ACOMEL

A Flux Vector Drive with integrated:

- **Auto-tunning**
- **Shaft orientation**
- **Line regen**

For use with induction or synchronous motors

VHF1400A - USER MANUAL

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DANAHER MOTION

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Limit of validity:

This user manual match with the software versions:

- **37011d30.std – standard units**
- **36204d30.std – keypad any version**

or latest issues

TECHNICAL MODIFICATIONS RESERVED

Villars-Ste-Croix, February 2002

Safety instructions

Information on the Operating Manual

This operating manual applies to the VHF1400A frequency inverter family. It describes the connections and basic functions of the standard models.

CAUTION! Danger of death by electrocution

CAUTION! Absolutely essential

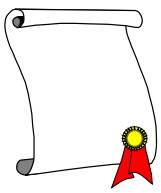
FORBIDDEN! Incorrect operation may lead to damage.

The Basic Safety Rules

First read the user manual
Before installing and commissioning, it is important for such personal to read carefully the operating instructions and safety warnings.

Electric drives are potentially dangerous

- Electrical voltages > 230 V/460 V
  High voltages may still be present up to10 minutes after the power has been cut off. Therefore you must always check for presence of power and voltages!
- In STOP mode, the drive remains active and the motor terminals are at a potential of 300 VDC against the ground.
- Rotating parts
- Hot surfaces



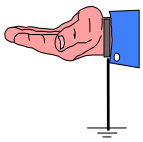
Your qualification

- In order to prevent personal injury and damage to property, only personnel with electrical engineering qualifications may work on the device.
- According to IEC364, DIN VDE0100, the qualified personnel must be familiar with the User Manual
- Have knowledge of national standards and accident prevention regulations

Working instruction

During installation observe the following instructions:

- Always comply with the connection conditions and technical specifications.
- Comply with the standards for electrical installations, such as regarding wire gauges, grounding lead and ground connections



The converter control board uses a large number of CMOS (Composite Metal Oxide Semiconductor) which are highly sensitive to electrostatic discharges.

To avoid any damages to the control board

- wear a grounding strap and always handle the board by the frame
- make sure you are working on an earthen anti-static floor
- use anti-static packing material only

Overspeed protection

If an overspeed protection is required, it must be provided by the motor manufacturer as this function is not integrated in the drive.

Proper installation

Inverter drives are components that are intended for installation within electrical systems or machines. The inverter may not be commissioned or put into operation until it has been established that the machine as a unit complies with the provisions of the EC Machinery Directive (89/392/EEC) as well with the standard EN 60204 (Safety of machines).

If the frequency inverter is used for special applications the specific standards and regulations for this environment must always be observed.

Repairs may only be carried out by authorized repair workshops. Unauthorized opening and incorrect intervention could lead to physical injury or material damage. The warranty provided by DANAHER MOTION would thereby be void.

Responsibility

Electronic devices are fundamentally not fail-safe. The company setting up and/or operating the machine or plant is itself responsible for ensuring that the drive is rendered safe if the device fails.

The standard EN 60204-1/DIN VDE 0113 “Safety of machines”, in the section on “Electrical equipment of machines”, stipulates safety requirements for electrical controls. The requirements to comply with are intended to protect the integrity of personnel and machines and to maintain the function capability of the machine or plant. The function of an emergency off system does not necessarily have to cut the power supply to the drive.

To protect against risk of injury, it may be more beneficial to maintain individual drives in operation or to initiate specific safety sequences. The emergency stop process may be assessed by means of a risk analysis of the machine or plant, including the electrical equipment to EN 1050. Part of this analysis is determined by the selection of the circuit category in accordance with prEN 954 “Safety of machines – Safety related parts of controls”.

A comprehensive range of product

Product basics

- The **VHF1400A** is a **Flux Vector Drive** designed for application up to **1400 Hz**. The **VHF1400A** family consists of 6 models with a peak output rating of **15 to 90 kVA.**
- The KEYPAD PC580 control unit can be integrated on the front panel or supplied as a separate remote control unit.
- The drive is equipped with a RS485 serial link.
- All units are standard with line regeneration.
- Easy adaptation to the motor's parameters using the **Auto-Tuning** process.
- The **VHF1415A and VHF1430A are UL certified**
- **UL certification** of the **VHF1440A, 1455A, 1472A, 1490A** is in process

Main technical data

- Input voltage, all units, 3 x 200 V to 3 x 480 V auto-ranging, no line transformer
- Output voltage V_{RMS} : 0 … U_{IN}
- Output frequency range 0 … 1400 Hz
- Ambient temperature 40°C
- Continuous current overload 120% without time limitation
- Max current overload 150% for 1 min / 10 min
- Short-circuit protection: suitable for use on a circuit capable of delivery not more than 5000 A_{RMS} symmetrical Amperes, 480 V maximum.

Current and Power ratings

Model	**Output Current A_{RMS}**			**Typical motor power**
	Nominal	Continuous	Peak	kW @ 3 x 400 V
VHF1415A	15	18	22.5	7.5
VHF1430A	30	36	45	15
Input current:	All units are rated for a maximal input current of 32 **A_{RMS}**			
Input terminals:	10 mm^2			
Input cables:	Minimum section 6 mm^2 resp. AWG 10 Use copper conductors 75°C **only**			
Overload protection:	An external overload protection is required			

Model	**Output Current A_{RMS}**			**Typical motor power**
	Nominal	Continuous	Peak	kW @ 3 x 400 V
VHF1440A	40	48	60	22
VHF1455A	55	66	83	30
Input current:	All units are rated for a maximal input current of 63 **A_{RMS}**			
Input terminals:	16 mm^2 (oversized terminal, will accept up to 25 mm^2 wire)			
Input cables:	Minimum section 16 mm^2 resp. AWG 6 Use copper conductors 75°C **only**			
Overload protection:	An external overload protection is required			

Model	Output Current A_{RMS}			Typical motor power
	Nominal	Continuous	Peak	kW @ 3 x 400 V
VHF1472A	73	90	110	40
VHF1490A	90	110	135	50
Input current:	All units are rated for a maximal input current of 90 A_{RMS}			
Input terminals:	35 mm^2			
Input cables:	Minimum section 25 mm^2 resp. AWG 3 Use copper conductors 75°C **only**			
Overload protection:	An external overload protection is required			

Type Part Numbering

VHF14xxA1-xxx	**With** PC580 on front cover
VHF14xxA0-xxx	**With** PC580 on remote position, customer mounted
VHFy1400A2-xxx	Drive integrated in IP54 cabinet, PC580 on front door y: U = fan cooling, V = Heat exchanger air / air W = heat exchange air / water, Q = air conditioning
NOTE: The versions **without KEYPAD PC** are **not available** **xxx** available to define customer specific version	

Connecting the VHF drive using a transformer

The VHF Flux Vector Drive with line regeneration has been design for **direct connection** to any 3 phases voltage between 200 and 480 V.

CAUTION: If you need to match the nominal voltage of the motor with the line voltage, respectively the output voltage of the drive, the transformer must be inserted BETWEEN the drive and the motor and NOT in the front of the drive. A mismatching of the line voltage and the motor voltage can leads to motor damages.

This is mandatory to:

- Safely regen into the line during the deceleration without tripping the drive with the message “Mains out of tolerances”
- Protect the input rectifier from voltage peaks

When regenerating direct into the mains, the impedance of the power supply network is very low and no increase of the input voltage can be seen.

Using a line transformer in front of the drive will completely change the behavior of the system. During the regenerative process, the input voltage of the drive respectively the secondary voltage of the transformer will increase due to the impedance represented by the transformer inductance. Voltage increases over 20 % has been measured and the input over-voltage protection of the drive was activated.

The software input protection accept as being within the tolerances, any input voltages between 200 V – 15% and 480 V +10% i.e. any voltage between 170 VAC and 530 VAC. Only if the input voltage is outside of this range, the drive will trip and the message “mains out of tolerances” displayed.

Nevertheless, if the input voltage is higher than 480 V or the installation requires a galvanic insulation in front of the drive, following rules must be respected:

- Don't use an auto-tranformer but only a **transformer with separated windings.**
- The output voltage of the transformer should not be higher than **400 V** to secure a proper operation of the line regen.

