Appendix – III

APPENDIX-III

Technical Data for VACON Drive:

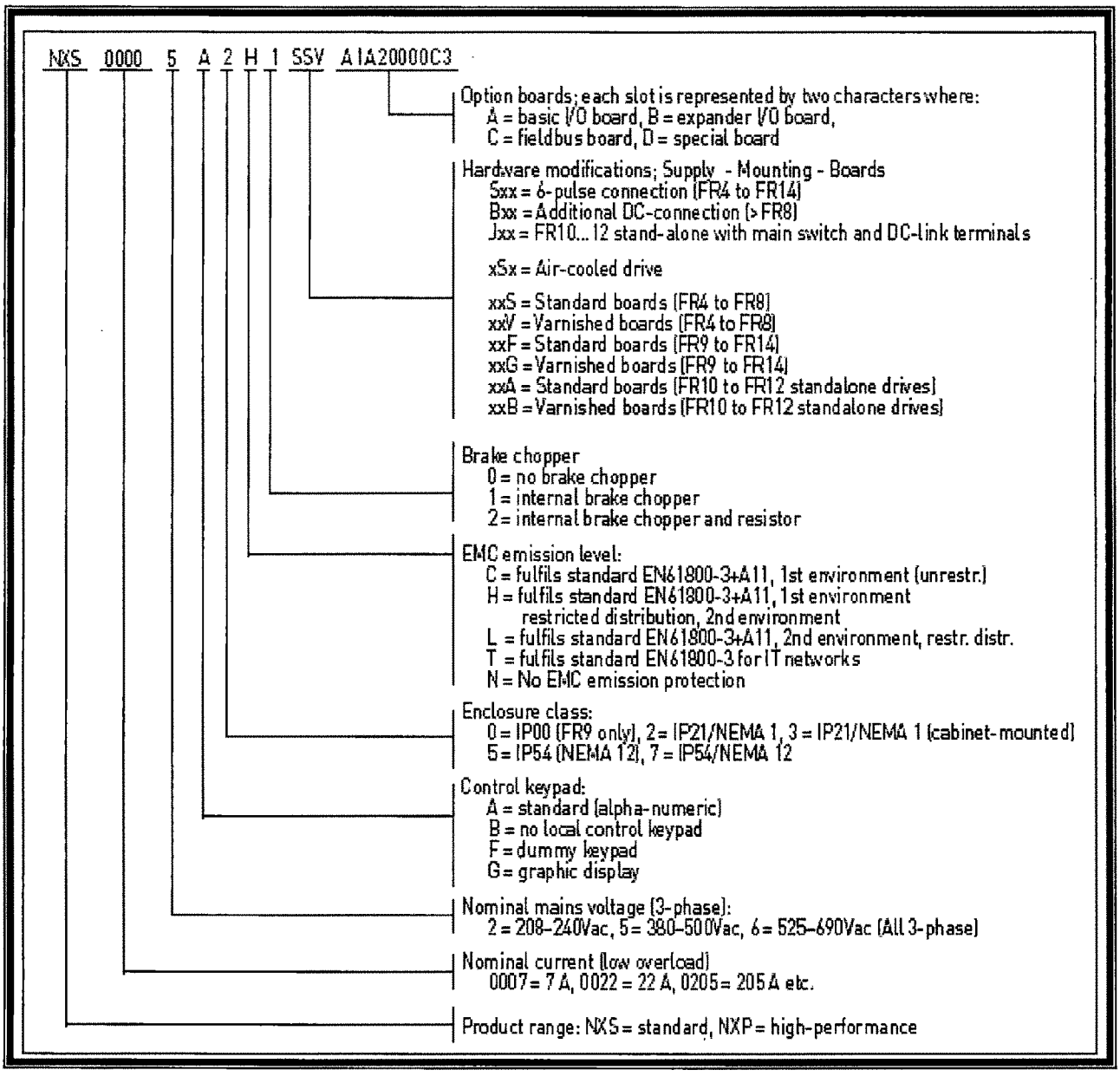


Figure III A. VACON NXP drive Type destination code

Mains connection	Input voltage U_{in}	208...240V; 380...500V; 525...690V; -15%...+10%
	Input frequency	45...66 Hz
	Connection to mains	Once per minute or less
	Starting delay	2 s (FR4 to FR8); 5 s (FR9)
Motor connection	Output voltage	0—U_{in}
	Continuous output current	I_H: Ambient temperature max. +50°C, overload 1.5 x I_H (1 min./10 min.) I_L: Ambient temperature max. +40°C, overload 1.1 x I_L (1 min./10 min.)
	Starting current	I_S for 2 s every 20 s
	Output frequency	0...320 Hz (standard); 7200 Hz (special software)
	Frequency resolution	0.01 Hz (NXS); Application dependent (NXP)
Control characteristics	Control method	Frequency control U/f Open Loop Sensorless Vector Control Closed Loop Vector Control (NXP only)
	Switching frequency (see parameter 2.6.9)	NX_2/NX_5: Up to NX_0061: 1...16 kHz; Default: 10 kHz NX_2: NX_0075 and greater: 1...10 kHz; Def: 3.6 kHz NX_5: NX_0072 and greater: 1...6 kHz; Def: 3.6 kHz NX_6: 1...6 kHz; Default: 1.5 kHz
	Frequency reference Analogue input Panel reference	 Resolution 0.1% (10-bit), accuracy ±1% Resolution 0.01 Hz
	Field weakening point	8...320 Hz
	Acceleration time	0.1...3000 sec
	Deceleration time	0.1...3000 sec
	Braking torque	DC brake: 30% * T_N (without brake option)
Ambient conditions	Ambient operating temperature	-10°C (no frost)...+50°C: I_H -10°C (no frost)...+40°C: I_L -10°C (no frost)...+35°C: for IP54/Nema12 NX 520 5 and 4166
	Storage temperature	-40°C...+70°C
	Relative humidity	0 to 95% RH, non-condensing, non-corrosive, no dripping water
	Air quality: - chemical vapours - mechanical particles	 IEC 721-3-3, unit in operation, class 3C2 IEC 721-3-3, unit in operation, class 3S2
	Altitude	100% load capacity (no derating) up to 1,000 m 1-% derating for each 100m above 1000. Max. altitudes: NX_2: 3000m; NX_5: 3000m/2000m (corner-grounded network); NX_6: 2000m
