

ACS600, ACS800

Installation Guide

du/dt Filters

AOCH0260-70

AOCH0400-70

NOCH0016-6x

NOCH0030-6x

NOCH0070-6x

NOCH0120-6x

NOCH0260-60

NOCH0400-60

NOCH0760-60



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Table of contents

Table of contents

du/dt Filters Installation Guide

Contents	5
General notes and restrictions	5
Technical data	7
Ambient conditions, operation	7
Ambient conditions, storage	8
Ambient conditions, transportation	8
Internal circuit diagrams	9
Power connections	10
Filter selection tables	17
Other applications	20
Dimensional drawings	21

du/dt Filters Installation Guide

Contents

This document contains the following information:

- General notes and restrictions
- Technical data (including allowable ambient conditions)
- Internal circuit diagrams
- Power connection diagrams
- Filter selection tables
- Dimensional drawings (including terminal sizes and tightening torques).

General notes and restrictions

Observe the following before you start to install the du/dt filters:



WARNING! Do not attempt any work on a powered drive. After switching off the mains, always allow the intermediate circuit capacitors 5 minutes to discharge before working on the frequency converter, the motor or the motor cable. It is good practice to check (with a voltage indicating instrument) that the drive is in fact discharged before beginning work.

- Unprotected (IP00) filters must be encased to meet the local safety requirements.
- The surface of the IP22/IP54 filter housing can reach a temperature up to 40 °C higher than the ambient temperature.
- Shielded cable must be used between enclosures.
- Filters must be grounded to the protective earth (PE) by using the fixing holes in the mounting legs.
- **Maximum drive output frequency:** 120 Hz
- **Maximum average switching frequency:**
3 kHz (converter units with supply voltage \leq 500 V) or
2 kHz (converter units with supply voltage $>$ 500 V)
- **Maximum cable length between the drive output and the filter:** 3 m
- **Maximum motor cable length for AOCH0xxx-70 filters:** 300 m (cumulative for several parallel-connected motors)

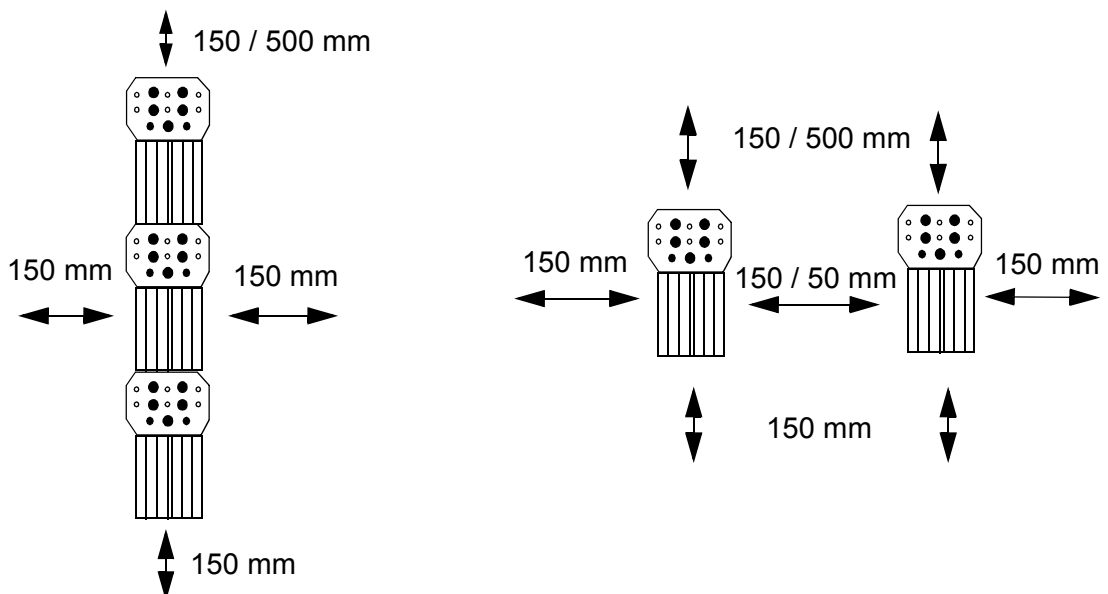
- **Maximum motor cable length for NOCH0xxx-6x filters** (cumulative for several parallel-connected motors):

NOCH0016-60/62 NOCH0030-60/62 NOCH0070-60/62 NOCH0120-62	150 m (can be increased to 300 m by connecting two filters in series)
NOCH0016-65 NOCH0030-65 NOCH0070-65 NOCH0120-65	50 m (can be increased to 100 m by connecting two filters in series)
NOCH0120-60 NOCH0260-60 NOCH0400-60 NOCH0760-60	300 m

- The following free space requirements apply for the **AOCH0xxx-70** filters:

150 mm free space on each free side. *Exception:* 500 mm above the filter if installed below the drive. *Exception:* 50 mm between single phase filters on the same transmission line.

If filters are mounted on top of each other with single drive types 0320-5, 0610-5 and 0610-7, the filters need a minimum of 700 m³/h of forced cooling. Maximum of three filters can be mounted on top of each other.



AOCH filters on top of each other

AOCH filters side by side

- **NOCH0xxx-6x** filters are designed to cool by natural convection, thus the following free space requirements apply:

Wall-mounted filter units:

300 mm on each free side. *Exception:* 500 mm above the filter if installed below the drive.

Floor-mounted filter units:

300 mm on each free side. *Exception:* 50 mm between single phase filters on the same transmission line. *Exception:* 500 mm above the filter if installed below the drive.

Technical data

Nominal voltage: 380 ... 690 V \pm 10%.

Rated short-time withstand current: 50 kA 1 s.

Applicable standards and markings: EN 60204-1, EN 60529, EN 61800-3, EN 50178, CE marking, UL approval.

Ambient conditions, operation

Ambient operating conditions refer to the conditions du/dt filters are subjected to when installed for stationary use.

Air temperature: -15 to +50 °C. At temperatures from +40 °C to +50 °C, the rated output current is decreased by 1% for every additional 1 °C. The output current is calculated by multiplying the current given in the rating table by the derating factor.

Relative humidity: 5% to 95%, no condensation allowed. Maximum allowed relative humidity is 60% in the presence of corrosive gases.

Installation site altitude: 0 to 4000 m. At altitudes from 1000 to 4000 m above the sea level, the rated output current is decreased by 1% for every 100 m.

Vibration:

AOCH0xxx-70: Max 1 mm (5 to 13.2 Hz), max 7 m/s² (13.2 to 100 Hz) sinusoidal (IEC 60068-2)

NOCH0xxx-6x: Max 0.3 mm (2 to 9 Hz), max 1 m/s² (9 to 200 Hz) sinusoidal (IEC60068-2)

Shock: Max 70 m/s², 22 ms (IEC 60068-2-27)

Ambient conditions, storage

Ambient storage conditions refer to the conditions du/dt filters are subjected to during storage in the protective package.

Temperature: -40 to +70 °C.

Relative humidity: Less than 95%, no condensation allowed

Atmospheric pressure: 70 to 106 kPa

Vibration:

AOCH0xxx-70: Max 1 mm (5 to 13.2 Hz), max 7 m/s² (13.2 to 100 Hz) sinusoidal (IEC 60068-2)

NOCH0xxx-6x: Max 0.3 mm (2 to 9 Hz), max 1 m/s² (9 to 200 Hz) sinusoidal (IEC 60068-2)

Shock: Max 100 m/s², 11 ms (IEC 60068-2-27)

Ambient conditions, transportation

Ambient transportation conditions refer to the conditions du/dt filters are subjected to during transportation in the protective package.

Temperature: -40 to +70 °C

Relative humidity: Less than 95%, no condensation allowed.