Motor protection chokes

For enhanced performances of the VHF1400A and the driven **induction motor**, it is strongly recommended to use line chokes between the drive and the motor to protect the motor from high current peaks.

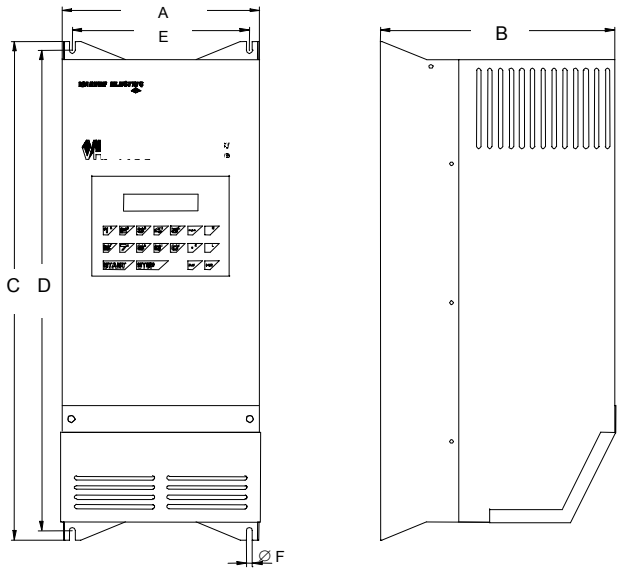
Suggested choke values: **60 µH** for the VHF1415A, 1430A, 1440A, and 1455A
30 µH for the VHF1472A and 1490A

For **synchromous motor** a higher value is required. Please consult the motor manufacturer for optimal selection.

Output power and heat dissipation

Model	Output current A_{RMS}			Heat dissipation
	Nominal	Continuous	Peak	Watts
VHF1415A	15	18	30	360
VHF1430A	30	36	45	720
VHF1040A	40	48	60	1000
VHF1055A	60	72	83	1300
VHF1072A	73	90	110	1800
VHF1090A	90	108	135 (150)	2200

The dimensions and weight of the VHF1400A



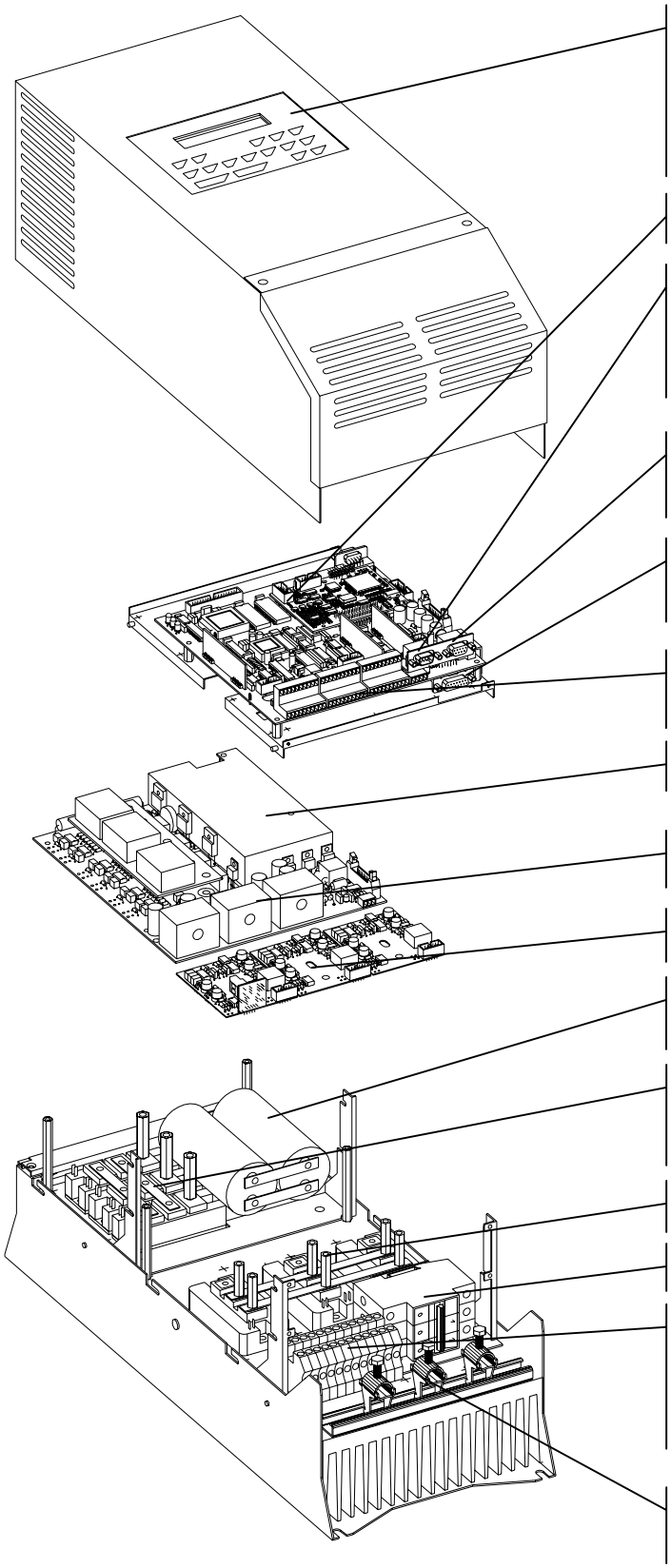
Type	Overall dimensions			Mounting screws location			Weight
	Width A mm	Height C mm	Depth B mm	Slot F mm	Width E mm	Height D mm	kg
VHF1415A, VHF1430A	223	557	265	7 (4 x M6)	199	537	29
VHF1440A to VHF1490A	308	645	318	9 (4 x M8)	279	625	41

Cabinet enclosure

1. The cabinet size and / or cabinet fan cooling, heat exchanger, air conditioning must be sized according the power dissipation shown on the table **Output power and heat dissipation** above.

2. The minimum distances between cabinet walls and the drive (left, right, top and bottom) as well between drives mounted side by side are 100 mm.

VHF1415A - VHF1430A - Drive overview



The KEYPAD PC580
Display with 2 lines of 20 characters
Serial link RS422 / 485 to control board
The keypad is **mandatory** to operate the drive

The control board

CN3 D-Sub 9 poles connector (left)
Parallel output of the sin/cos sine waves of the speed sensor.
Only active if sin/cos sine waves on CN2