	Vibration EN50178/EN60068-2-6	5...150 Hz Displacement amplitude 1 mm (peak) at 5...15.8 Hz (FR4...9) Max acceleration amplitude 1 G at 15.8...150 Hz (FR4...FR9) Displacement amplitude 0.25 mm (peak) at 5-31 Hz (FR10...12) Max acceleration amplitude 0.25 G at 31...150 Hz (FR10...12)
	Shock EN50178, EN60068-2-27	UPS Drop Test (for applicable UPS weights) Storage and shipping: max 15 G, 11 ms (in package)
	Enclosure class	IP21/NEMA1 standard in entire kW/HP range IP54/NEMA12 option in entire kW/HP range Note! Keypad required for IP54/NEMA12

EMC (at default settings)	Immunity	Fulfils EN61800-3, first and second environment
	Emissions	Depend on EMC level. See chapters 2 and 3.
Safety		EN 50178 (1997), EN 60204-1 (1996), EN 60950 (2000, 3rd edition) (as relevant), CE, UL, CUL, FI, GOST R; (see unit nameplate for more detailed approvals)
Control connections (apply to boards OPT-A1, OPT-A2 and OPT-A3)	Analogue input voltage	0...+10V, R_i = 200kΩ, (-10V...+10V joystick control) Resolution 0.1%, accuracy ±1%
	Analogue input current	0(4)...20 mA, R_i = 250Ω differential
	Digital inputs (6)	Positive or negative logic; 18...30VDC
	Auxiliary voltage	+24V, ±10%, max volt. ripple < 100mVrms; max. 250mA Dimensioning: max. 1000mA/control box
	Output reference voltage	+10V, +3%, max. load 10mA
	Analogue output	0(4)...20mA; R_L max. 500Ω; Resolution 10 bit; Accuracy ±2%
	Digital outputs	Open collector output, 50mA/48V
	Relay outputs	2 programmable change-over relay outputs Switching capacity: 24VDC/8A, 250VAC/8A, 125VDC/0.4A Min.switching load: 5V/10mA
Protections	Overvoltage trip limit Undervoltage trip limit	NX_2: 437VDC; NX_5: 911VDC; NX_6: 1200VDC NX_2: 183VDC; NX_5: 333VDC; NX_6: 460 VDC
	Earth fault protection	In case of earth fault in motor or motor cable, only the frequency converter is protected
	Mains supervision	Trips if any of the input phases is missing
	Motor phase supervision	Trips if any of the output phases is missing
	Overcurrent protection	Yes
	Unit overtemperature protection	Yes
	Motor overload protection	Yes
	Motor stall protection	Yes
	Motor underload protection	Yes
	Short-circuit protection of +24V and +10V reference voltages	Yes