Atmospheric pressure: 60 to 106 kPa

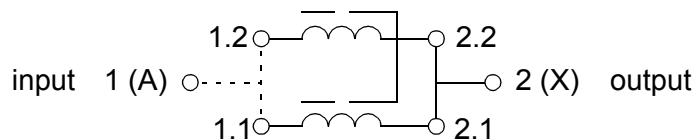
Vibration: Max 3.5 mm (2 to 9 Hz), max 15 m/s² (9 to 200 Hz) sinusoidal (IEC 60068-2)

Shock: Max 100 m/s², 11 ms (IEC 60068-2-27)

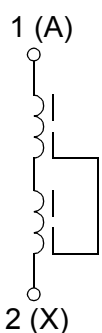
Bump: Max 300 m/s², 6 ms (IEC 60068-2-29)

Free fall: 250 mm

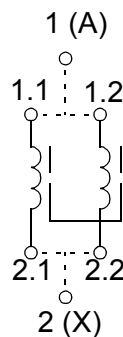
Internal circuit diagrams



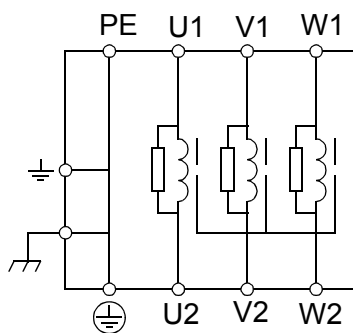
AOCH0xxx-70: Connect the input terminals together.