CN1 D-Sub 9 poles connector (right)
RS422 / 485 serial link for Keypad

CN2 D-Sub 15 poles for sin/cos sine waves 1 V peak or encoder TTL input

The control signal TERMINAL BLOCK **X2**

The switching power supply

The 3 current sensing modules

The IGBT's drivers

The 2 paper capacitors of the intermediate DC bus

The 3 phases input rectifier with inverter function for the line regeneration

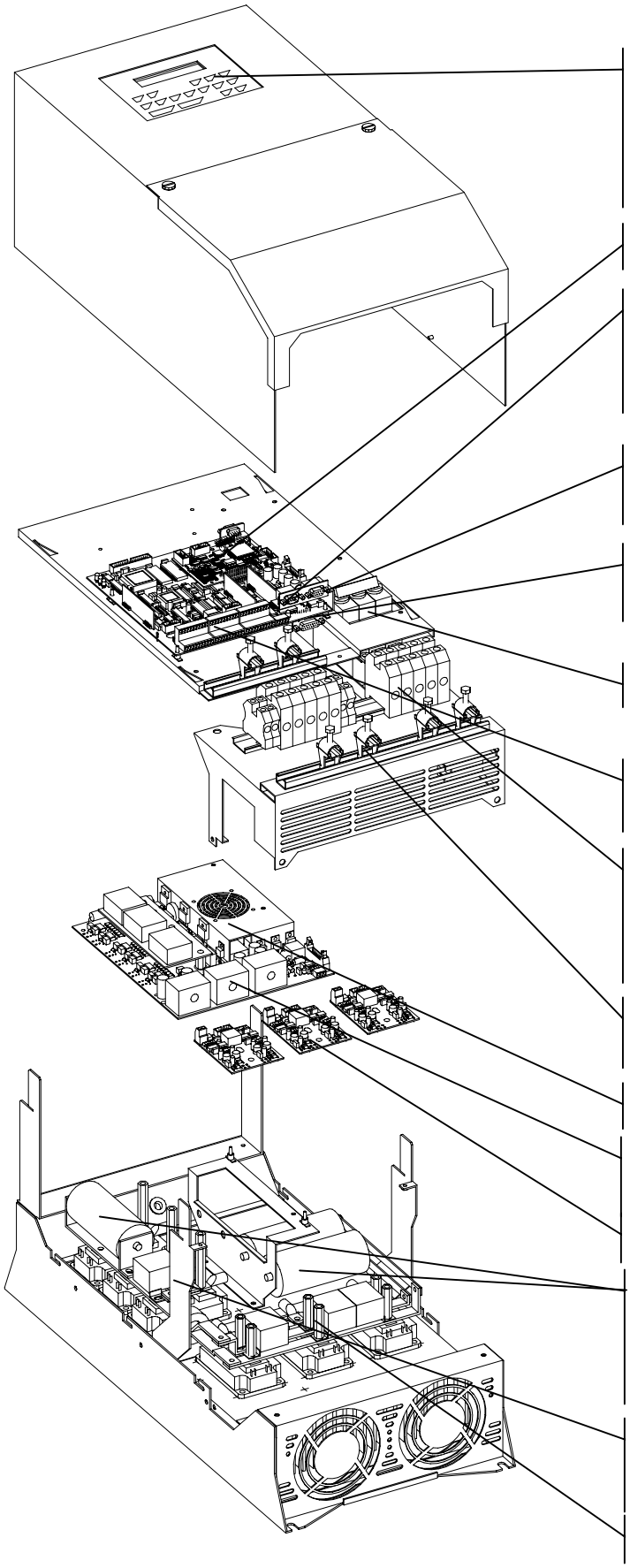
The 3 phases output inverter

The input circuit breaker

Power terminal block **X1**
3 phases line input
3 phases motor output
and ground terminals

Connecting cables strength relief and shielding grounding clamps

VHF1440A to VHF1490A Drive overview



The KEYPAD PC580
Display with 2 lines of 20 characters
Serial link RS422 / 485 to control board
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The control board

CN3 D-Sub 9 poles connector (left)
Parallel output of the sin/cos sine waves of the speed sensor.
Only active if sin/cos sine waves on CN2

CN1 D-Sub 9 poles connector (right)
RS422 / 485 serial link for Keypad

CN2 D-Sub 15 poles for sin/cos sine waves 1 V peak or encoder TTL input

The input circuit breaker

The control signal TERMINAL BLOCK **X2**

Power terminal block **X1**
3 phases line input
3 phases motor output
and ground terminals

Connecting cables strength relief and shielding grounding clamps

The switching power supply

The 3 current sensing modules (shape are different on VHF1490A)

The IGBT's drivers

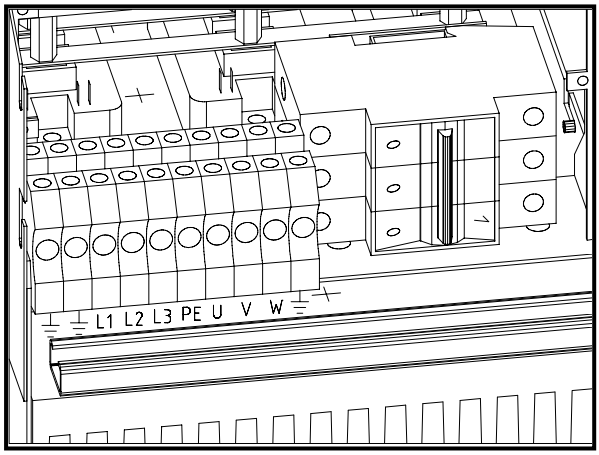
The paper capacitors of the intermediate DC bus
VHF1440A, 1455A : 3 ea
VHF1472A, 1490A : 5 ea

The 3 phases input rectifier with inverter function for the line regeneration

The 3 phases output inverter

VHF1400A - Terminals description

The power terminal block X1

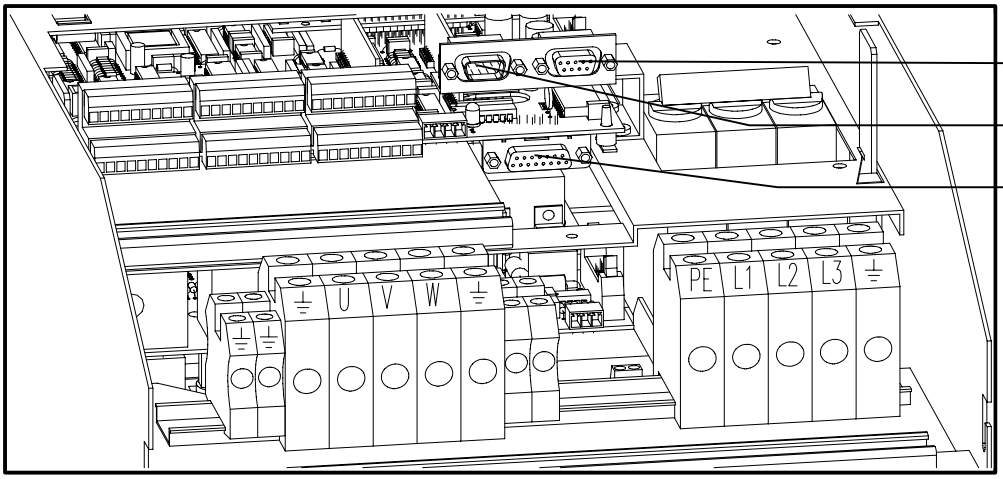


VHF1415a and VHF1430A

PE	Earth terminals
L1-L2-L3	Line input, 3 phases 200 V to 480 V
U-V-W	Motor output

High Voltage inputs and outputs

VHF1404A to VHF1490A



Motor output terminals U-V-W
In STOP mode, the drive remains active and the motor terminals are at a potential of 300 VDC against the ground. Before any intervention on the drive, make sure that the power supply has been removed.

DC-bus voltage
Large capacitors are installed on the intermediate DC-bus voltage. Please **wait at least 3 min.** before to remove the cover of the terminal bloc and to access to the internal part of the drive.

