

OPEN DRIVE

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Regenerative AC-DC

A.F.E.

Connections (rev. 1.3)

AFE: Connections

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1. AFE: connections diagram

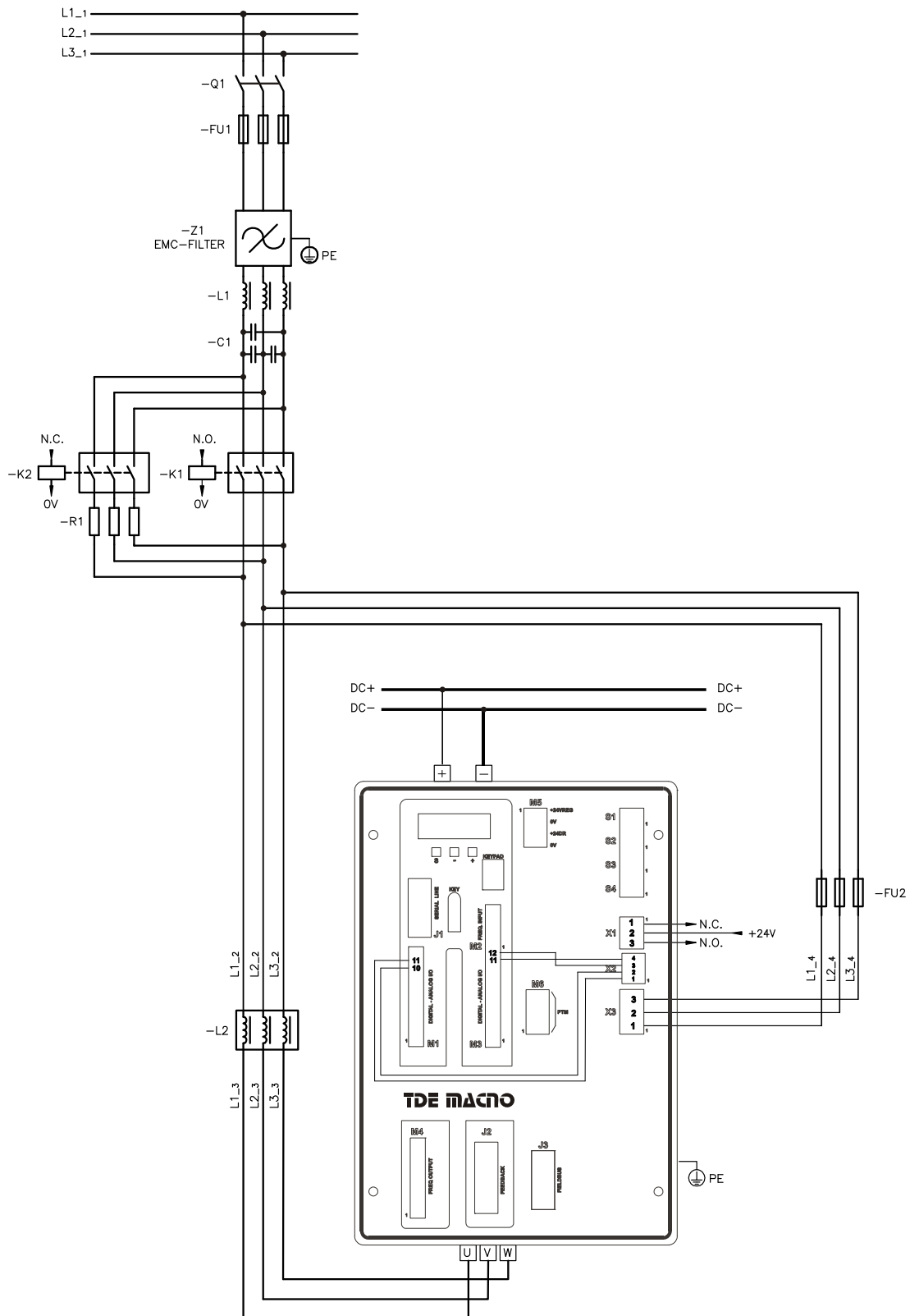


Figure 1: AFE connections diagram.