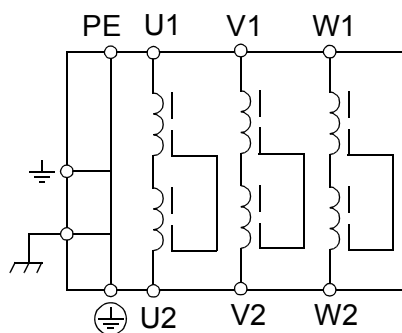
NOCH0120-60



NOCH0260-60
NOCH0400-60
NOCH0760-60

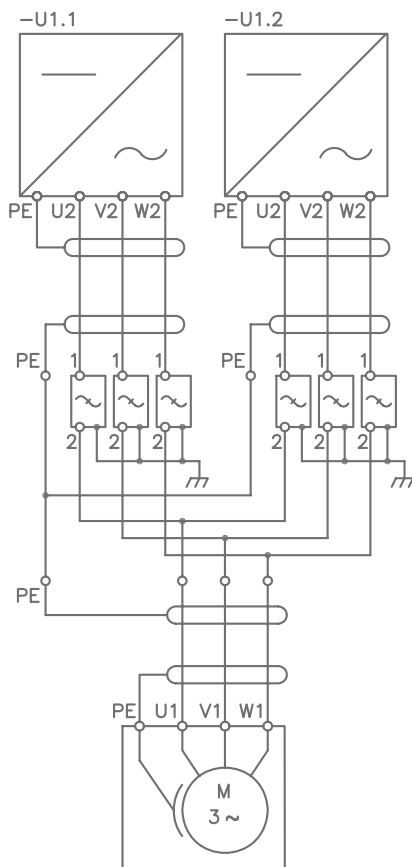


NOCH0016-6x
NOCH0030-6x
NOCH0070-6x

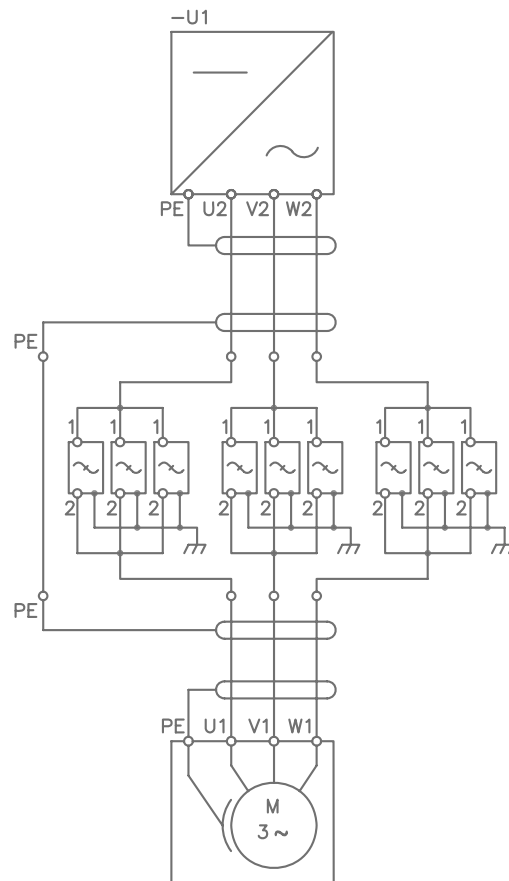


NOCH0120-6x

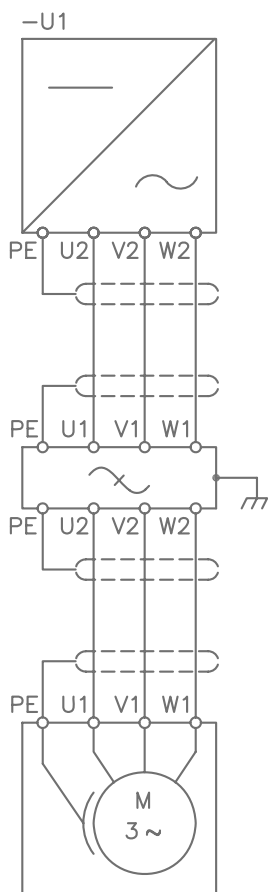
Power connections



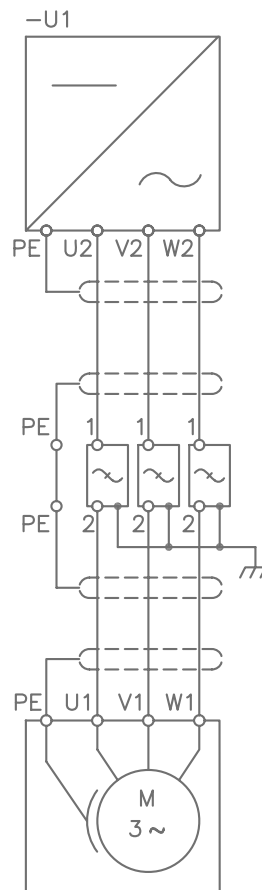
NOCH0260-60
 NOCH0400-60
 NOCH0760-60



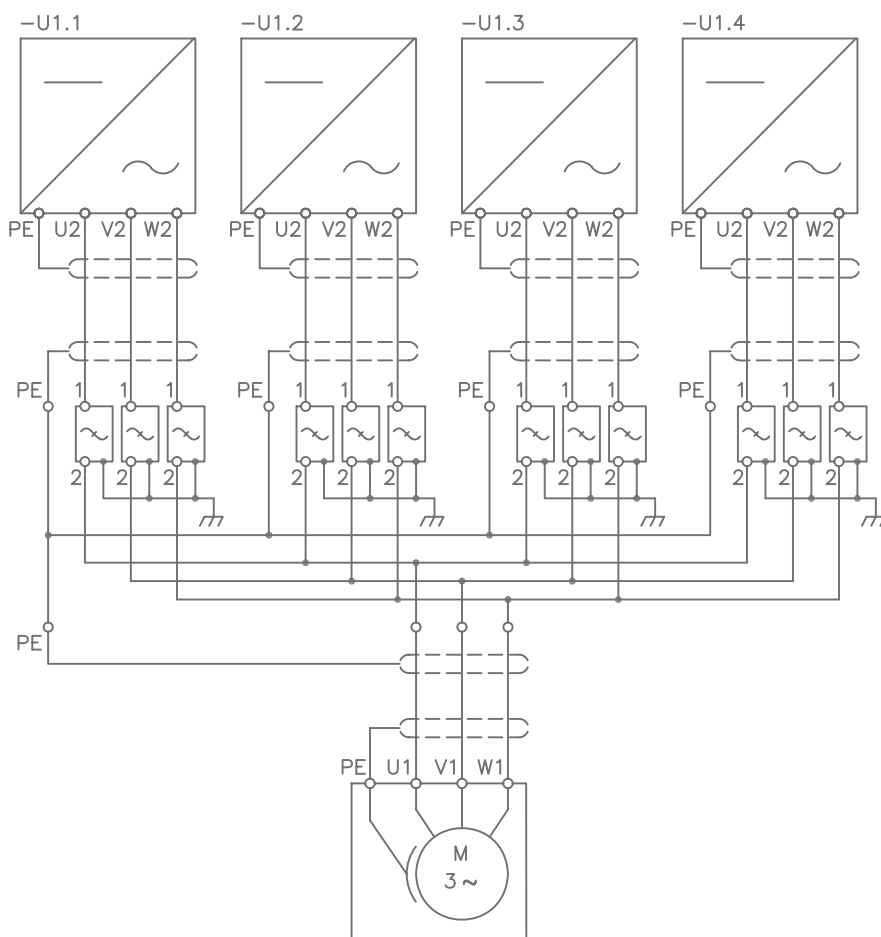
NOCH0400-60



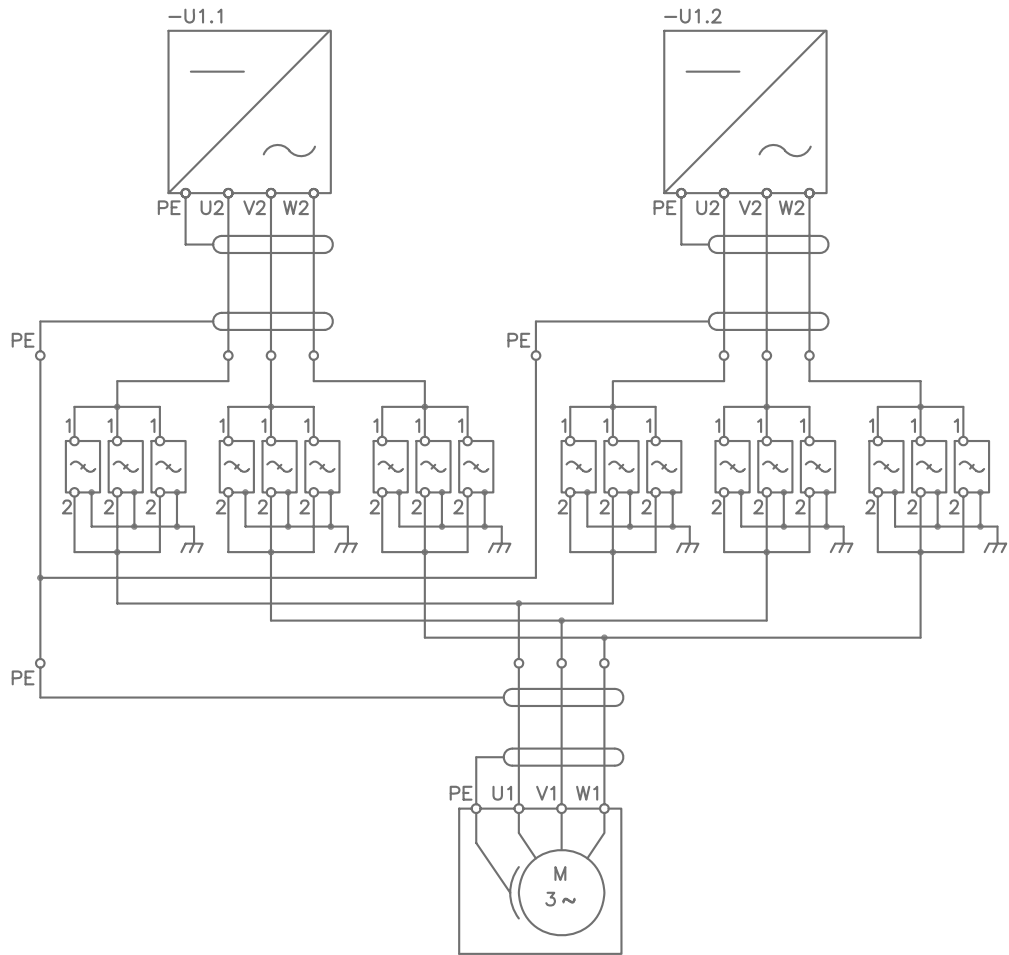
NOCH0016-6x
 NOCH0030-6x
 NOCH0070-6x



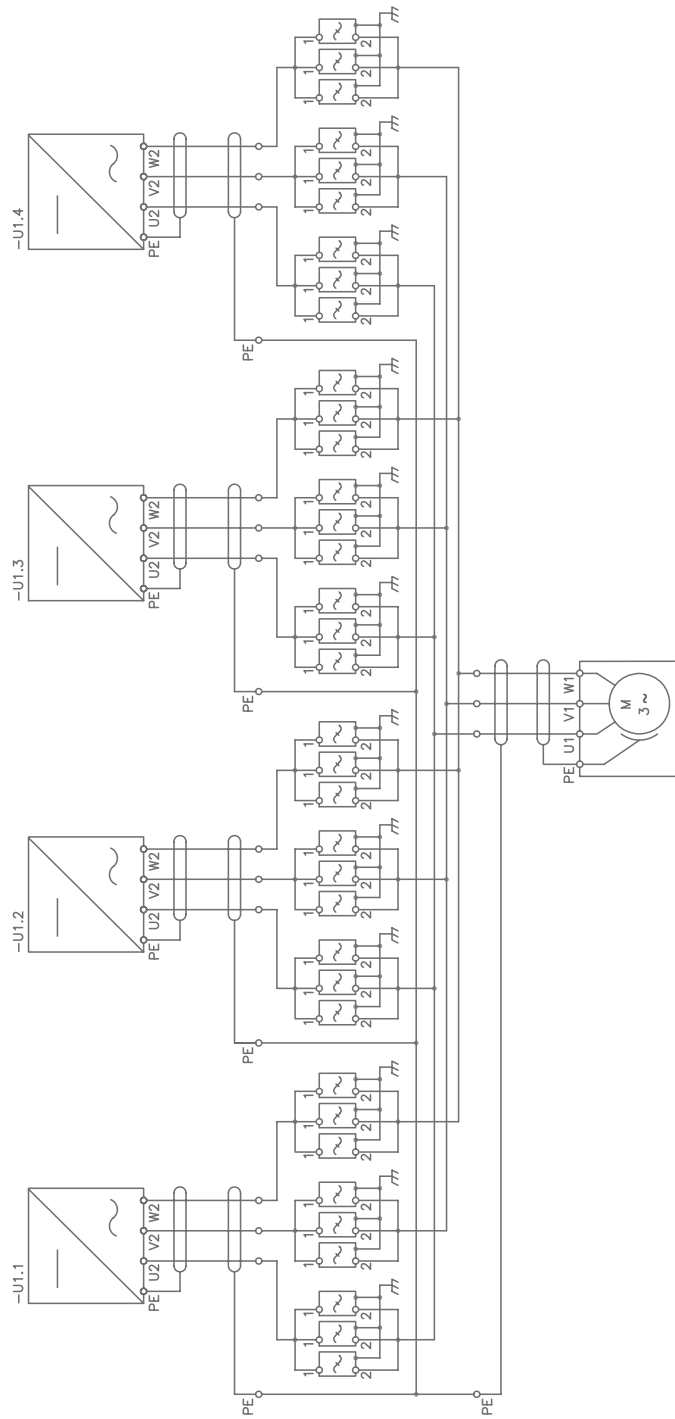
NOCH0120-6x
 NOCH0260-60
 NOCH0400-60
 NOCH0760-60
 AOCH0260-70
 AOCH0400-70