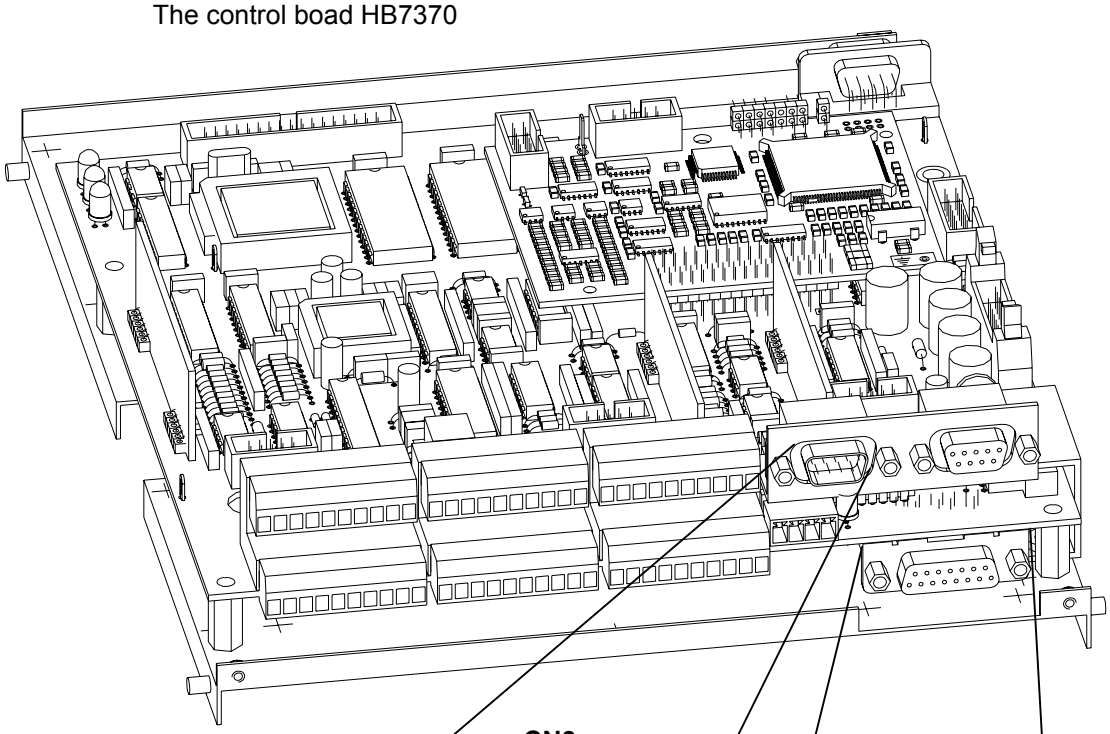
The + 25VDC - Auxiliary Power Supply

On the control terminal block X2, they are a number of terminals where the +25 V internal power supply is available. This power supply is only available for the inputs and outputs of the VHF1400A; no other device must be connected. The +25VDC outputs are short-circuit protected by an internal PTC. If this protection has been activated, you have to wait until the PTC has cooled down to get the auxiliary power supply back

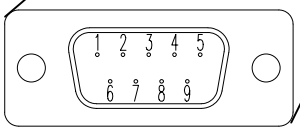
The total load must not exceed 400 mA.

CN2 The D- Sub connector of the speed / position feedback input

The control boad HB7370

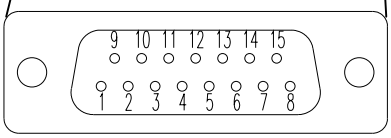


CN3
Sin / Cos output



1	2	3	4	5	6	7	8	9
SIN	$\overline{\text{SIN}}$	COS	$\overline{\text{COS}}$	N	$\overline{\text{N}}$	GND	GND	--

CN2
Sensor Input



1	Detection of loop	*see note
2	Index +	N
3	Cosinus +	COS
4	Sinus +	SIN
5	Channel INDEX +	ENCODER
6	Channel B +	ENCODER
7	Channel A +	ENCODER
8	0 V - shield	
9	Index -	N inverted
10	Cos -	COS inverted
11	Sinus -	SIN inverted
12	Channel INDEX -	ENCODER
13	Channel B -	ENCODER
14	Channel A -	ENCODER
15	5 V resp. 25 V / 100 mA	See comment

* When the connector is plugged in, the 5V of pin 15 are applied to pin 1, confirming the presence of the closed loop signals.
In the cable connector you must put a bridge between terminals 15 and 1

The integrated interface for sin/cos sensors

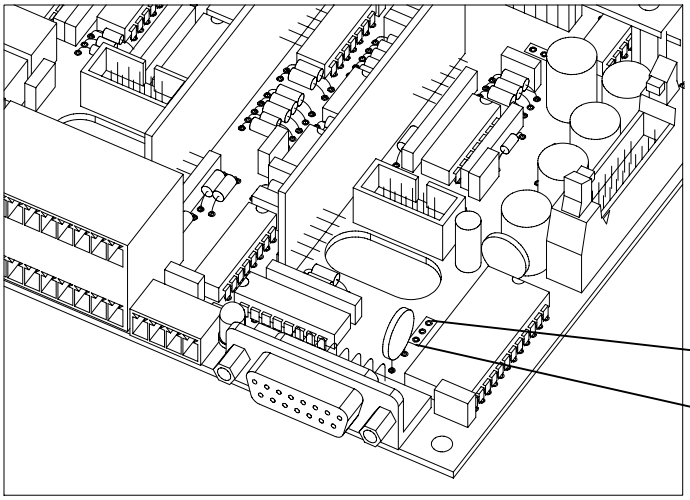
Usually the sensors used deliver two sinusoidal waves, 1 V peak to peak, electrically shiffed by 90°, it's why it is called a sin/cos sensor. Additionally an index signal must be available is the application need to orient the shaft of the motor. Those sensors have normally an output frequency limitation around 200 kHz. Take car of it when selecting the number of teeth of the gear. For example a gear with 256 teeth can be used without problem up to 45'000 rpm. (Exact value: 256 teeth * 45000 rpm / 60 s = 192 kHz).

Those sensors deliver for each channel 2 signals: the direct one and its inverted value. The interface takes care of the offsets compensation of the signals, as well as their possible amplitude distortions. The setup process is automatic and is describe in the menu L : Setup of the Feedback.

When the motor speed is higher than 10% of the maximum speed, we check if the feedback signals are available. If not the drive will be tripped and the error message: **Sensor Problems** will be displayed.

For speed and positioning control, we use the feedback signal with an interpolation of 4, this values is fix and cannot be modified. As we use the positive and negative crossing of the 0 V line by both signals (sin and cos), we have a factor 4 (number of polarity changes for both channels) over the number of pulses per revolution and channel. For example a gear with 256 teeth will give 4096 increments per revolution (256 teeth * 4 polarity changes * 4 interpolation, or to make it simplle just take "the number of teeth*16).

Selecting the voltage of the feedback sensor power supply



A bridge on the control board allows to select the supply voltage of the speed / position feedback sensor. This voltage is present on PIN No 15 / CN2

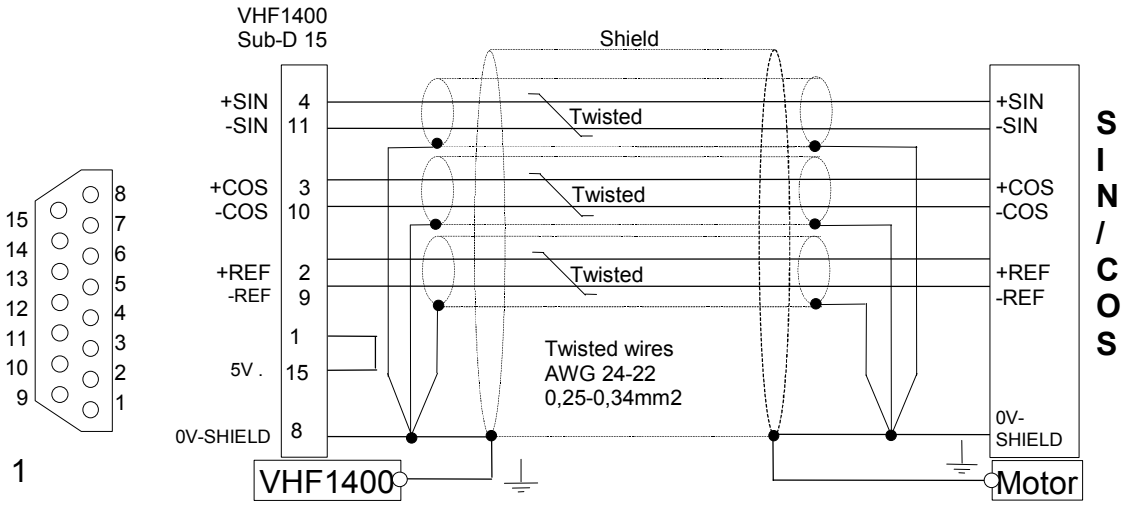
On **JP1**, a jumper between the 2 upper points corresponds to 25 VDC, between the 2 lower points to 5 VDC.

