ABB LV AC DRIVE

User Manual for PIHF Harmonic Filters

Applicable to ACS510/ACS530
ACx580-01/04
ACS880-01/04

List of Related Manuals

Drive Manuals and Guides	Code (English)	Code (Chinese)
ACS510 Frequency Converter User Manual	*3ABD00017199*	*3ABD00016170*
ACS530 Frequency Converter Hardware Manual	*3AXD50000035400*	*3AXD50000035399*
ACS530 Standard Firmware Manual	*3AXD50000035402*	*3AXD50000035401*
ACS580-01 Frequency Converter Hardware Manual	*3AXD50000019738*	*3AXD50000018826*
ACS580 Standard Firmware Manual	*3AXD50000016097*	*3AXD50000016430*
ACS580-04 Drive Module Hardware Manual	*3AXD50000015497*	*3AXD50000016428*
ACH550-01 Frequency Converter User Manual	*3AFE68258537*	*3ABD00036052*
ACH580 Standard Firmware Manual	*3AXD50000027537*	*3ABD00045445*
ACH580-01 Frequency Converter Hardware Manual	*3AUA0000076331*	*3ABD00045444*
ACH580-04 Drive Module Hardware Manual	*3AXD50000048685*	*3ABD00046059*
ACQ580 Standard Firmware Manual	*3AXD50000035867*	*3ABD00045443*
ACQ580-01 Frequency Converter Hardware Manual	*3AXD50000035866*	*3ABD00045442*
ACQ580-04 Drive Module Hardware Manual	*3AXD50000048677*	*3ABD00046061*
ACS880-01 Hardware Manual	*3AUA0000078093*	*3AXD50000009104*
ACS880-04 Hardware Manual	*3AUA0000128301*	*3AXD50000023005*
ACS880 Primary Control Program Firmware Manual	*3AUA0000085967*	*3AXD50000009105*

Tools and Maintenance Manual	
Drive composer PC Tool User Manual	*3AUA0000094606*

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1

Safety Instructions

Contents

The safety instructions necessary to the installation, operation and maintenance of harmonic filter units are described in this chapter. Ignoring these safety instructions may result in personal injury or damage to filters, drives, motors or other drive equipment. Please read this chapter carefully before operating the filter.

Safety of installation and maintenance

General safety instructions

Warning! All electrical installation and maintenance of harmonic filters shall be performed by qualified electrical engineers.

The harmonic filter and its connecting devices shall be grounded.

Never try any operation on the harmonic filter that has been powered on. After the power supply is cut off, the capacitor of the intermediate circuit shall be discharged for 5 minutes before operating the frequency converter, motor or motor cable. Before starting the operation, a voltage multimeter shall be used to check whether the incoming and outgoing terminals of harmonic filter have been discharged.

Safety instructions for harmonic filters

1. PIHF harmonic filter is matched with the frequency converter, which can only be mounted at the power inlet of the frequency converter.
2. The power of the selected filter shall be matched with that of the frequency converter as far as possible, to obtain the best filtering effect. If not matched, the filter with the higher power can be used for that with the lower power, but the filtering effect may be reduced.
3. A single PIHF filter can be used to power multiple frequency converters, but the total load shall not exceed the rated power value of PIHF filter.
4. The reactor in the filter is a heat generating device. It shall be mounted to keep a heat dissipation space of at least 150mm around the filter. When two filters are mounted in parallel, the distance between the filters shall be at least 200mm.
5. The capacitor in the filter is a temperature-sensitive device, of which the ambient temperature shall be kept below 50 ℃ .
6. A reliable ground wire shall be connected for mounting according to the wiring instructions in the circuit diagram.
7. If the harmonic filter needs to be operated, first measure whether there is any residual dangerous voltage on the incoming and outgoing terminals of the filter.

Grounding

Warning! Ignoring the following instructions may cause personal injury or death, and increase electromagnetic interference and equipment damage.

In any case, the harmonic filter, drive and its connecting equipment shall be grounded to ensure personal safety and reduce electromagnetic radiation and interference.