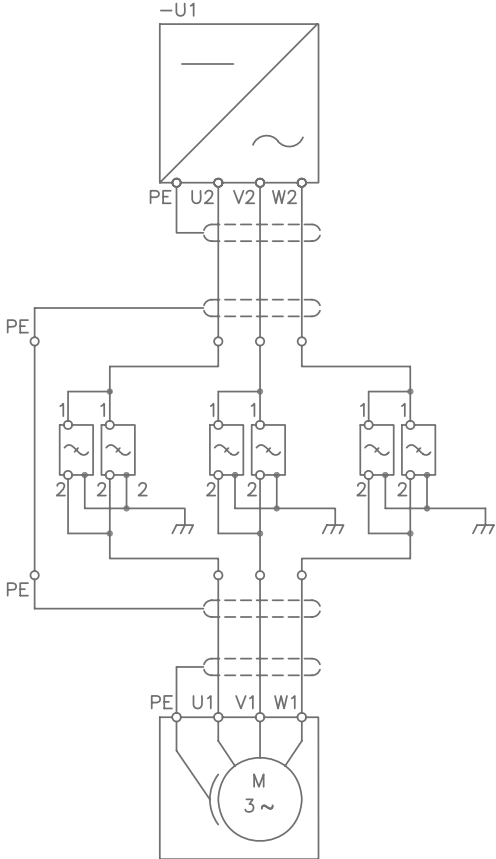
NOCH0760-60



NOCH0400-60

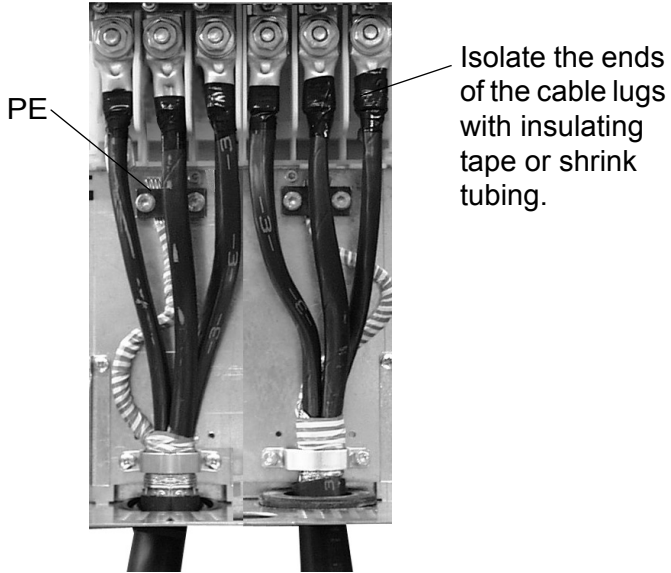


NOCH0400-60

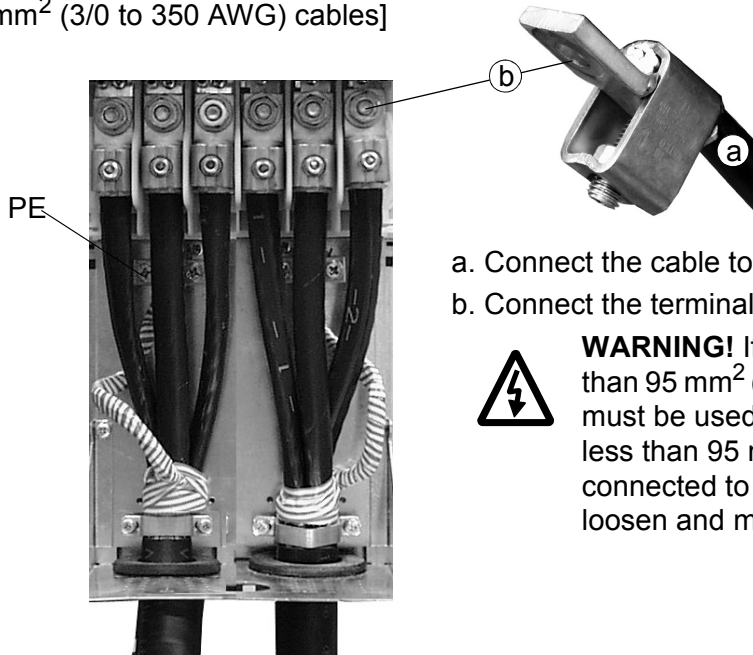


AOCH0400-70
AOCH0260-70

NOCH0120-6x: Cable lug installation
 [16 to 70 mm² (6 to 2/0 AWG) cables]



NOCH0120-6x: Cable terminal installation
 [95 to 185 mm² (3/0 to 350 AWG) cables]



- a. Connect the cable to the terminal.
- b. Connect the terminal to the drive.



WARNING! If the wire size is less than 95 mm² (3/0 AWG), a cable lug must be used. A cable of wire size less than 95 mm² (3/0 AWG) connected to this terminal will loosen and may damage the drive.

Filter selection tables

Single drive				du/dt filter type (* 3 filters included in kits marked with *)								
				x=0 $\hat{=}$ IP00, x=2 $\hat{=}$ IP22, x=5 $\hat{=}$ IP54								
				*AOCH0260-70	*AOCH0400-70	NOCH0016-6X	NOCH0030-6X	NOCH0070-6X	*NOCH0120-60	*NOCH0120-6X	*NOCH0260-60	*NOCH0400-60
400 V	500 V	690 V										
60x-	0005-3, 0006-3 0009-3, 0011-3	0006-5, 0009-5 0011-6, 0016-6	0009-6, 0011-6 0016-6			1						
	0016-3, 0020-3	0020-5, 0025-5	0020-6, 0025-6 0030-6				1					
	0025-3, 0030-3 0040-3, 0050-3 0060-3	0030-5, 0040-5 0050-5, 0060-5 0070-5	0040-6, 0050-6 0060-6, 0070-6					1				
	0070-3, 0100-3 0120-3	0100-5, 0120-5 0140-5	0100-6, 0120-6						1			
	0140-3, 0170-3 0210-3	0170-5, 0210-5 0260-5	0140-6, 0170-6 0210-6, 0260-6							1		
	0260-3, 0320-3 0400-3	0320-5, 0400-5 0490-5	0320-6, 0400-6 0490-6								1	
	0490-3, 0610-3	0610-5, 0760-5	0610-6, 0760-6								2	
			0900-6									1
	0760-3, 0930-3 1120-3	0930-5, 1090-5 1380-5	1040-6, 1380-6 1710-6									3
	1440-3, 1770-3	1760-5, 2160-5	2120-6, 2540-6									6
	2140-3, 2340-3	2620-5, 2850-5	2800-6, 3350-6									4
	2820-3	3450-5	3880-6, 5140-6									12

Single drive				du/dt filter type (* 3 filters included in kits marked with *)										
				x=0 ⇨ IP00, x=2 ⇨ IP22, x=5 ⇨ IP54										
				400 V	500 V	690 V	*AOCH0260-70	*AOCH0400-70	NOCH0016-6X	NOCH0030-6X	NOCH0070-6X	*NOCH0120-60	*NOCH0120-6X	*NOCH0260-60
800-01-800-04-	0003-3, 0004-3 0005-3, 0006-3 0009-3, 0011-3	0004-5, 0005-5 0006-5, 0009-5 0011-5, 0016-5	0011-7			1								
	0016-3, 0020-3 0023-3	0020-5	0016-7, 0020-7 0025-7				1							
	0025-3, 0030-3 0035-3, 0040-3 0050-3	0025-5, 0028-5 0030-5, 0040-5 0045-5, 0050-5 0060-5	0030-7, 0040-7 0050-7, 0060-7					1						
	0060-3, 0070-3 0075-3	0070-5, 0100-5 0105-5	0070-7, 0100-7 0120-7							1				
	0100-3 0120-3	0120-5 0140-5							1					
	0130-3, 0140-3 0170-3	0150-5, 0170-5 0210-5	0140-7, 0170-7	1										
	0210-3, 0260-3	0260-5, 0270-5 0300-5, 0320-5	0210-7, 0260-7		1									
	0320-3	0400-5	0320-7, 0400-7	2										
	0400-3, 0440-3 0490-3	0440-5, 0490-5 0550-5, 0610-5	0440-7, 0490-7 0550-7, 0610-7		2									

Multidrive				du/dt filter type (3 filters included in kits marked with *)														
				x=0 ≙ IP00, x=2 ≙ IP22, x=5 ≙ IP54														
				*AOCH0260-70	*AOCH0400-70	NOCH0016-6X	NOCH0030-6X	NOCH0070-6X	*NOCH0120-6X	*NOCH0260-60	*NOCH0400-60	*NOCH0760-60						
	400 V	500 V	690 V															
6xx-	0005-3, 0006-3 0009-3, 0011-3	0006-5, 0009-5 0011-6, 0016-6	0009-6, 0011-6 0016-6			1												
	0016-3, 0020-3	0020-5, 0025-5	0020-6, 0025-6 0030-6				1											
	0025-3, 0030-3 0040-3, 0050-3 0060-3	0030-5, 0040-5 0050-5, 0060-5 0070-5	0040-6, 0050-6 0060-6, 0070-6					1										
	0070-3, 0100-3 0120-3	0100-5, 0120-5 0140-5	0100-6, 0120-6						1									
	0185-3, 0225-3	0215-5, 0255-5	0185-6, 0205-6 0255-6, 0315-6							1								
	0265-3, 0335-3	0325-5, 0395-5	0375-6, 0485-6									1						
	0405-3, 0500-3, 0630-3	0495-5, 0610-5, 0770-5	0600-6, 0750-6 0900-6															1
	0765-3, 0935-3	0935-5, 1095-5	1045-6, 1385-6														3	
	1125-3	1385-5	1715-6															2
	1440-3, 1775-3	1760-5, 2165-5	2125-6, 2545-6														6	
	2145-3, 2340-3	2625-5, 2850-5	2800-6, 3350-6															4
	2820-3	3450-5	3880-6, 5140-6														12	
800-104-	0003-3, 0004-3 0005-3, 0006-3 0009-3	0004-5, 0005-5 0006-5, 0009-5 0011-5	0011-7, 0016-7			1												
	0011-3, 0016-3	0016-5, 0020-5	0020-7, 0025-7 0030-7				1											
	0020-3, 0025-3 0030-3	0025-5, 0030-5 0040-5, 0050-5	0040-7, 0050-7 0060-7					1										
	0040-3, 0050-3 0060-3	0060-5, 0070-5							1									

Other applications

With other applications filters are chosen according to the maximum thermal current I_{th} and the maximum energy $E = \frac{1}{2} C(U_{dc})^2$ given in the following table. The maximum losses, P_{loss} , are also listed in the table.