Caution: Factory setting is 5 V. A wrong setting can cause destructive damages to the sensor

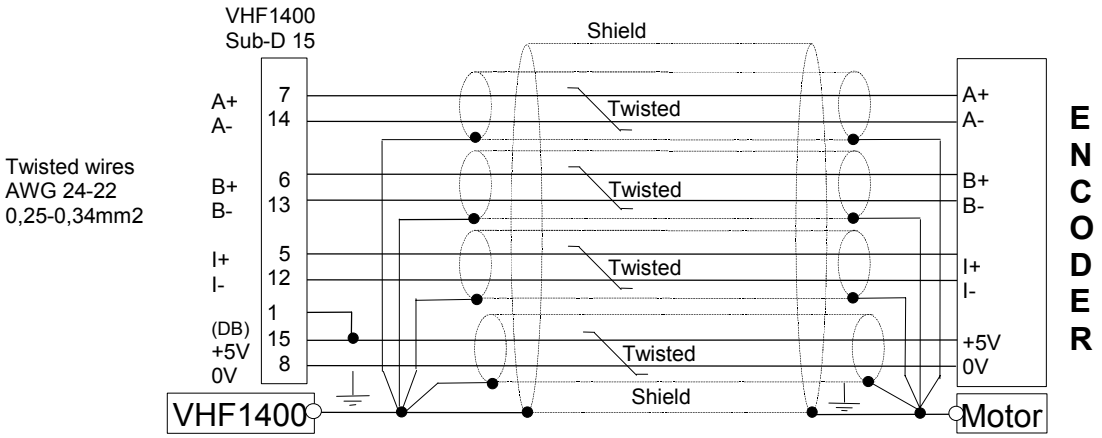
Grounding of the shielding of the encoder / sin-cos sensor connections is very important, a bad ground could lead to system failure or non performances

Connecting the feedback

VHF1400 - SIN / COS sensor



VHF1400 - ENCODER



The shielding of the connection must start at the sensor have no interruption, and be grounded at both ends.

The control TERMINAL BLOCK X2

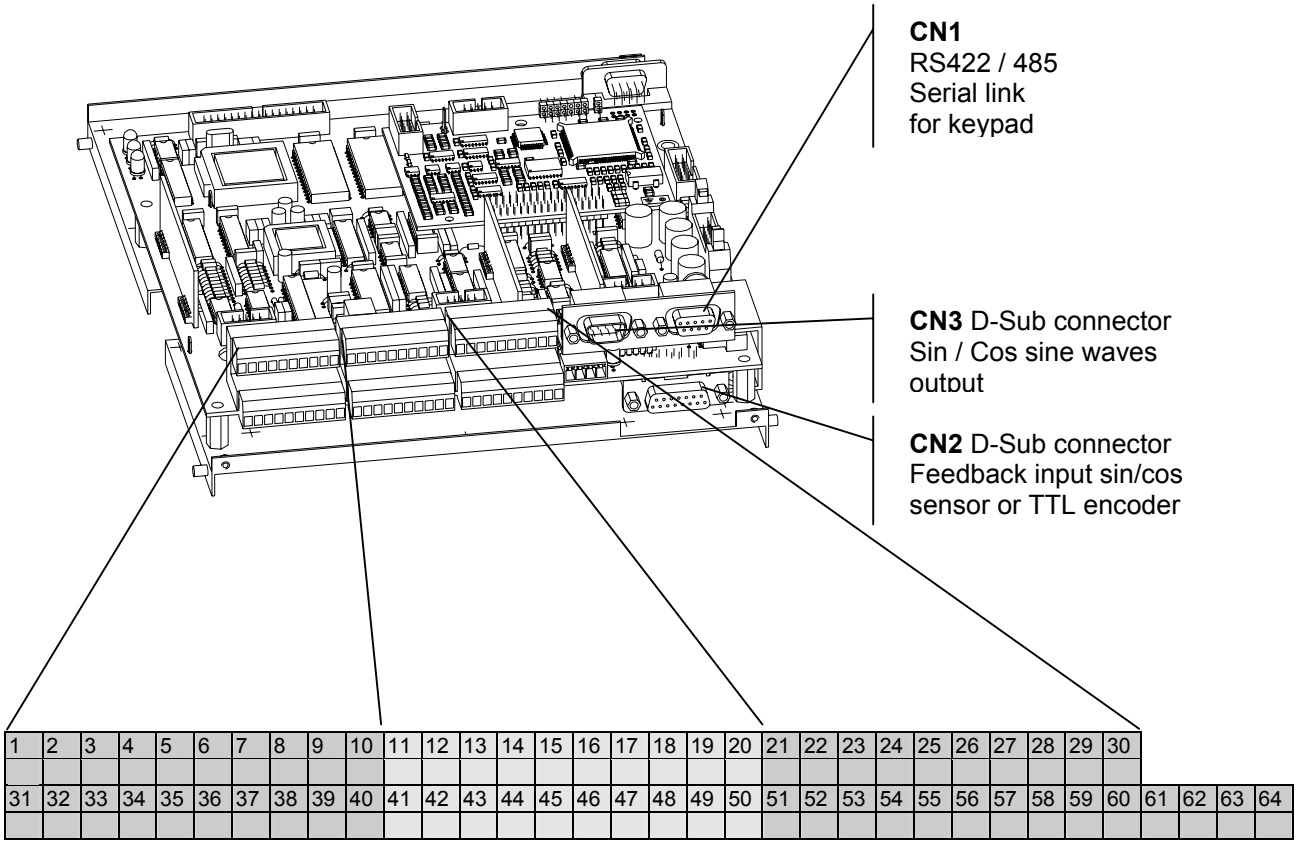
Terminals description

Our digital inputs are **not** galvanic insulated. You must take care that no external potential (24 VDC) is applied to those inputs before our own internal auxiliary power supply 25 VDC has been built up. Non respect of this process could lead to **major damages** to the motor and / or the drive.

Term No	Short Name	Description	How to activate
1	2^0	Pre-set speeds – value 1	Apply +25VDC
2	2^1	Pre-set speeds – value 2	Apply +25VDC
3	2^2	Pre-set speeds – value 4	Apply +25VDC
4	+25VDC	25VDC auxiliary power supply	Available for input activation
5	KEY	Locking key	Apply +25VDC
6	+25VDC	25VDC auxiliary power supply	Available for input activation
7	START	Start input	Apply +25VDC
8	+25VDC	25VDC common to Start and Stop	
9	STOP	Stop input – stop the drive if open	
10	RST	Reset input	Apply +25VDC
11	+25VDC	25VDC auxiliary power supply	Available for input activation
12	POS	Position activation input	Apply +25VDC
13	+25VDC	25VDC auxiliary power supply	Available for input activation
14	Pot. +	+10 VDC	To connect an external pot. For speed reference input
15	Pot. -	- 10 VDC	
16	PTC +	Terminal for motor PTC+	Activated when motor temperature too high
17	AGND	Electronic Ground	
18	RE1-NC	Output relay 1 – contact NC	Contact will open **When relay is energized** Contact will close
19	RE1-COM	Output relay 1 – common	
20	RE1-NO	Output relay 1 – contact NO	
21	RE3-NC	Output relay 3 – contact NC	Contact will open **When relay is energized** Contact will close
22	RE3-COM	Output relay 3 – common	
23	RE3-NO	Output relay 3 – contact NO	
24	RE5-NC	Output relay 5 – contact NC	Contact will open **When relay is energized** Contact will close
25	RE5-COM	Output relay 5 – common	
26	RE5-NO	Output relay 5 – contact NO	
27	AO1	Analogue output 1	Internal programmable parameters – 0 … 10 V
28	AO2	Analogue output 2	
29	PSTOP	Priority Stop	Apply +25VDC
30	+25VDC	25VDC auxiliary power supply	Available for input activation
31	2^0	Pre-set stop position – value 1	Apply +25VDC
32	2^1	Pre-set stop position – value 2	Apply +25VDC
33	2^2	Pre-set stop position – value 4	Apply +25VDC
34	+25VDC	25VDC auxiliary power supply	Available for input activation
35	2^0	Motor partition selection – value 1	Apply +25VDC
36	2^1	Motor partition selection – value 2	Apply +25VDC
37	2^2	Motor partition selection – value 4	Apply +25VDC
38	+25VDC	25VDC auxiliary power supply	Available for input activation
39	EXT	External interlock – Apply 25VDC	Drive stop when open
40	+25VDC	25VDC auxiliary power supply	Available for input activation
41	ISR	Reverse the rotation direction	Apply +25VDC
42	+25VDC	25VDC auxiliary power supply	Available for input activation
43	CMD1 +	HIGH level of differential speed reference input	Used to connect +10 V or $\pm$ 10 V from the CNC
44	CMD1 -	LOW level of differential speed reference input	
45	CMD2	Speed reference input 0 … 20 mA	Use to connect a current speed reference input
46	AGND	Electronic Ground	

