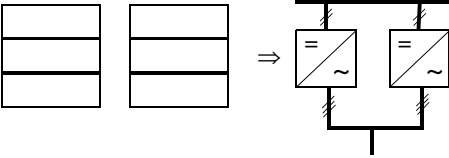
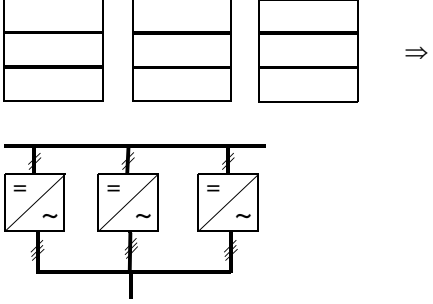
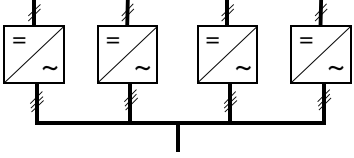
TOP VIEW



With a ventilated cubicle, an air baffle must be installed to prevent the cooling air from circulating inside the cubicle.

With a closed-type cubicle, an air-to-water heat exchanger must be used. (No additional fan is needed.)

Configuration The basic configurations of the inverter modules are as follows:

Frame Size	Configuration
R8i, R9i	
2 x R9i	
R12i	Three phase modules = one inverter 
2 x R12i	2 x three phase modules = two phase module blocks ⇒ one inverter 
3 x R12i	3 x three phase modules = three phase module blocks ⇒ one inverter 
4 x R12i	4 x three phase modules = four phase module blocks ⇒ one inverter 

Components The control electronics are identical to the corresponding air-cooled drive units. Units that consist of parallel-connected smaller (phase) modules (2×R9i, 2×R12i, etc.) require an optical PPCS branching unit.

The components specific to the water-cooled drive units are presented below.

Cooling Fans for Water-cooled Inverter Modules					
Inverter Module Frame	Auxiliary Voltage (V AC)	Qty	Ordering Code	Type	Connection Cable Length
R8i, R9i, 2×R9i	230	1	×	10028841	Not included. Connector: Screw terminal block
	115	1	×	10032318	
R12i	230	2	×	64490052	2.1 m
	115	2	×	64490061	
2×R12i	230	4	×	64490052	
	115	4	×	64490061	
3×R12i	230	6	×	64490052	
	115	6	×	64490061	
4×R12i	230	8	×	64490052	
	115	8	×	64490061	

Mounting Frames for Water-cooled Inverter Modules			
Inverter Module Frame	Qty	Ordering Code	Dimensions
R8i, R9i	1	×	64497821
2×R9i	2	×	64497821
R12i	1	×	64497812
2×R12i	2	×	64497812
3×R12i	3	×	64497812
4×R12i	4	×	64497812

Input (DC) Fuses for Water-cooled Inverter Modules						
Inverter Module Frame	Qty	Ordering Code	U_N (V)	I_N (A)	Type	Size
R8i, R9i	2 ×	10001773	1250	630	170M6205	03SHT
2×R9i	4 ×					
R12i	6 ×					
2×R12i	12 ×					
3×R12i	18 ×					
4×R12i	24 ×					

For fuseholders, see the *Product Catalogue*.