The size of the grounding conductor shall meet the requirements of local safety regulations.

2

Guide on Installation and Debugging of Filters

Contents

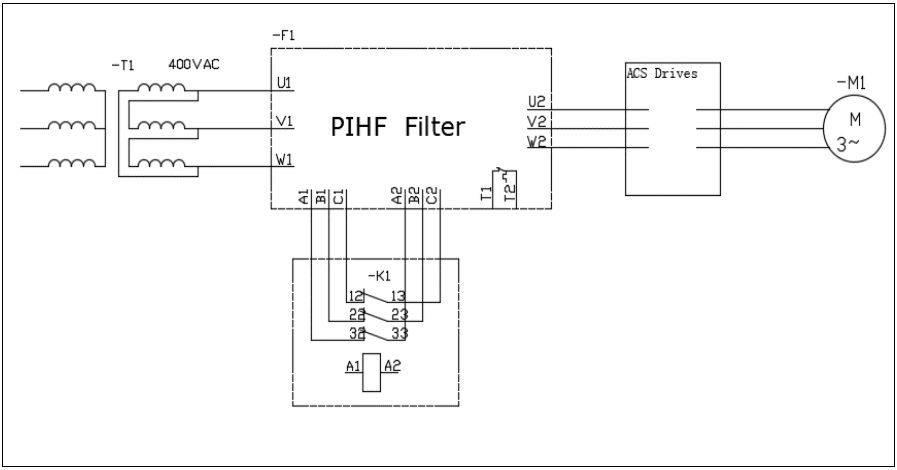
The operating principle and structure of the harmonic filter are briefly described in this chapter.

Product overview

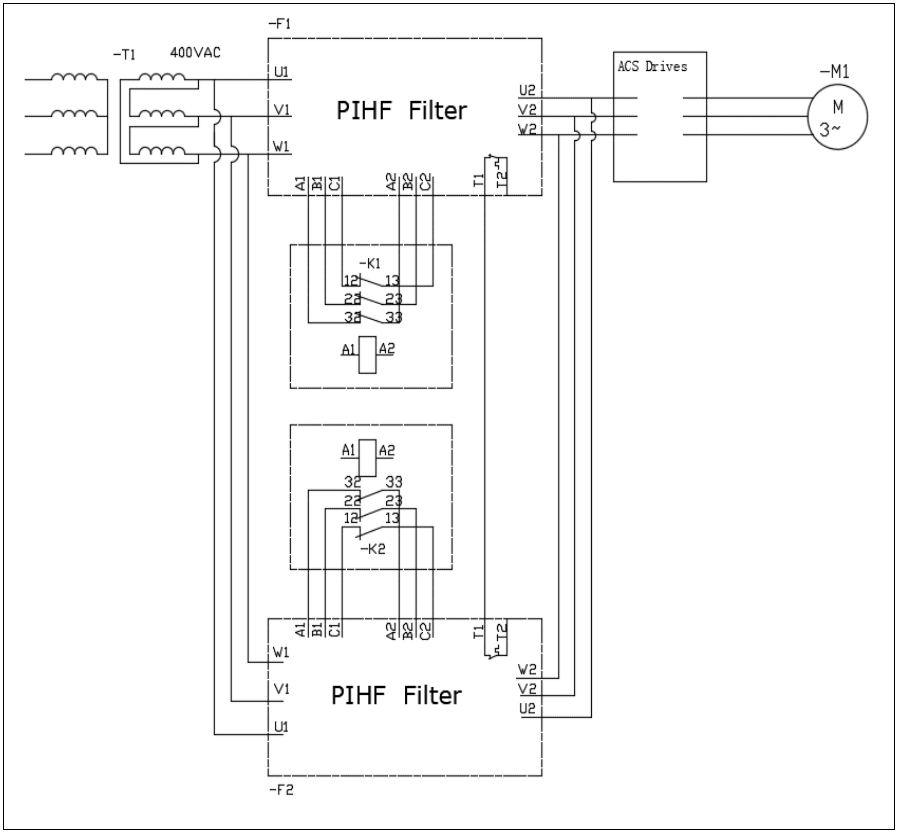
Wiring diagram

The harmonic filter is a low-pass filter that suppresses high-frequency harmonic currents on the input side of the drive. The figure below shows a drive system with harmonic filters.