Term No	Short Name	Description	How to activate
47	+25VDC	25VDC auxiliary power supply	Available for input activation
48	RE2-NC	Output relay 2 - contact NC	Contact will open
49	RE2-COM	Output relay 2 - common	**When relay is energized**
50	RE2-NO	Output relay 2 - contact NO	Contact will close
51	RE4-NC	Output relay 4 - contact NC	Contact will open
52	RE4-COM	Output relay 4 - common	**When relay is energized**
53	RE4-NO	Output relay 4 - contact NO	Contact will close
54	A+	Encoder channel A	Encoder outputs For external use Signals: TTL level
55	A-	Encoder channel A inverse	
56	B+	Encoder channel B	
57	B-	Encoder channel B inverse	
58	I+	Index channel	
59	I-	Index channel inverse	
60	NC	Not connected	
61	AI1	Analogue input 1	0 … 10 VDC signal
62	AGND	Analogue ground	
63	AI2	Analogue input 2	0 … 10 VDC signal
64	NC	Not connected	

X2 - Terminals location

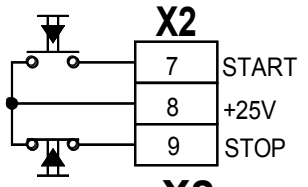


Compulsory Connections

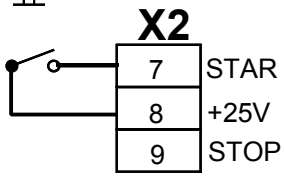
Some of the connections are optional, depending on what functions are required and whether these functions are to be accessed in digital mode from KEYPAD or from the TERMINAL BLOCK X2. For further information, refer to the block diagram. Even to control the drive through the user interface PC580, the following connections are compulsory:

- Mains input: terminals L1, L2, L3 and PE
- Converter outputs: U, V, W and PE
- STOP terminals X2/8 – X2/9 must be strapped together if the STRAT/STOP is made using the PC580 keypad
- Priority STOP: terminals X2/29 – X2/30 must be strapped together. Opening this contact will stop the motor with a braking current of 150% of the nominal current of the motor, as long this current doesn't exceed the peak current of the converter.
- External interlocks: terminals X2/39 – X2/40 (must be strapped together if the external interlocks are not used).
- Motor temperature probe PTC: terminals X2/16 – X2/17 (must be strapped together if the motor has no temperature probe). **UL requires an External Motor Overload Protection.**
- Encoder or sin/cos sensor connections

The START / STOP functions



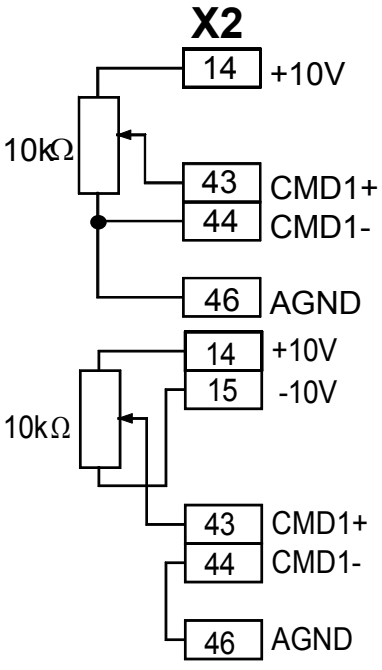
START command with impulse **or** permanent contact to be defined in the menu B.
The **START** remains active until the **STOP** circuit between terminals 8 and 9 is interrupted.



START / STOP command using a single permanent contact.
Caution: If the permanent start contact is closed when the inverter is powered up, the motor will start automatically.

Note: With the **START / STOP** allocated to the **keypad**, don't forget to strap together the terminals X2/8 – X2/9.

The Speed Reference Input using an external potentiometer



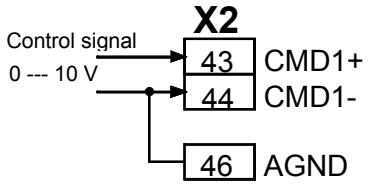
Input 0 ... +10 V

Reversing through terminal block or user interface PC580 KEYPAD depending on the assignment made in the menu B

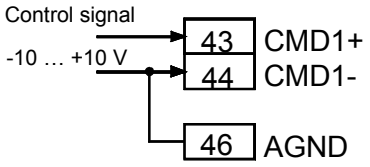
Differential input ± 10 V

Reversing of direction when crossing 0 V
Reversing contact on TERMINAL BLOCK X2 must be open

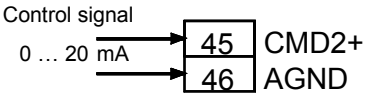
The Speed Reference Input using an external analog signal



Input 0 ... +10 V
Reversing through terminal block
or user interface PC580 KEYPAD



Differential input ± 10 V
Reversing of direction when crossing 0 V
Reversing contact on TERMINAL BLOCK X2
must be open



0 ... 20 mA Current loop as speed reference input
Reverse the direction of rotation only with the PC580 KEYPAD

Compensation of a analogue reference offset

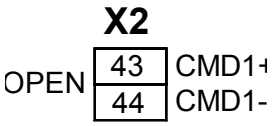
Depending on the length of the analogue speed reference cable, its routing through the machine, the possible induced voltage, the quality of the grounding of the shielding as well other environmental influences, the analogue speed reference signal delivered by the CNC will be affected by noise and / or by an **voltage offset which will affect the precision of the set speed. Using a ± 10 V signal** with reversing of the rotation direction when crossing 0 V, the **offset could even be different for each direction.**

When an accurate speed is needed and if speed difference when reversing the direction with a bipolar signal, can be the source of problem, this offsets need to be compensated.

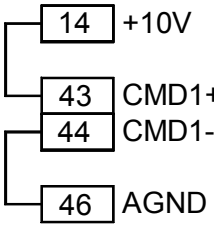
HOW TO PROCEED:

1. In START mode give an analogue speed reference of ≅ 2% of F_{MAX} from the CNC
2. Using either the true speed value displayed on the KEYPAD PC580 or the CNC display, compare your reference speed with the true speed. If you have a speed difference:
   - either it is variable and your reference signal is affected by noise; in this case you better carefully check your wiring and shielding grounding
   - or the speed difference is constant and your reference is affected by an **offset;** in this case proceed to the offset compensation as follow:
3. Enter to menu D using **2ndF D (see programming section)**
4. Using arrow down go to menu step: **Offset compensation**
5. Using either the **Arrow UP** and **Arrow DOWN** or the numerical key of the PC580 input the **number of RPM** you want to compensate. To key in a negative number, use the key • (decimal point) to key in the **minus.** Confirm compensation with **ENTER.** The maximum offset compensation is limited to 2% of F_{MAX}. This compensation will be then used over the all speed range for the set rotation direction.
6. Repeat steps 4 and 5 if necessary.
7. If you are using a ± 10 V signal with reversing when crossing 0 V, reverse you speed reference signal from the CNC.
8. Repeat steps 4 to 6 for the reversed direction.