Switch Fuse Kits for Water-cooled Inverter Modules					
Fuses and fuseholders are not included.					
Aux. Voltage (V AC)	Inverter Module Frame	Qty	Ordering Code	Kit Contents	Charging Circuit Type
230	R8i, R9i	1 ×	64349686	1–Switch Fuse (OESA630D2PL-21/1, including: locking device, charging contacts, 1–NC contact, 1–NO contact) • 2–Resistor (ZRF 30×165) • 1–Charging Monitoring Unit (NCHM-21C) • 1–Wire Set, OESA control wiring	3
	2×R9i	1 ×	64349473	1–Switch Fuse (OESA630DF4PL-21/1, including: locking device, charging contacts, 1–NC contact, 1–NO contact) • 4–Resistor (ZRF 30×165) • 1–Charging Monitoring Unit (NCHM-21C) • 1–Wire Set, OESA control wiring	
	3×R12i	4 ×			
	R12i	1 ×	64349538	1–Switch Fuse (OESA630D6PL-21/1, including: locking device, charging contacts, 1–NC contact, 1–NO contact) • 6–Resistor (ZRF 30×165) • 1–Charging Monitoring Unit (NCHM-21C) • 1–Wire Set, OESA control wiring	
	2×R12i	2 ×			
	4×R12i	4 ×			
115	R8i, R9i	1 ×	64349694	1–Switch Fuse (OESA630D2PL-21/2, including: locking device, charging contacts, 1–NC contact, 1–NO contact) • 2–Resistor (ZRF 30×165) • 1–Charging Monitoring Unit (NCHM-11C) • 1–Wire Set, OESA control wiring	
	2×R9i	1 ×	64349481	1–Switch Fuse (OESA630DF4PL-X, including: locking device, charging contacts, 1–NC contact, 1–NO contact) • 4–Resistor (ZRF 30×165) • 1–Charging Monitoring Unit (NCHM-11C) • 1–Wire Set, OESA control wiring	
	3×R12i	4 ×			
	R12i	1 ×	64349546	1–Switch Fuse (OESA630D6PL-21/2, including: locking device, charging contacts, 1–NC contact, 1–NO contact) • 6–Resistor (ZRF 30×165) • 1–Charging Monitoring Unit (NCHM-11C) • 1–Wire Set, OESA control wiring	
	2×R12i	2 ×			
	4×R12i	4 ×			

Charging Circuit Fuses for Water-cooled Inverter Modules						
Inverter Module Frame	Qty	Ordering Code	U_N (V)	I_N (A)	Type	Size
ACW 634 0210 6 ACW 634 0320 6 ACW 634 0380 6 ACW 634 0490 6 ACW 634 0710 6 ACW 634 0930 6 ACW 634 1050 6 ACW 634 1390 6	2 ×	10032601	1000	10	170M2690	00
ACW 634 1985 6 ACW 634 2625 6	4 ×					
ACW 634 2945 6 ACW 634 3900 6	6 ×					
ACW 634 5145 6	8 ×					

For fuseholders, see the *Product Catalogue*.

Optical (PPCS) Branching Unit Kits for Water-cooled Inverter Modules		
Inverter Module Frame	Ordering Code	Kit Contents
2×R9i, 2×R12i	64349091	1–NPBU-42C 2–Fibre Optic Cable (2000 mm) 2–Fibre Optic Cable (3000 mm)
3×R12i, 4×R12i	64349139	1–NPBU-42C 4–Fibre Optic Cable (3000 mm) 4–Fibre Optic Cable (5000 mm)

du/dt Filters for Water-cooled Inverter Modules							
Inverter Module Frame	Qty	Ordering Code	Type	I_{RMS} (A)	L (μH)	Power Loss (W)	Connection Size
R8i, R9i	3 ×	10030340 58982911*	NOCH0400-60	351	52	250	M10
2×R9i	6 ×						
R12i	9 ×						
2×R12i	18 ×						
3×R12i	27 ×						
4×R12i	36 ×						

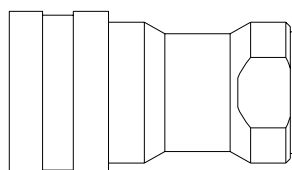
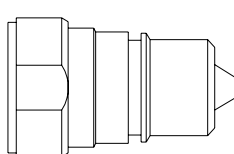
*Connecting busbars and insulating supports included

Common Mode Filters (CMF) / Light Common Mode Filters (LCMF) for Water-cooled Inverter Modules						
Inverter Module Type	CMF			LCMF		
	Qty		Ordering Code	Qty		Ordering Code
ACW 634 0210 6 ACW 634 0320 6 ACW 634 0380 6	1	×	64315811	1	×	64392611
ACW 634 0490 6	2	×	64315811	2	×	64392611
ACW 634 0710 6	3	×	64315811	3	×	64392611
ACW 634 0930 6	4	×	64315811	4	×	64392611
ACW 634 1050 6 ACW 634 1390 6	6	×	64315811	6	×	64392611
ACW 634 1985 6 ACW 634 2625 6	12	×	64315811	12	×	64392611
ACW 634 2945 6	16	×	64315811	16	×	64392611
ACW 634 3900 6 ACW 634 5145 6	24	×	64315811	24	×	64392611