Wiring diagram of single filter (1.5-250kW)



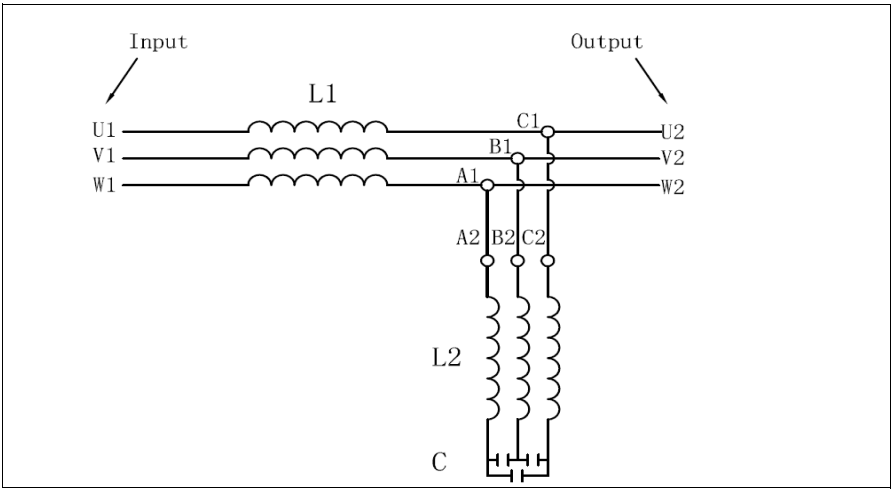
Wiring diagram of parallel filters (250-400kW)



1. The input terminals (U1,V1,W1) of the parallel filter are all connected to the power supply side, and the output terminals (U2,V2,W2) are all connected to the incoming line side of the frequency converter.
2. The over-temperature protection terminals of the parallel filter are connected in series before connection into the frequency converter.
3. Before connecting the contactor, A1-A2, B1-B2, and C1-C2 short-connected plates (short-connected for factory default) shall be removed, and the rated current of the contactor shall be greater than I_{filter}.It is recommended to use AC-3 contactors.
4. When connecting in parallel, the contactors with disconnected capacitors on each filter shall be allocated separately, and it is not allowed to share one contactor with several filters.
5. It is recommended that the cable length between the filter and the frequency converter should not be greater than 10 meters.

Electrical diagram

The figure below shows the electrical diagram of harmonic filters.



Model label

PIHF-xxxx-x-xx

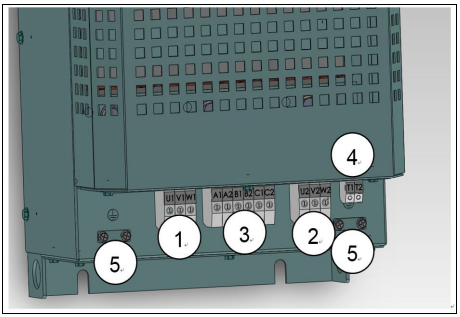
- Harmonic content: 10=10%
- Rated voltage: 4=400V
- Rated current: 0004=4A
- Product: PIHF harmonic filter

Mechanical installation

The protection degree of PIHF harmonic filter is IP00. The filter shall be installed in a suitable housing or cabinet to ensure safety. The filter adopts natural cooling. Please keep a heat dissipation space of at least 150mm around the filter. If the filters are installed in parallel, the installation distance between the filters shall be at least 200mm. There shall be enough fresh cooling air for use, and hot air can freely escape from the filter housing or cabinet.