The Speed Reference Input using the PC580 KEYPAD



Reversing the direction using the **PC580 KEYPAD**

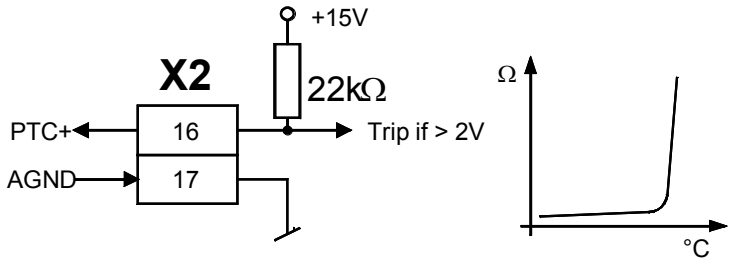


Reversing the direction using the **TERMINAL BLOCK X2**

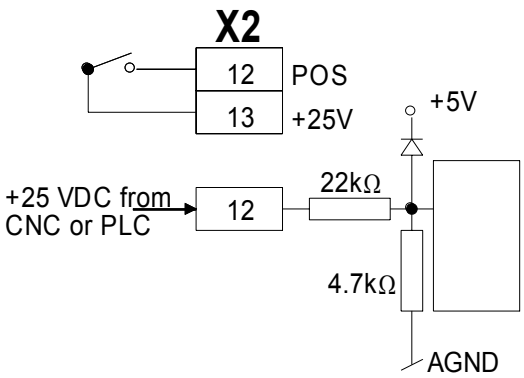
In addition see page 22: Reversing from terminal block

Connecting the PTC - motor temperature protection

The PTC - motor temperature protection sensor will be connected between terminal X2/16 and X2/17. This input is not protected against overvoltage



The digital and analog programmable outputs and Inputs



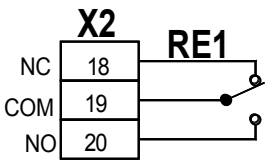
They are two ways to activate a digital input.

The first is using our internal 25VDC, which will be applied to the corresponding input using a simple contact.

The second is using an external 25VDC source coming either from a CNC or a PLC. In this case the **electronic ground** of both systems must be linked together.

In our drive, the internal circuitry is providing a divider to get 5 V out of the 25VDC supplied.

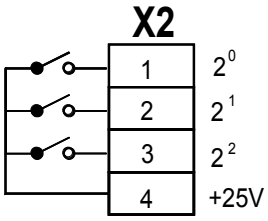
The potential free relay contacts



Digital outputs No 1, 2, 3, 4 and 5
Contact rating 25VDC - 100 mA

RE1-NC Output relay 1- contact normally closed
RE1-COM Output relay 1 - middle point
RE1-NO Output relay 1 - contact normally open
Terminals 18, 19, 20: relay No 1
Terminals 48, 49, 50: relay No 2
Terminals 21, 22, 23: relay No 3
Terminals 51, 52, 53: relay No 4
Terminals 24, 25, 26: relay No 5

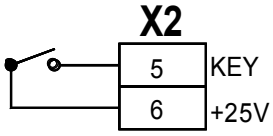
Pre-set speed selection



The selection of the pre-set speed is made using BCD coding.
The sequence of the selection using the TERMINAL BLOCK X2 is the following:

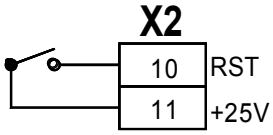
- Pre-set speed No 1 = Apply +25VDC to terminal 1
- Pre-set speed No 2 = Apply +25VDC to terminal 2
- Pre-set speed No 3 = Apply +25VDC to terminal 1 and 2
- Pre-set speed No 4 = Apply +25VDC to terminal 3
- … and so on until Pre-set speed No 7

The access key



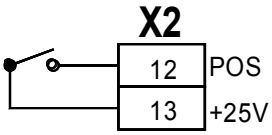
The access to the programming menus B (motor parameters) and C (inputs and outputs set-up) can be locked using the terminal X2/5. The access is locked when +25VDC is applied

The RESET



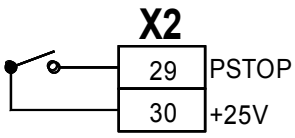
In case of failure, applying +25VDC to the terminal X2/10 can reset the drive

Activating the shaft orientation



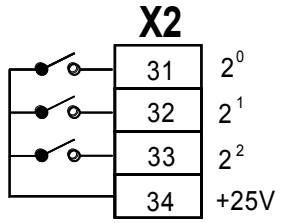
Applying +25VDC to the terminal X2/12 activates the shaft orientation function. The positioning will be activated **only after 2 complete revolution of the motor shaft. The system will test correct index and number of pulses of the sensing system**

The priority Stop



Opening this input will STOP the motor using the fastest possible braking ramp but maximum with 150% of the nominal current. In this case the deceleration time will be ignored and the motor will be braked down using the programmed overload current, respectively torque

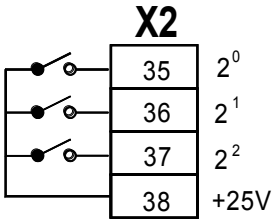
Selecting the STOP position



The selection of the pre-set STOP position is made using BCD coding. The sequence of the selection using the TERMINAL BLOCK X2 is the following:

- Pre-set position No 1 = Apply +25VDC to terminal 31
- Pre-set position No 2 = Apply +25VDC to terminal 32
- Pre-set position No 3 = Apply +25VDC to terminal 31 and 32
- Pre-set position No 4 = Apply +25VDC to terminal 33
- … and so on until Pre-set position No 7

Selecting the motor partition

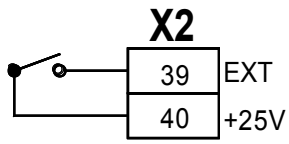


The selection of the motor partitions is made using BCD coding. They are 8 pre-programmed motor partition available. The sequence of the selection using the TERMINAL BLOCK X2 is the following:

- Motor partition No 0 = default value in **TERMINAL BLOCK** mode
- Motor partition No 1 = Apply +25VDC to terminal 35
- Motor partition No 2 = Apply +25VDC to terminal 36
- Motor partition No 3 = Apply +25VDC to terminal 35 and 36
- Motor partition No 4 = Apply +25VDC to terminal 37

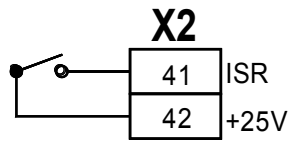
… and so on until Pre-set position No 7

External Interlocks



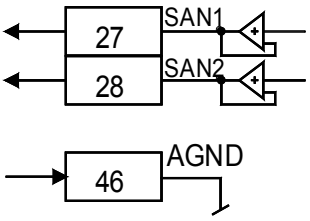
When this circuit is open, a converter error condition is generated. This interlock is used for monitoring external functions such as spindle lubrication, safety door etc...

Reversing from the terminal block



External motor-reversing contact
This function must be set for terminal block mode

The Analog Outputs AO1 and AO2

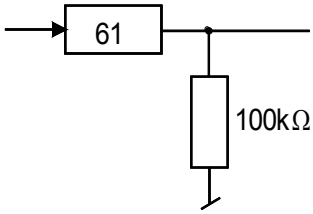


Each analog output is 0 ... 10 V
Maximal load 10 mA **not protected**

Terminal X2/27 = analog output 1
Terminal X2/28 = analog output 2

Use one of the 0 V (electronic ground) on the terminal block X2 for the return.

The Analog Inputs AI1 and AI2

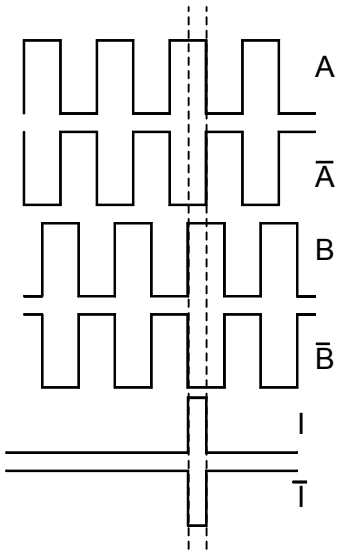


Each analog input is 0 ... 10 V
Input AI1: terminal X2/61
Input AI2: terminal X2/63

The analog input AI2 is allocated to the Torque Mode Control in Torque Mode Modus This modus is not described in this manual

The input AI1 is not yet allocated to a specific functions.

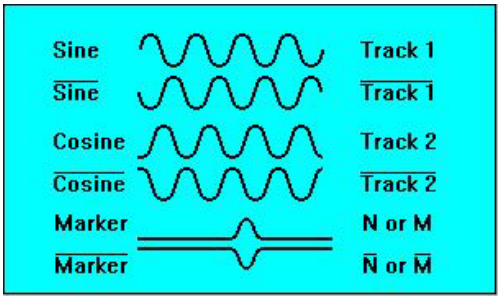
The Encoder Signal Outputs



The VHF drive provides on the terminal block a parallel output of the encoder signals.