Figure III B. Technical Data

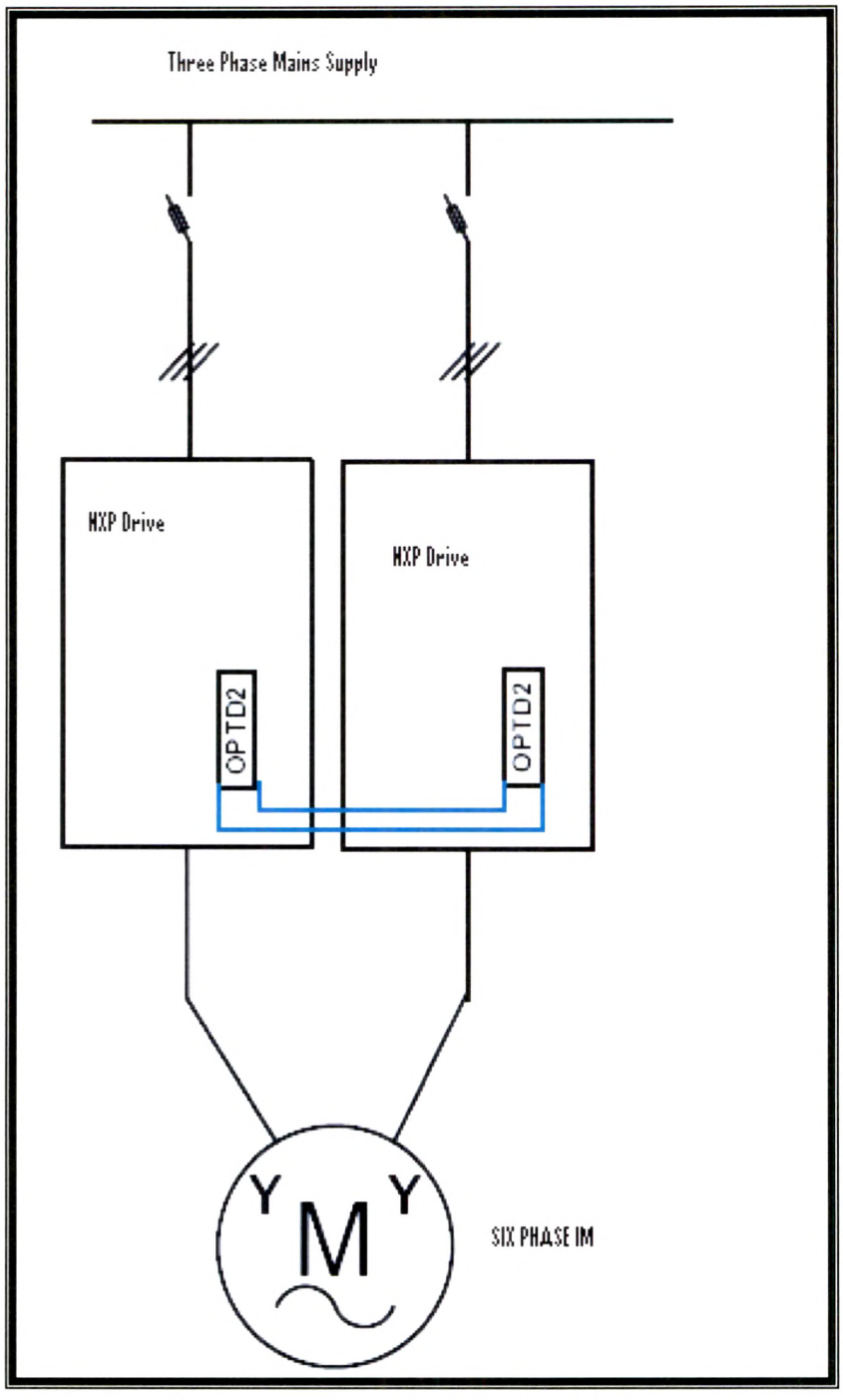
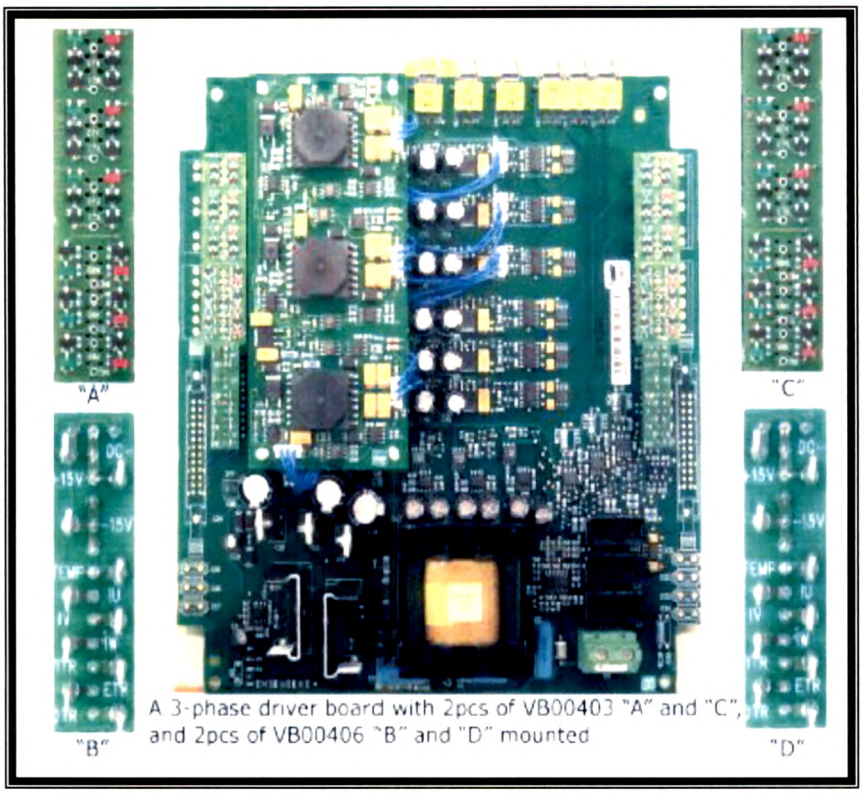