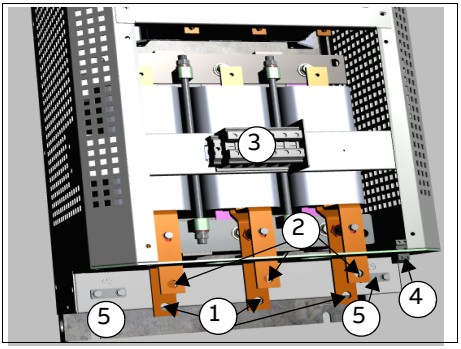
Electrical connection

S1...S4



No.	Terminal No.	Description
1	U1/V1/W1	PIHF filter input terminal
2	U2/V2/W2	PIHF filter output terminal
3	A1/B1/C1/A2/B2/C2	PIHF filter loop control terminal (external contactor control)
4	T1/T2	Overheat protection switch terminal
5		Protective earthing

S5...S6



No.	Terminal No.	Description
1	U1/V1/W1	PIHF filter input terminal
2	U2/V2/W2	PIHF filter output terminal
3	A1/B1/C1/A2/B2/C2	Filter branch bypass control terminal of PIHF filter (external contactor control)
4	T1/T2	Overheat protection switch terminal
5		Protective earthing

*For the use of bypassing the filter branch, after removing the short wiring of A1-A2, B1-B2, and C1-C2, the user selects the appropriate control contactor according to the I_{filter} current value in the selection information.

*Overheating protection terminals T1- T2 can be connected to the frequency converter as overheating protection signals. In the normal state, it is normally closed. When the temperature limit of the overheat protection is reached, the state will turn to off.

Typical power cable specifications (copper) and wiring torque

Harmonic filter model	Incoming and outgoing line terminal U1/V1/W1 U2/V2/W2		Capacitor switching terminal A1/B1/C1 A2/B2/C2		Temperature control terminal T1/T2		PE	
PIHF-0004-4-10	1.5mm2 AWG14	1.1-1.5 N.m	1.5mm2 AWG14	1.1-1.5 N.m	1.5mm2 AWG16	0.6-0.8 N.m	1.5mm2 AWG14	1.1-1.5 N.m
PIHF-0007-4-10								
PIHF-0012-4-10								
PIHF-0015-4-10	6mm2 AWG8		2.5mm2 AWG14				6mm2 AWG8	
PIHF-0030-4-10	10mm2 AWG6		4mm2 AWG10				10mm2 AWG6	
PIHF-0045-4-10	16mm2 AWG6	2.5-2.8 N.m	4mm2 AWG10				16mm2 AWG6	4.2-5.1 N.m
PIHF-0075-4-10	35mm2 AWG3	4.3-4.6 N.m	6mm2 AWG8					
PIHF-0090-4-10			10mm2 AWG6					
PIHF-0160-4-10	120mm2 AWG3/0	37.5-50.8 N.m	16mm2 AWG6	2.5-3 N.m			70mm2 AWG2/0	10-13.5 N.m
PIHF-0205-4-10	150mm2 300MCM		25mm2 AWG3	3.2-3.7 N.m				
PIHF-0290-4-10	2x95mm2 2xAWG3/0		35mm2 AWG2				95mm2 AWG3/0	
PIHF-0363-4-10	2*150mm2 2x300MCM		70mm2 AWG2/0	8-10 N.m			150mm2 300MCM	
PIHF-0430-4-10								

Parameter setting

Under the default setting of ACS510, the parameter **26.19** *(enabling or disabling the DC voltage regulator) is used for disabling.*

The DC voltage regulator is used to prevent possible voltage oscillation in the DC bus of the frequency converter due to the motor load or weak grid. In case of voltage fluctuation, the frequency converter will adjust the frequency reference to stabilize the bus voltage, thereby stabilizing the oscillation of load torque.

When the filter is matched with ACS510 frequency converter, if bus oscillation occurs, the parameter **26.19** shall be set to **ENABLE** state to reduce bus oscillation so as to avoid input phase loss of the frequency converter.

When the filter is matched with ACS530/ACx580/ACS880 frequency converter, the parameter **97.48** and **227.17** shall be set to obtain the same adjusting effect.