The maximum allowed filter energy E depends on the drive DC voltage, cable length and the number of cables as well as the cable type. The power losses have been calculated for the worst case, i.e. for the maximum energy.

	400 V	500 V	690 V		
Du/dt filter type	I_{th} / A_{rms}	I_{th} / A_{rms}	I_{th} / A_{rms}	E / mJ	P_{loss} / W
NOCH0016-60/2	19	19	15	24	110
NOCH0016-65	19	19	15	8	58
NOCH0030-60/2	41	41	28	28	167
NOCH0030-65	41	41	28	9	95
NOCH0070-60/2	112	112	65	35	210
NOCH0070-65	112	112	65	12	150
NOCH0120-60	178	164	113	94	240*
NOCH0120-62	166	157	113	47	210*
NOCH0120-65	166	157	113	15	180*
NOCH0260-60	375	345	230	134	441*
NOCH0400-60	521	495	351	252	750*
AOCH0260-70 ¹⁾	261	258	177	94	309*
AOCH0400-70 ¹⁾	445	440	280	176	525*
AOCH0260-70 ²⁾	375	345	230	134	441*
AOCH0400-70 ²⁾	521	495	351	252	750*

¹⁾ Filters mounted on top of each other

²⁾ Filters mounted side by side

* Value is for a kit, which includes three filters.

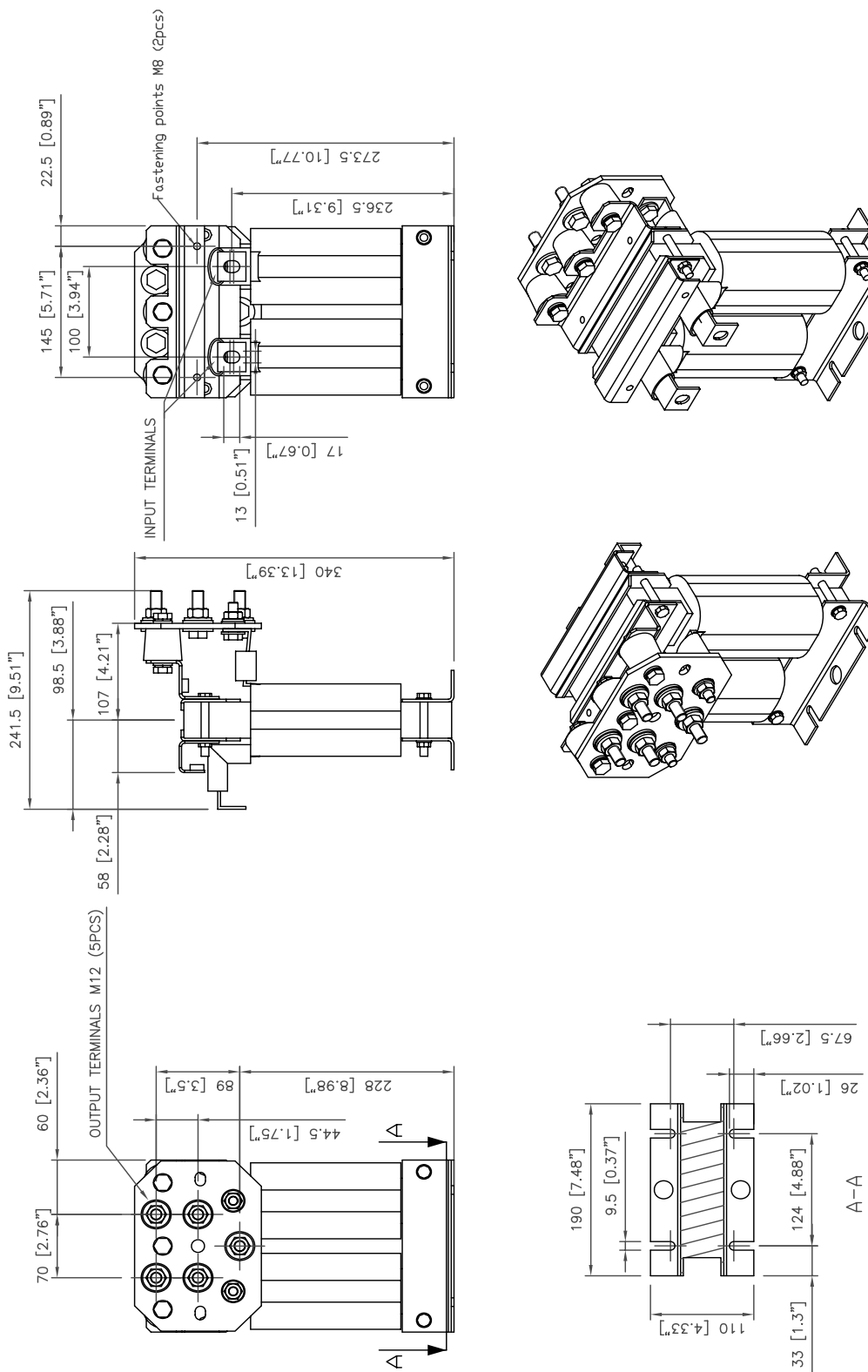
I_{th} is the total rms current of the filter.

C is the total capacitance of the motor cable(s) (i.e. the product of the capacitance/length value given in the cable catalogue and the cumulative length of the motor cables).

U_{dc} is the average intermediate circuit DC voltage.

Dimensional drawings

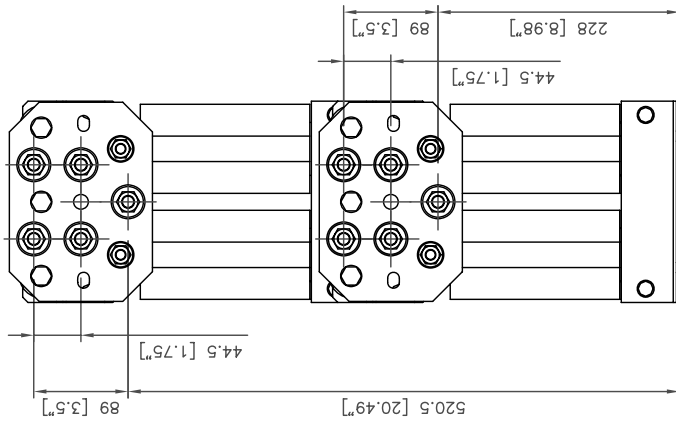
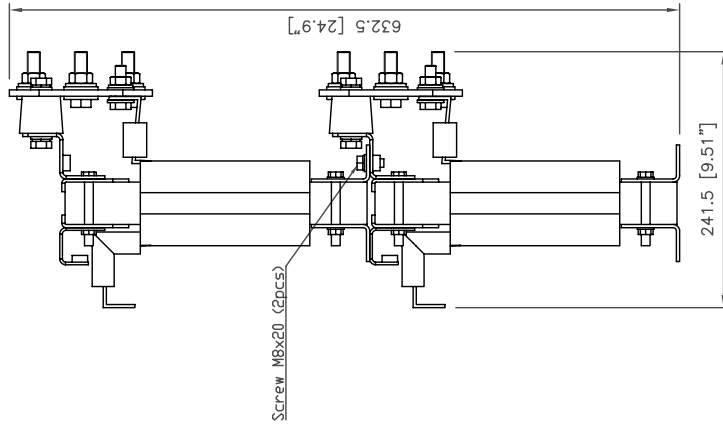
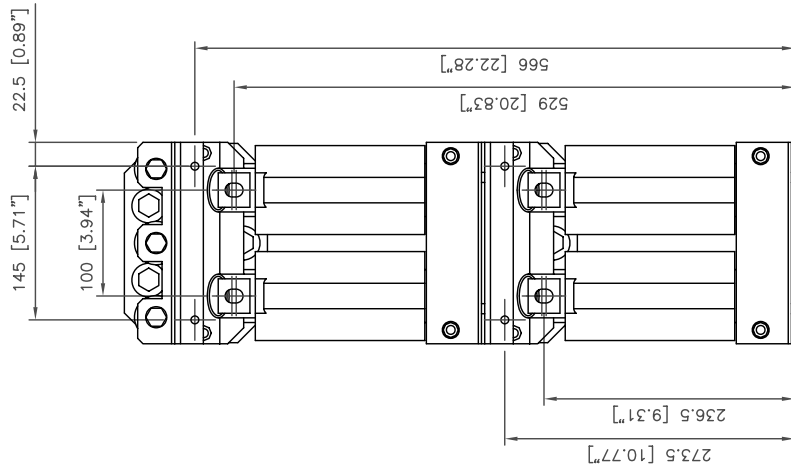
AOCH0260-70, single phase filter
du/dt filter kit includes 3 pieces of single phase filters.