Note: +24Vreg and +24VDR of the regulation board must be fed by only one +24V.

FU1	Line fuses
Z1	EMC filter group (if forecast)
L1	Line choke (foresee if the line drop is lower than 3%). Contact TDEMACNO technical support for more details.
C1	Group of capacitors per Filter (500Hz/700Hz)(Table 5).
K1	Main contactor. It is normally open and it is closed only at the end of the soft-start (i.e. when the DC BUS is charged and it can be commanded by the RELAY RL1) Sizing (Table 1)
K2	Secondary contactor. It is normally closed and can open only once the soft-start of the DC BUS has been achieved. It can be controlled by the command outcoming from the RELAY RL1, even without delays with the command at K1. K2 is a contactor type AC-3, size up according to Table 2.
R1	Resistors group for the soft-start of the DC BUS, size up according to Table 3
L2	Main choke AFE. Sizing according to Table 4

2. Contactors (K1,K2)

The choice of the main contactors (K1) must be made on the rated current of the AFE according to the instructions of the following table for an AFE S1 with overload 1,5.

SIZE AFE		Main Contactor (K1)	
AFE S1 overload 1,5		kW (400V) Rated power, three-phase motor at 50Hz	Rated Current In category of use AC-3
OPD 32	15kW	15	32
OPD 40	18,5kW	18,5	40
OPD 48	22kW	22	50
OPD 60	30kW	30	65
OPD 70	37kW	37	80
OPD 90	45kW	45	95
OPD 110	55kW	55	115
OPD 150	75kW	75	150
OPD 175	90kW	90	185
OPD 220	110kW	110	225
OPD 250	132kW	132	265
OPD 310	160kW	160/200	300/400
OPD 370	200kW	200	400
OPD 460	250kW	250	500

Table 1: Main Contactor (K1)

The secondary contactor (K2) must be sized according to the following table (the currents involved are those of the capacitors soft-start in the DC Bus). In the right column the Ohmic value of the soft-start resistors is indicated (minimum values) .

SIZE AFE		Secondary Contactor (K2)		Main Resistor
		kW (400V) Rated Power, three- phase motor at 50Hz	Rated current In category of use AC-3	OHM (minimum value)
OPD 32	15kW	<4	<9	29
OPD 40	18,5kW	4	9	25
OPD 48	22kW	4	9	23
OPD 60	30kW	4	9	23
OPD 70	37kW	4	9	23
OPD 90	45kW	5.5	12	15
OPD 110	55kW	5.5	12	11
OPD 150	75kW	5.5	12	8
OPD 175	90kW	7.5	17	5
OPD 220	110kW	7.5	17	5
OPD 250	132kW	11	25	4
OPD 310	160kW	11	25	4
OPD 370	200kW	11	25	4
OPD 460	250kW	15	32	3

Table 2: Secondary Contactor (K2)

3. Soft-start Resistors (group R1)

The function of the soft-start resistors of the DC BUS is to limit the currents when the AFE is connected to the mains.

In the following table the resistors calculated, supposing an AFE unit coupled with an inverter of the same power (concurrent factor=1).

Each resistor must dissipate the energy indicated in the table in an adiabatic way , the value in Watts is only indicative.