Model information

Selection information table

PIHF-	ACS510 -01	Frame size	ACS530 -01	Frame size	ACx580 -01	Frame size	ACS880 -01	Frame size
3ph 400VAC								
0004-4-10	-	-	02A6	R0	02A7	R1	02A4	R1
	03A3	R1	03A3	R0	03A4	R1	03A3	R1
	04A1	R1	04A0	R0	04A1	R1	04A0	R1
0007-4-10	05A6	R1	05A6	R0	05A7	R1	05A6	R1
	07A2	R1	07A2	R0	07A3	R1	07A2	R1
0012-4-10	09A4	R1	09A4	R0	09A5	R1	09A4	R1
	012A	R1	12A6	R1	12A7	R1	12A6	R1
0015-4-10	017A	R2	017A	R2	018A	R2	017A	R2
0030-4-10	025A	R2	025A	R2	026A	R2	025A	R2
	031A	R3	033A	R3	033A	R3	032A	R3
0045-4-10	038A	R3	039A	R3	039A	R3	038A	R3
	046A	R3	046A	R3	046A	R3	045A	R4
0075-4-10	060A	R4	062A	R4	062A	R4	061A	R4
	072A	R4	073A	R4	073A	R4	072A	R5
0090-4-10	088A	R4	088A	R5	088A	R5	087A	R5
0160-4-10	-	-	106A	R5	106A	R5	105A	R6
	125A	R5	145A	R6	145A	R6	145A	R6
	157A	R6	169A	R7	169A	R7	169A	R7
0205-4-10	180A	R6	-	-	-	-	-	-
	195A	R6	206A	R7	206A	R7	206A	R7
0290-4-10	246A	R6	246A	R8	246A	R8	246A	R8
	290A	R6	293A	R8	293A	R8	293A	R8
0363-4-10	-	-	363A	R9	363A	R9	363A	R9
0430-4-10	-	-	430A	R9	430A	R9	430A	R9
PIHF-	**ACS510 -01**	**Frame size**	**ACS530 -01**	**Frame size**	**ACx580-04**	**Frame size**	**ACS880 -04**	**Frame size**
0505-4-10	-	-	-	-	505A	R10	505A	R10
0585-4-10	-	-	-	-	585A	R10	585A	R10
0650-4-10	-	-	-	-	650A	R10	650A	R10
0725-4-10	-	-	-	-	725A	R11	725A	R11

Maximum, heat dissipation and noise level

Harmonic filter model	I_{max} (A)	P_{max} (kW)	I_{filter} (A)	Noise level (dB)	Heat dissipating capacity (W)	CFMm3/h (CFM)
PIHF-0004-4-10	4.1	1.5	1.8	70	90	-
PIHF-0007-4-10	7.2	3	3	70	90	-
PIHF-0012-4-10	12.6	5.5	4.5	70	140	-
PIHF-0015-4-10	17	7.5	6	70	150	-
PIHF-0030-4-10	32	15	12	70	220	-
PIHF-0045-4-10	46	22	20	72	330	-
PIHF-0075-4-10	72	37	28	72	460	-
PIHF-0090-4-10	88	45	36	72	510	-
PIHF-0160-4-10	169	75	60	75	660	343(203)
PIHF-0205-4-10	206	110	75	75	850	343(203)
PIHF-0290-4-10	293	160	95	75	1050	592 (350)
PIHF-0363-4-10	363	200	125	75	1070	592 (350)
PIHF-0430-4-10	430	250	125	75	1150	592 (350)
PIHF-0505-4-10	505	250	-	80	1880	2*592 (2*350)
PIHF-0585-4-10	585	315	-	80	2100	2*592 (2*350)
PIHF-0650-4-10	650	355	-	80	2120	2*592 (2*350)
PIHF-0725-4-10	725	400	-	80	2200	2*1318 (2*780)

Rating	
I_{max}	Maximum sustained current
P_{max}	Maximum power
I_{filter}	Filter branch current