AOCH0260-70

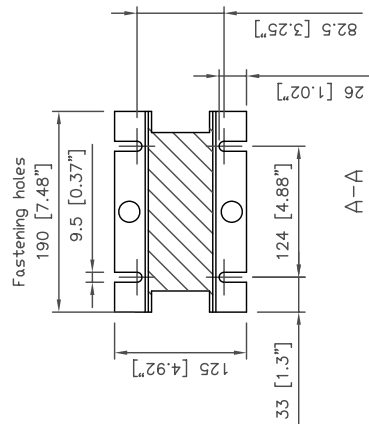
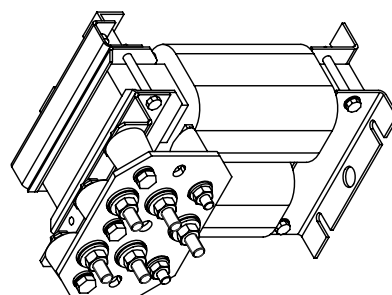
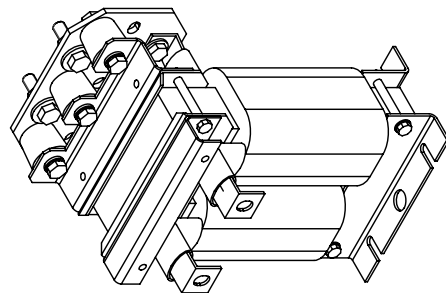
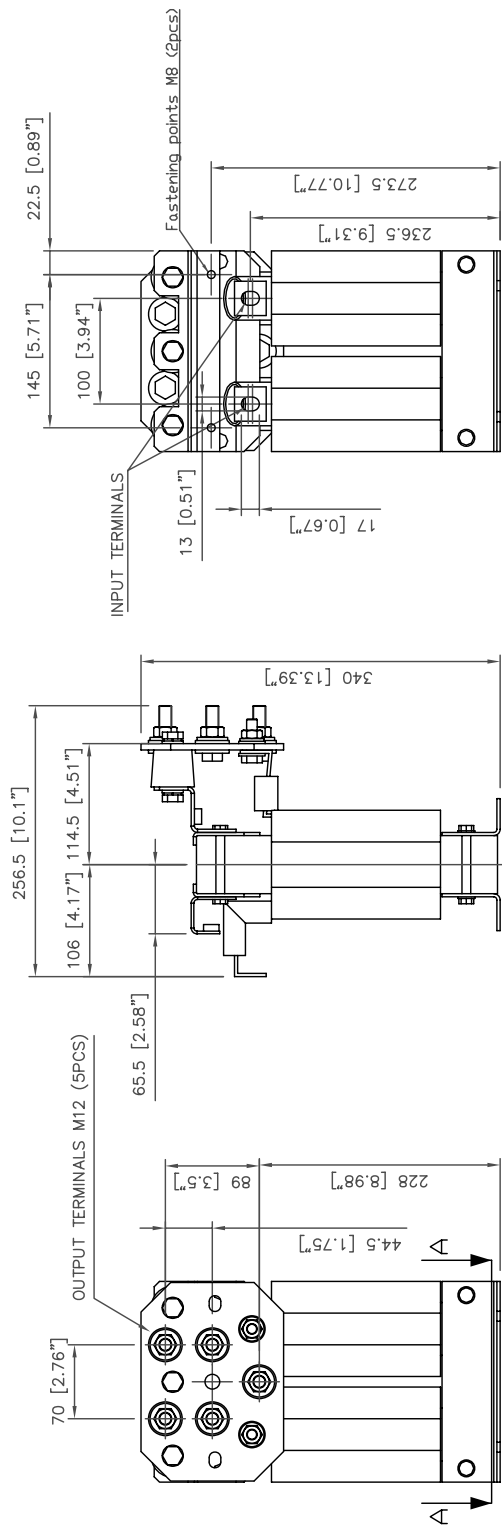
du/dt filter kit includes 3 pieces of single phase filters.

Cable size:	3x(3x185)	Weight:	15.9 kg (35.1 lbs)
Screw size:	M12	I_{TH}	227 A _{rms}
Power loss:	147 W	L	74 μH



Alternative assembly

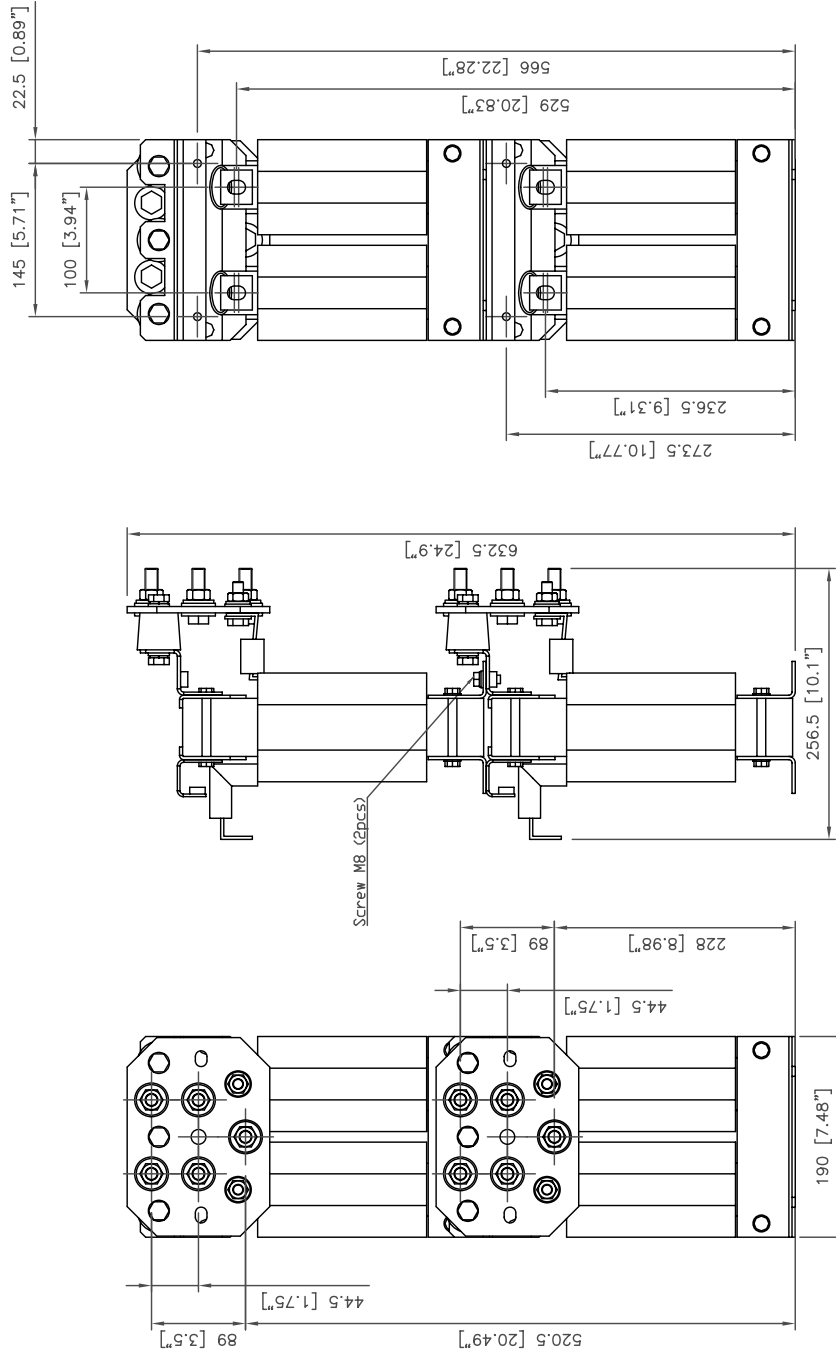
AOCH0400-70, single phase filter
 du/dt kit includes 3 pieces of single phase filters.