SIZE AFE	ENERGY [Joule]	WATT (indicative)	R (Ohm) Minimum value	Commercial Resistors (I.R.E. RFH)
OPD 32	15kW	3 X 880	3 X 50	29 RFH75 47 Ohm 150W
OPD 40	18,5kW	3 X 1100	3 X 50	25 RFH75 47 Ohm 150W
OPD 48	22kW	3 X 1600	3 X 80	23 RFH75 47 Ohm 150W
OPD 60	30kW	3 X 1800	3 X 80	23 RFH75 47 Ohm 150W
OPD 70	37kW	3 X 1800	3 X 80	23 RFH75 47 Ohm 150W
OPD 90	45kW	3 X 1800	3 X 80	15 RFH75 15 Ohm 150W
OPD 110	55kW	3 X 2500	3 X 100	11 RFH75 15 Ohm 150W
OPD 150	75kW	3 X 3500	3 X 150	8 RFH75 15 Ohm 150W
OPD 175	90kW	3 X 5000	3 X 200	5 RFH100 5 Ohm 200W
OPD 220	110kW	3 X 5000	3 X 200	5 RFH100 5 Ohm 200W
OPD 250	132kW	3 X 7100	3 X 300	4 RFH165 4 Ohm 300W
OPD 310	160kW	3 X 7100	3 X 300	4 RFH165 4 Ohm 300W
OPD 370	200kW	3 X 7300	3 X 300	4 RFH165 4 Ohm 300W
OPD 460	250kW	3 X 10000	3 X 400	3 RFH220 3 Ohm 400W

Table 3: Soft-start Resistors

4. Main Choke (L2)

The table shows the main chokes for AFE.

AFE		In (A)	Choke 3 phase (mH)	Nom Current thermal (A)	Saturation peak current (A)	Saturation Rms current (A)	Power Eq. (VA)	TDE Code
OPD 03	1,5kW	4,0	17,503	4,2	14,8	10,5	363	RETF010
OPD 07	3kW	7,1	9,861	7,5	26,3	18,6	645	RETF011
OPD 12	5,5kW	12,1	5,786	12,7	44,8	31,7	1099	RETF013
OPD 15	7,5kW	17,4	4,024	18,3	64,4	45,6	1580	RETF014
OPD 22	11kW	24,2	2,893	25,4	89,6	63,4	2197	RETF015
OPD 32	15kW	31,6	2,216	33,2	117,0	82,8	2869	RETF016
OPD 40	18,5kW	36,9	1,897	38,7	136,6	96,7	3351	RETF017
OPD 48	22kW	48,5	1,444	50,9	179,5	127,1	4404	RETF018
OPD 60	30kW	60,6	1,155	63,6	224,3	158,8	5503	RETF019
OPD 70	37kW	70,6	0,992	74,1	261,3	185,1	6411	RETF020
OPD 90	45kW	91,7	0,763	96,3	339,4	240,4	8327	RETF021
OPD 110	55kW	105,4	0,664	110,7	390,1	276,3	9571	RETF022
OPD 150	75kW	147,6	0,474	155,0	546,3	386,9	13403	RETF023
OPD 175	90kW	173,9	0,403	182,6	643,6	455,8	15791	RETF024
OPD 220	110kW	221,3	0,316	232,4	819,1	580,1	20095	RETF025
OPD 250	132kW	250,9	0,279	263,4	928,6	657,7	22783	RETF026
OPD 310	160kW	310	0,226	325,5	1147,4	812,6	28149	RETF027
OPD 370	200kW	370	0,189	388,5	1369,5	969,9	33597	RETF028
OPD 460	250kW	460	0,152	483,0	1702,6	1205,8	41770	RETF029

Table 4: main choke

5. Filter capacitors (C1) 500Hz / 700Hz

AFE		L2 uH	C1 (500Hz) uF	C1 (700Hz) uF
OPD 32	15kW	2216	15	8
OPD 40	18,5kW	1897	18	9
OPD 48	22kW	1444	23	12
OPD 60	30kW	1155	29	15
OPD 70	37kW	992	34	17
OPD 90	45kW	763	44	23
OPD 110	55kW	664	51	26
OPD 150	75kW	474	71	36
OPD 175	90kW	403	84	43
OPD 220	110kW	316	107	55
OPD 250	132kW	279	121	62
OPD 310	160kW	226	149	76
OPD 370	200kW	189	179	91
OPD 460	250kW	152	222	113

Table 5: filter capacitors (C1) 500 / 700Hz.

Phase-Phase filter capacitors (C1) must be selected with values between C1(500Hz) and C1(700Hz) (Figure 1). Choose *AC filter Application* capacitors (ex. ARCOTRONICS series MKP 700V-50Hz).