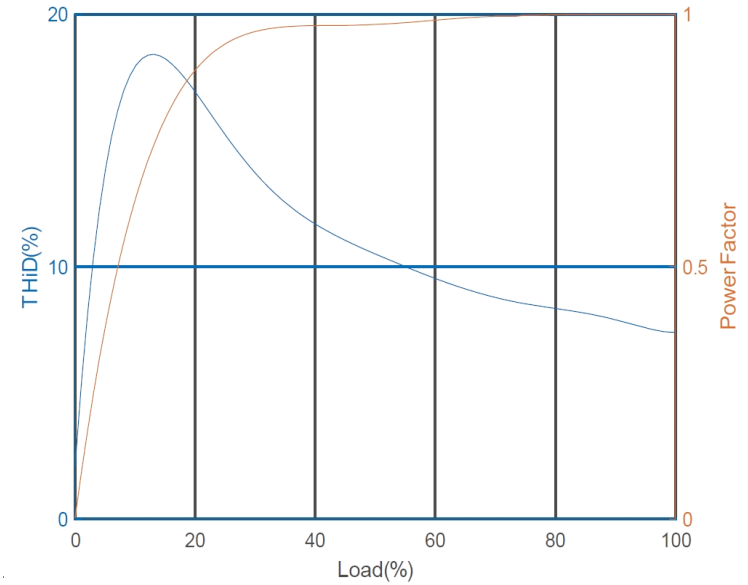
Note! The power of the selected filter shall be matched with that of the frequency converter as far as possible, to obtain the best filtering effect. If not matched, the filter with the higher power can be used for that with the lower power, but the filtering effect may be reduced.

Technical data

This chapter describes the technical specifications of the harmonic filter, such as operating conditions, frame size and parameter settings.

Power connection	
Rated voltage	Three-phase, U_N=380 to 415V +10% to -15%
Protection class	IP00
Harmonic filtering effect*	Under full load conditions, the total harmonic current distortion at the input of the filter (THDI) is less than 10% (the background voltage THDU is lower than 2%, and the ratio between the short-circuit power of the grid and the installed load is higher than 66)
Frequency	50 Hz
Insulation class	Overvoltage category III (in accordance with EN61800-5-1)
Overheating protection	155 ℃
Operating conditions	
Cooling mode	Air cooling
Ambient temperature (operating)	Under full load, -25 ℃ to +40 ℃
Storage temperature	-25 ℃ to +70 ℃
Work altitude	0 to 2000m
Relative humidity	0 to 95%, no condensation

* In a typical motor drive system, the THDI can be reduced to less than 19% at any load ratio.Under 100% load ratio, the THDI can be controlled below 10%.