AOCH0400-70

du/dt filter kit includes 3 pieces of single phase filters.

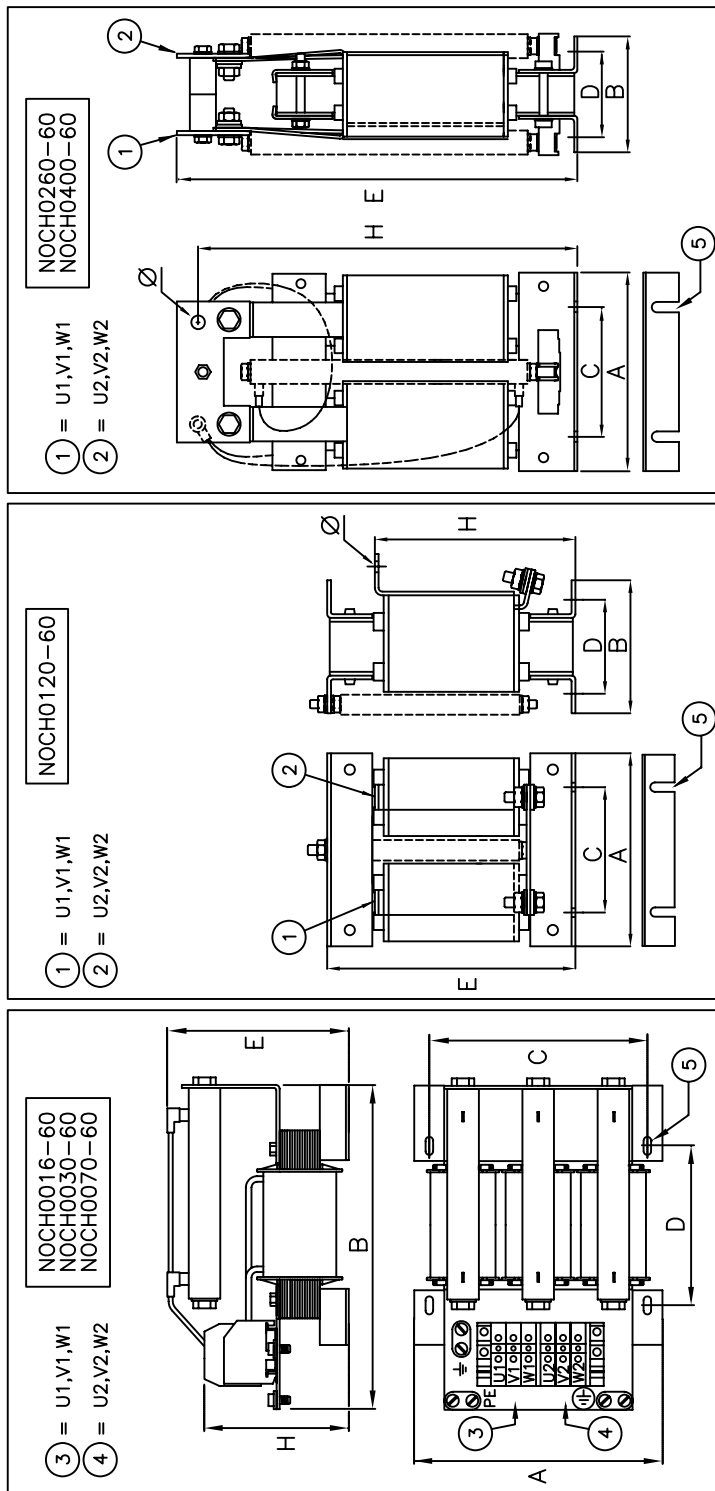
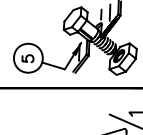
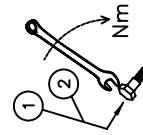
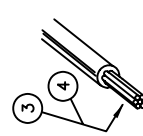
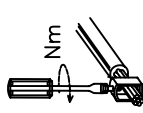
Cable size:	3x(3x185)	Weight:	20.7 kg (45.6 lbs)
Screw size:	M12	I_{TH}	355 A _{rms}
Power loss:	250 W	L	52 μH



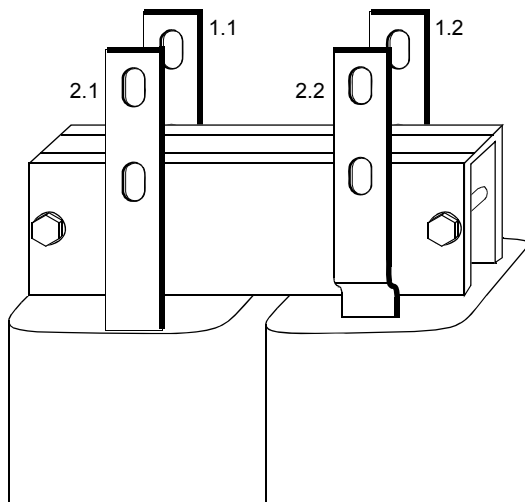
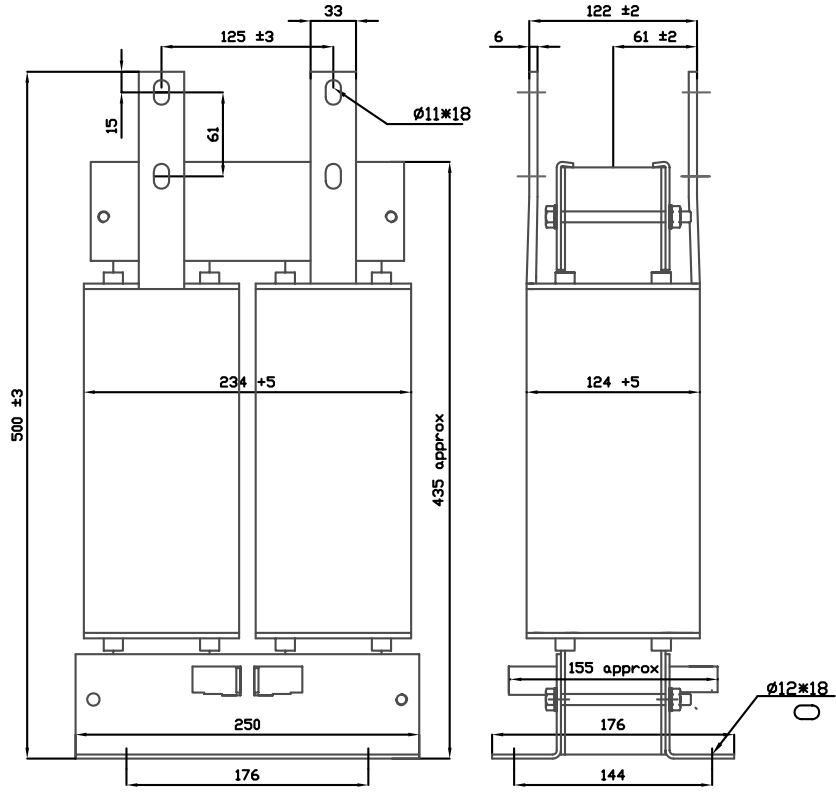
Alternative assembly

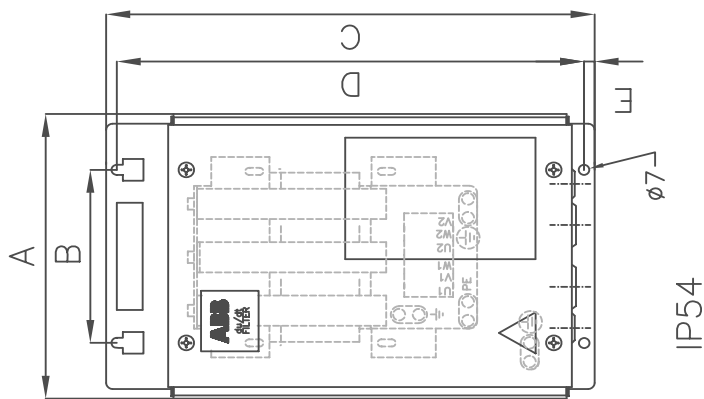
NOCH0120-60, NOCH0260-60 and NOCH0400-60 du/dt kits include 3 filters.