Fig.III C Multiphase IM fed from Vacon drives



Photograph of Driver Board

A:- I/O Board (Input / Output Board)

B :- Expander I/O Board

C :- Field Bus Board

E :- Special Board

M File Codings To Generate SVPWM

```
function [gp]=svpwm(t)
st=t*314;
teta=mod(st,2*pi);
s=1+fix(teta/(pi/3+1*10^-30));
v_ref=100;
vdc=200;
tz=0.000333;
fu=sqrt(3)*tz*v_ref/vdc;
t1 = fu*(sin(s*pi/3)*cos(teta)-cos(s*pi/3)*sin(teta));
t2 = fu*(cos((s-1)*(pi/3))*sin(teta)-sin((s-1)*(pi/3))*cos(teta));
t0=tz-(t1+t2);
if s==1
ta=(t1+t2+t0/2);
tb=(t0/2);
tc=(t0/2+t1);
elseif s==2
ta=(t1+t2+t0/2);
tb=(t0/2+t2);
tc=(t0/2);
elseif s==3
ta=(t0/2+t1);
tb=(t1+t2+t0/2);
tc=(t0/2);
elseif s==4
ta=(t0/2);
tb=(t1+t2+t0/2);
tc=(t0/2+t2);
elseif s==5
ta=(t0/2);
tb=(t0/2+t1);
tc=(t1+t2+t0/2);
else
ta=(t0/2+t2);
tb=(t0/2);
tc=(t1+t2+t0/2);
end
d=rem(t,tz);
sum1=ta-d;
sum2=tb-d;
sum3=tc-d;
ta1=ta(1);
tb1=tb(1);
tc1=tc(1);
time=t;
sw1=sum1(1);
sw2=sum2(1);
sw3=sum3(1);
h=d(1);
```

```
if sw1>0
va=200;
else
va=-200;
end
if sw2>0
vb=200;
else
vb=-200;
end
if sw3>0
vc=200;
else
vc=-200;
end
s11h=va(1);
s22h=vb(1);
s33h=vc(1);
vab=s11h-s22h;
vbc=s22h-s33h;
vca=s33h-s11h;
vabb=vab(1);
vbcc=vbc(1);
vcaa=vca(1);
loc2=(vabb<0);
g2=loc2;
loc4=(vbcc<0);
g4=loc4;
loc6=(vcaa<0);
g6=loc6;
g22=g2(1)*1;
g44=g4(1)*1;
g66=g6(1)*1;
loc1=(vabb>0);
g1=loc1;
loc3=(vbcc>0);
g3=loc3;
loc5=(vcaa>0);
g5=loc5;
g11=g1(1)*1;
g33=g3(1)*1;
g55=g5(1)*1;
gp=[g11,g22,g33,g44,g55,g66];
```

Universal Bridge
No of bridge arms:3
Snubber resistance(RS)= 1e5
Snubber capacitance(CS)= inf
Ron=1e-3
Power electronic device: MOSFET/DIODE