Frame size

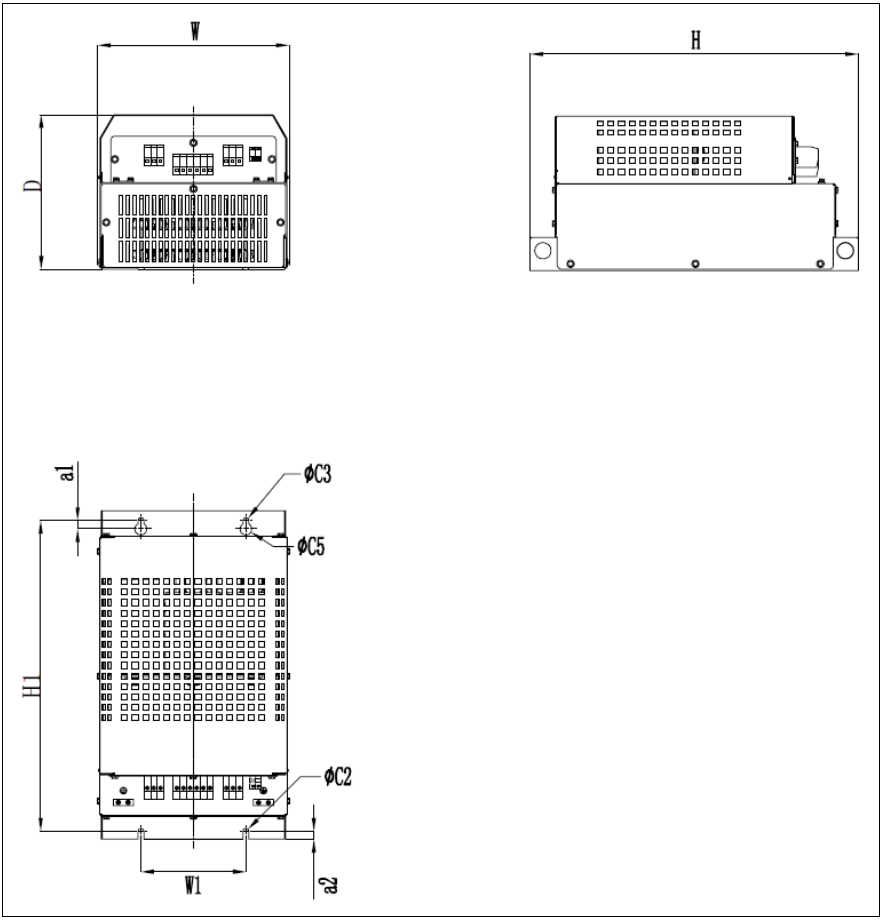
Model code of harmonic filter	Frame size	H (mm)	W (mm)	D (mm)	Weight (kg)
PIHF-0004-4-10	S1	400	220	175	12
PIHF-0007-4-10					14
PIHF-0012-4-10	S2	500	292	235	23
PIHF-0015-4-10					30
PIHF-0030-4-10	S3	600	306	275	50
PIHF-0045-4-10					55
PIHF-0075-4-10	S4	605	387	315	67
PIHF-0090-4-10					70
PIHF-0160-4-10	S5	950	455	335	140
PIHF-0205-4-10					145
PIHF-0290-4-10	S6	1060	485	365	190
PIHF-0363-4-10					195
PIHF-0430-4-10					195
PIHF-0505-4-10	PIHF-205-4-10 PIHF-290-4-10 Parallel installation	-	-	-	-
PIHF-0585-4-10	PIHF-290-4-10 PIHF-290-4-10 Parallel installation	-	-	-	-
PIHF-0650-4-10	PIHF-205-4-1 PIHF-430-4-10 Parallel installation	-	-	-	-
PIHF-0725-4-10	PIHF-290-4-10 PIHF-430-4-10 Parallel installation	-	-	-	-