Air-to-Water Heat Exchangers for Water-cooled Inverter Modules						
Inverter Module Type	Qty	Ordering Code	Type	P_N (kW)	Coolant	
					Capacity (l)	Flow (kg/h)
ACW 634 0210 6 ACW 634 0320 6 ACW 634 0380 6 ACW 634 0490 6 ACW 634 0710 6 ACW 634 0930 6	1	×	64433041	–	2.0	1.0 240
ACW 634 1050 6 ACW 634 1390 6	1	×	64345095	201702	2.0	2.0 700
ACW 634 1985 6 ACW 634 2625 6	2	×	64345095	201702	2 × 2.0	2 × 2.0 2 × 700
ACW 634 2945 6 ACW 634 3900 6	3	×	64345095	201702	3 × 2.0	3 × 2.0 3 × 700
ACW 634 5145 6	4	×	64345095	201702	4 × 2.0	4 × 2.0 4 × 700

Quick Release Coupling Kits for Water-cooled Inverter Modules			
Inverter Module Type	Qty	Ordering Code	Type
ACW 634 0210 6 ACW 634 0320 6 ACW 634 0380 6 ACW 634 0490 6	1 ×	64438841	1–ALGR520-6 R3/8 HK SH-3-63 1–ALGR510-06 R3/8 HK SH-3-62
ACW 634 0710 6 ACW 634 0930 6	2 ×		
ACW 634 1050 6 ACW 634 1390 6	3 ×		
ACW 634 1985 6 ACW 634 2625 6	6 ×		
ACW 634 2945 6 ACW 634 3900 6	9 ×		
ACW 634 5145 6	12 ×		

Each kit contains both the female and male halves of a complete quick release coupling.



Size: 3/8"

Braking Choppers

The NBRW-669C is the water-cooled counterpart of the air-cooled NBRA-669C braking chopper.

Water-cooled Braking Chopper														
U_N (V)	Ordering Code	Type	P_{brmax} (kW)	P_{cont} (kW)	I_{max} (A)	I_{rms} (A)	R (ohm)	C (mF)	Duty Cycle (10/60 s)		Duty Cycle (1/5 min)		U_{br_on} (V)	U_{br_off} (V)
									P_{br} (kW)	I_{rms} (A)	P_{br} (kW)	I_{rms} (A)		
690	64260049	NBRW-669C	404	119	414	107	2.72	20.1	404	361	298	267	1120	1096

U_N = Nominal voltage

P_{brmax} = Maximum short-term (1 min every 10 mins) braking power

P_{cont} = Maximum continuous braking power

I_{max} = Maximum peak current

I_{rms} = Corresponding RMS current

R = Recommended resistance

C = Assumed DC bus capacitance (including supply and inverter modules) per chopper. If actual DC bus capacitance (per chopper) is lower than this value, see derating instructions given in *The ACS 600 MultiDrive Modules Engineering Tool*, or contact an ABB representative.

P_{br} = Braking power for the specified duty cycle

U_{br_on} = DC bus voltage at which chopper starts conducting

U_{br_off} = DC bus voltage at which chopper stops conducting

NBRW-669C units can be connected in parallel to form the following dynamic braking units. Note that each chopper must have their own resistor system.

Water-cooled Braking Units											
U_N	Chopper(s)	Qty	Ordering Code	R (ohm)	P_{brmax} (kW)	P_{cont} (kW)	I_{max} (A)	Duty Cycle (10/60 s)		Duty Cycle (1/5 min)	
								P_{br} (kW)	I_{rms} (A)	P_{br} (kW)	I_{rms} (A)
690 V	NBRW-669C	1	× 64260049	2.72	404	119	414	404	361	298	267
	2 × NBRW-669C	2	× 64260049	2.72	807	238	828	808	722	596	534
	3 × NBRW-669C	3	× 64260049	2.72	1211	357	1242	1212	1083	894	801
	4 × NBRW-669C	4	× 64260049	2.72	1615	476	1656	1616	1444	1192	1068
	5 × NBRW-669C	5	× 64260049	2.72	2019	595	2070	2020	1805	1490	1335
	6 × NBRW-669C	6	× 64260049	2.72	2422	714	2484	2424	2166	1788	1602