L2	mm								kg	Ø	① ②	Nm	mm ²	Nm
	A	B	C	D	E	H	mm							
~	140	195	120	85	115	83	-	2.4	M5	4	0.2...10	1.5		
	165	215	145	108	130	95	-	4.7	M5	4	0.5...16	1.5		
	180	261	170	125	150	120	-	9.5	M6	6	10...35	2.5		
	154	106	100	75	200	160	9	7	M8	20	-	-		
	185	111	124	82	383	368	13	12	M10	30	-	-		
	185	126	124	97	383	368	13	17	M10	30	-	-		

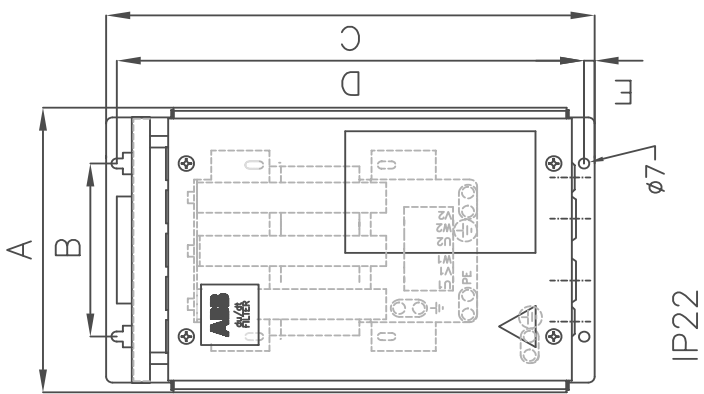
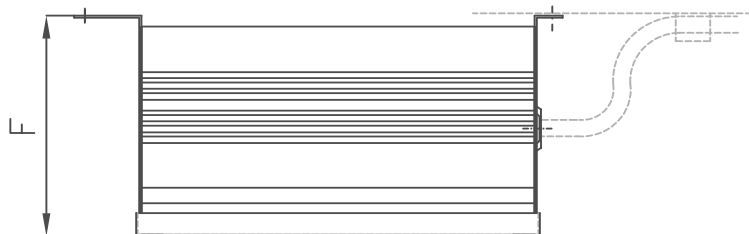


NOCH0760-60 Weight: 43 kg (95 lbs)
du/dt filter kit includes 3 filters.

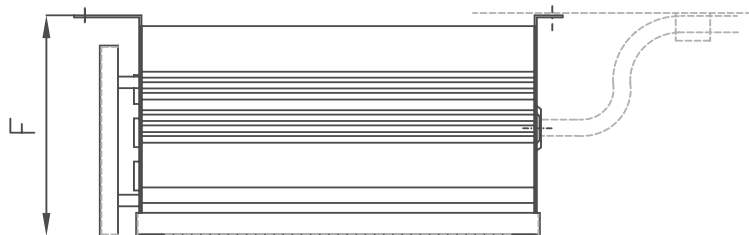





IP54

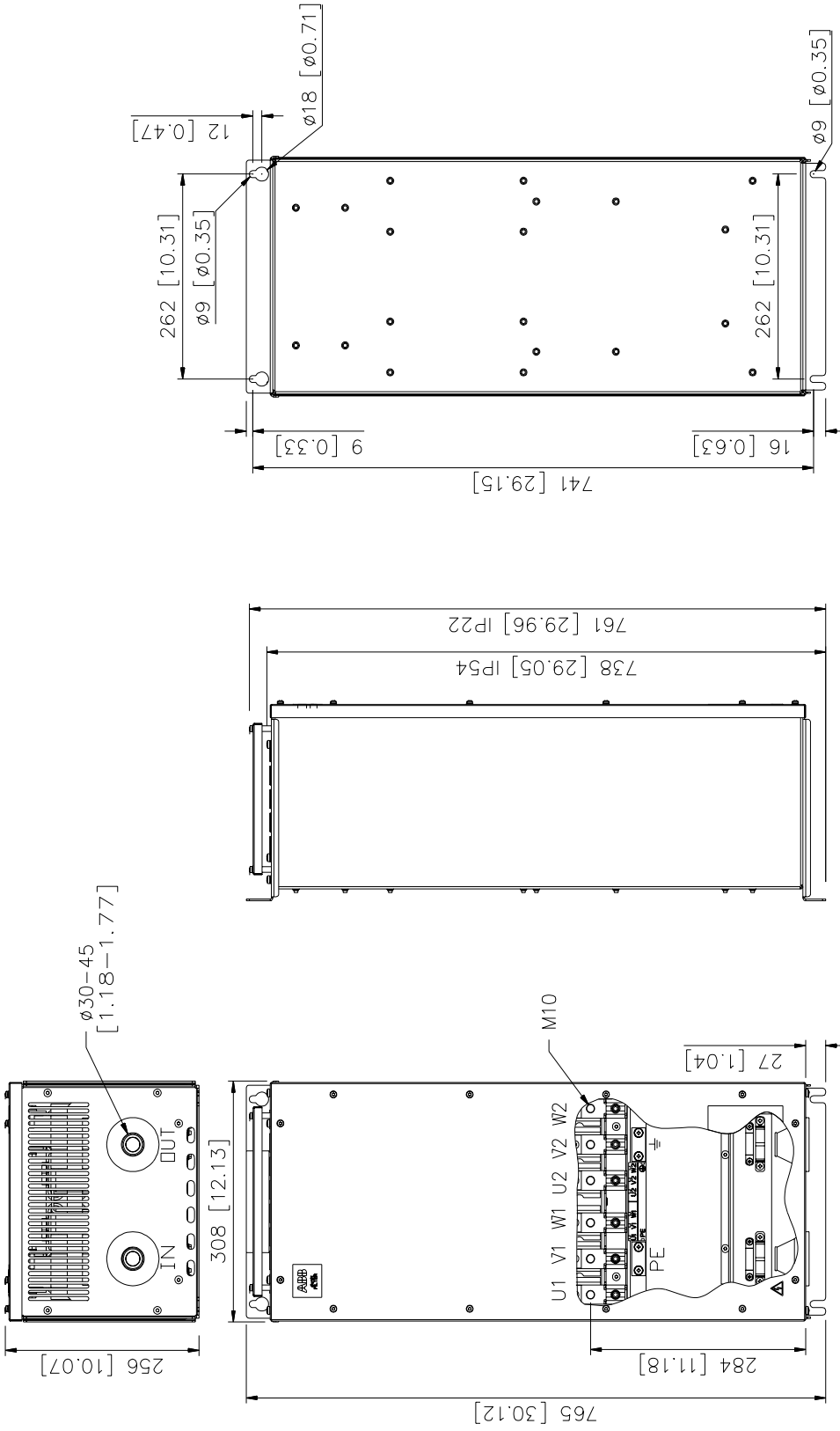


IP22



	A	B	C	D	E	F	 / 1	
IP22	NOCH0016-62	120	323	309	7	154	6	
	NOCH0030-62	249	348	334	7	172	9	
	NOCH0070-62	279	180	433	419	7	202	15.5
IP54	NOCH0016-65	120	323	309	7	154	6	
	NOCH0030-65	249	160	348	334	7	172	9
	NOCH0070-65	279	180	433	419	7	202	15.5

NOCH0120-62, NOCH0120-65 Weight 45 kg (99 lbs)
 du/dt filter kit includes 3 filters.



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