Installation dimensions

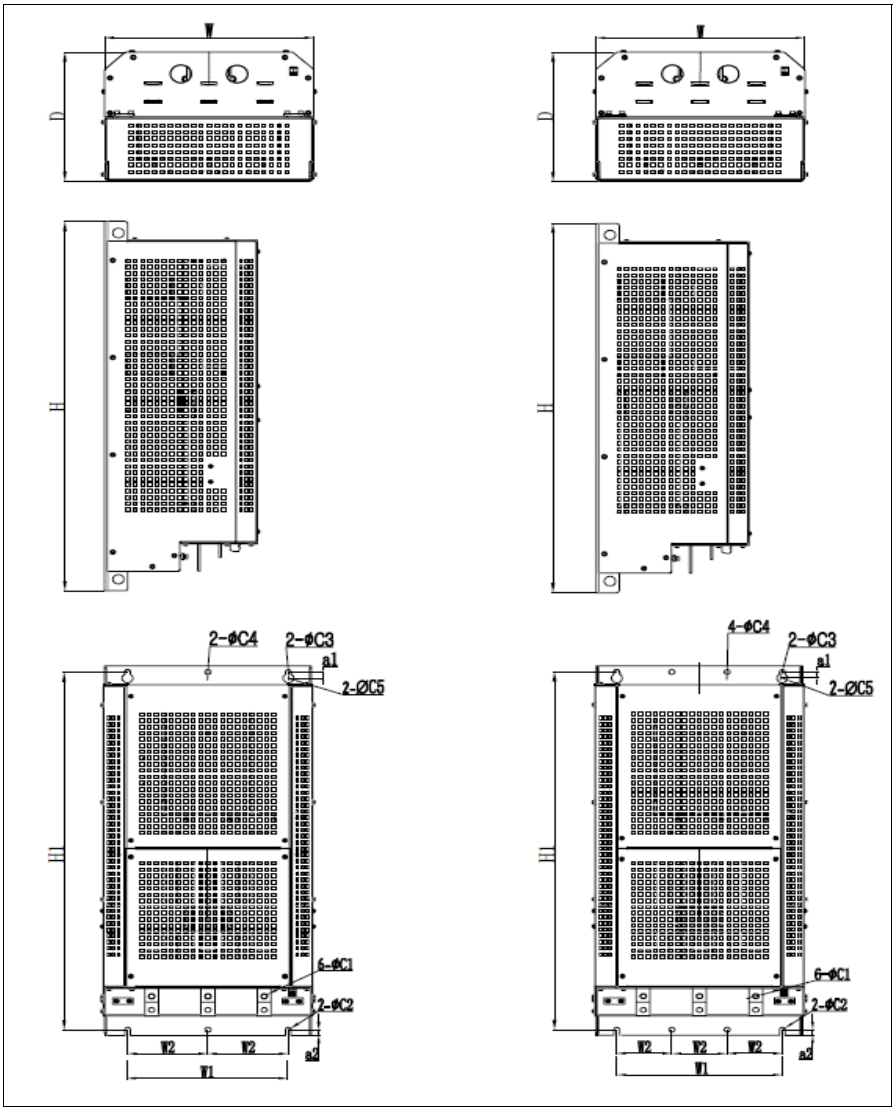
Frame size	W	W1	W2	D	H	H1	a1	a2	C1...C4	C5
S1	220	160	-	175	400	373	13	12	9	18
S2	292	160	-	235	500	473	13	12	9	18
S3	306	190	-	275	600	570	16	15	11	22
S4	387	300	-	315	605	575	16	15	11	22
S5	455	350	175	335	950	920	18	15	13	26
S6	485	375	125	365	1060	1030	18	15	13	26

Unit: mm

Product outline drawing (S1 to S4)

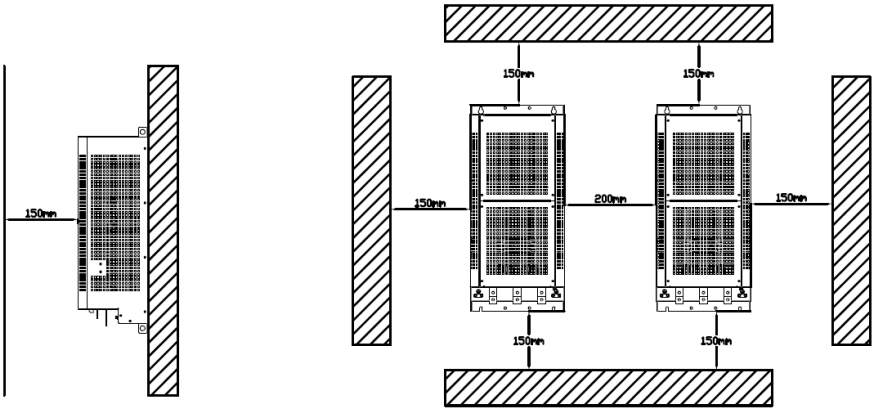


Product outline drawing (S5,S6)



Parallel Installation Diagram

For the model that needs two filters installed in parallel, the wall mounted mode shall be selected, and the installation distance between the filters shall be at least 200mm to ensure a sufficient heat dissipation space. The recommended installation diagram is shown as follows.



Further information

Product and service inquiries

Address any inquiries about the product to your local ABB representative, quoting the type designation and serial number of the unit in question. A listing of ABB sales, support and service contacts can be found by navigating to abb.com/search channels.

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