U_N = Nominal voltage

R = Recommended resistor resistance (per chopper)

P_{brmax} = Maximum total short-term (1 min every 10 mins) braking power

P_{cont} = Maximum total continuous braking power

I_{max} = Maximum total peak current at recommended resistance

P_{br} = Total braking power for the specified duty cycle

I_{rms} = Corresponding total RMS current

Cooling Characteristics of Water-cooled Braking Units				
Choppers	Power Loss		Coolant	
	into Coolant (kW)	into Cooling Air (kW)	Capacity (l)	Flow (kg/h)
1 × NBRW-669C	1.8	0.2	0.4	140
2 × NBRW-669C	3.6	0.4	2 × 0.4	2 × 140
3 × NBRW-669C	5.4	0.6	3 × 0.4	3 × 140
4 × NBRW-669C	7.2	0.8	4 × 0.4	4 × 140
5 × NBRW-669C	9.0	1.0	5 × 0.4	5 × 140
6 × NBRW-669C	10.8	1.2	6 × 0.4	6 × 140

Braking Resistors There are currently no water-cooled resistors available in the *ACS 600 MultiDrive Modules* product range. However, the air-cooled resistors specified in the *Product Catalogue* can be used if otherwise allowed by the application.

Configuration The configuration of a water-cooled dynamic braking unit is the same as with air-cooled choppers.

Components The attenuator, DC fuses, and fuse bases are identical to those used with an air-cooled unit (see the *Product Catalogue* for the ordering codes). However, in a water-cooled braking unit, the cooling fan is different due to the fact that it is only required for circulating the air inside the cubicle.

Cooling Fan Kits for Water-cooled Braking Units					
Auxiliary Voltage (V AC)	Choppers	Qty	Ordering Code	Type	Connection Cable Length
230	1 × NBRW-669C 2 × NBRW-669C	1	× 10012171	W2E 200-HH38-06	Not included. Connector: Screw terminal block.
	3 × NBRW-669C 4 × NBRW-669C	2	× 10012171		
	5 × NBRW-669C 6 × NBRW-669C	3	× 10012171		
115	1 × NBRW-669C 2 × NBRW-669C	1	× 10032300	W2E 200-HH86-14	
	3 × NBRW-669C 4 × NBRW-669C	2	× 10032300		
	5 × NBRW-669C 6 × NBRW-669C	3	× 10032300		

ACW 695 Water Cooling Sections

A water cooling section can be used to isolate the cooling system of the drive from an external system. This is necessary if the water quality, temperature variation, etc. of the on-site cooling system do not match those required by the drive.

The water cooling section contains a water/water heat exchanger, a pump, and a control unit to adjust the coolant flow in the drive.

The ACS 600 MultiDrive Modules product range contains these complete water cooling sections:

Water Cooling Sections									
Type	Ordering Code	P_N (kW)	Power Loss		Coolant			Operating Point at 150 kPa (kg/h)	Pressure Loss (kPa)
			into Coolant (kW)	into Cooling Air (kW)	Capacity (internal system) (l)	Capacity (external system) (l)	Nominal Mass Flow (kg/h)		
380 to 690 V									
ACW 695 xxxxx*	xxxxx	38	1.4	0.6	20.0	4.0	8700	4800	150
ACW 695 050	Contact an ABB sales representative.	50	1.8	0.2	36.0	7.0	14400	12960	150
ACW 695 100		100	2.1	0.2	39.0	10.0	26300	19800	150
ACW 695 175		175	2.3	0.2	41.0	12.0	35300	23400	150

*This type consists of the components installed in a mounting frame. The other types are housed in a cubicle.

For dimensions, see [Appendix B – Dimensional Diagrams](#).

The water cooling sections are detailed in the *ACW 695 Water Cooling Sections User's Manual* (3BFE 64314912 [English]).