- In case of sin / cos feedback, the two sine wave signals are first converted into encoder signals, 5V TTL level, based on an interpolation of 4 over the number of teeth of the gear.
- The encoder outputs are for external use only.
- Index channel correspond to A*B

The Sin/Cos signal outputs on CN3



The signals are identical to the ones coming from the sensor itself i.e. they are affected with the same offsets and amplitudes variations as the original signals.
The signals were not electonically treated.

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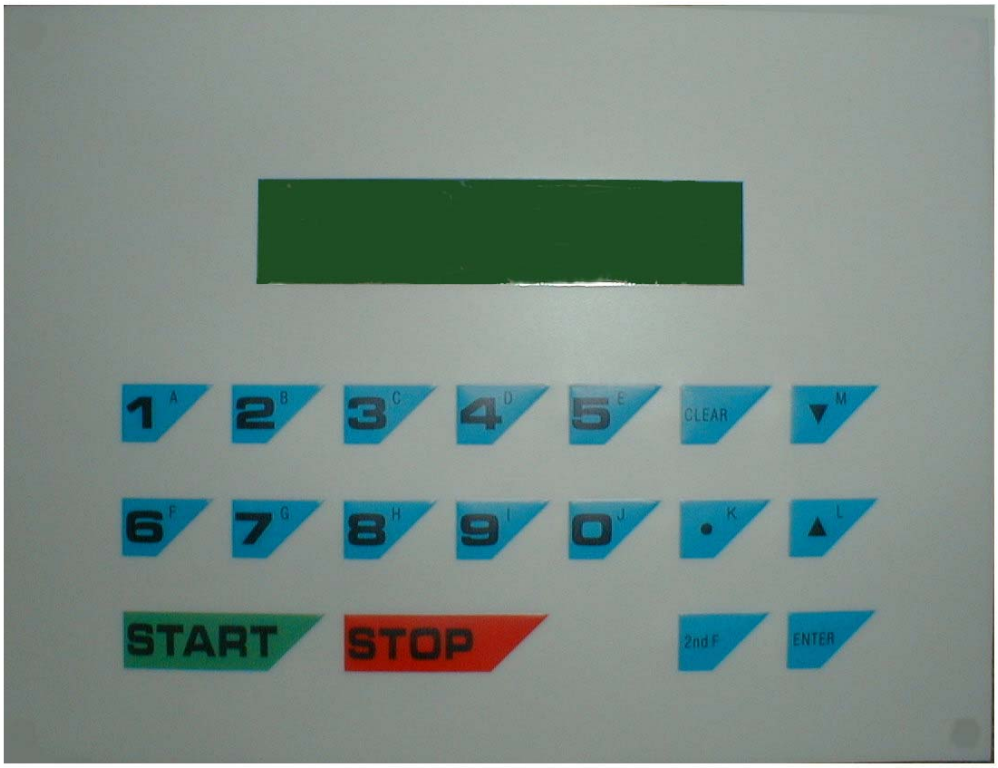
Programming the VHF1400A

The Menus

- Menu A Inverter parameters
- Menu B Part 1 - Operation related parameter
  Part 2 - Motor related parameter
- Menu C Allocation of the digital and analog outputs
- Menu D The parameters accessible in START mode
- Menu E Reversing from PC580
- Menu F Speed or torque reference input
- Menu G Display block selection
- Menu H Display of the last 8 failures (FIFO)
- Menu I RESET
- Menu J Memorized the last speed reference as default speed
- Menu K N/A
- Menu L Setting up the feedback
- Menu M Auto-tuning and positioning functions

To access to the desired Menu, press **2ndF** followed by the corresponding letter:
Example: **2ndF B** for menu B

The User Interface PC580



Note: To operate the VHF1400A, the User Interface PC580 must be connected, even after the unit has been fully programmed and the Auto-Tuning processed.

Before to START the drive

1. Compulsory connections

Check that all compulsory connections according page 18, have been done.

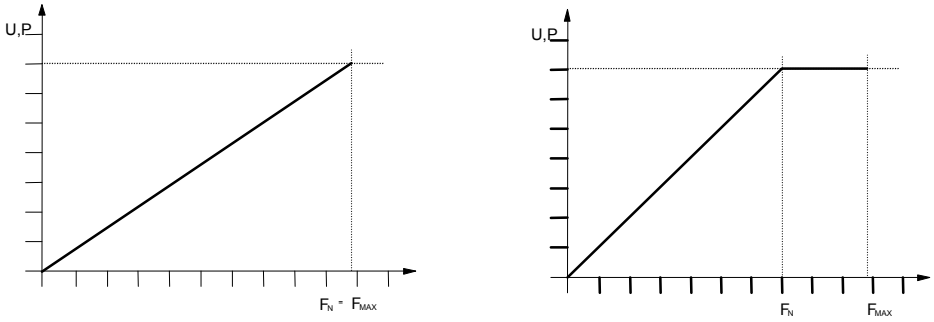
2. Sin-Cos sensor and encoder connections

The VHF1400A is able to check if the wiring of the feedback is correct as well to proceed to an auto-tuning of the signals in case of use of a Sin-Cos sin-waves sensor.

- Power up the drive
- Turn the motor shaft by hand in both directions. In one direction the led LD3 located to the right of the terminal 64 on terminal block X2 must turn green, in the other direction the led must remain off.
- If not check the connection of the various channels.
- For the auto-tuning of the Sin-Cos sensor see description in the menu L.

3. The characteristic Voltage / Frequency or Power / Frequency

For optimal performances of the motor **and** its flux vector control, it is important that this characteristic has been correctly inputted.



Left a typical linear characteristic. In this case, the maximum operating frequency (speed) of the motor F_{MAX} is identical to F_N . In the corresponding step of the menu B, we input the power corresponding to this point.

Right a typical characteristic with a break point. In this case, the base speed F_N is lower than the maximum operating frequency (speed) of the motor F_{MAX} . We have to input here the maximum operating frequency F_{MAX} as well as the base speed F_N and the power at this frequency.

Caution: the value of F_{MAX} is set in Hz and the speed F_N in RPM.

Depending if the drive is used with an induction or a synchronous motor, the parameters to input are slightly different. In the case of a synchronous motor with having a power / speed characteristic with a break point, the drive will operate in field weakening in the upper area. The ratio maximum speed to base speed is limited to 2:1 and the demagnetizing current at full speed will have to be input in the corresponding step of the menu B.

4. The input of the parameters

This is done using the keys of the KEYPAD PC580.
The drive is delivered which pre-programmed default values selecting operation with the user interface PC580, acceleration and deceleration of 10 s etc.. ***Only a few number of parameters have to be entered in the menu B*** before to be able to start your motor using the KEYPAD. The **actions** to be done are in **bold.** Use the ↓ and ↑ to progress inside of the menu and press the ENTER key to confirm an input.

The programmable parameters

Menu A : Inverter Related Parameters

Access in STOP mode only by entering **2ndF A**

Display	Description	Values
Max. current	Display the maximum output current of the inverter. This parameter is related to the drive rating and is used to protect the drive in overload conditions as well short circuit between phases and phase to ground.	**VHF1415A: 23 A VHF1430A: 45 A VHF1440A: 63 A VHF1455A: 83 A VHF1472A:110 A VHF1490A:136 A**
Software version	Release number of the installed software. In case of programming problems, please indicate this number when calling our customer support. The software version No is printed on the Program-EEPROM – see control board	**xxxxxdxx.std**
Delivery date	Shipping date of the unit. This is the date the unit left our manufacturing plant in Switzerland.	**?**
Serial number	Specific to each unit. The first 4 digits "V14xx" are related to the power rating of the units. The **** are related to our internal codification.	**V14xx-******

The Menu A is a read only. The customer can't modify those information.

Menu B – Part 1: Operation related parameters

Access in STOP mode only

Display	Description
0=F 1=GB 2=D 3=I 4=E	Selection of the user language. Enter: • 0 for French • 1 for English • 2 for German • 3 for Italian • 4 for Spanish
Mains voltage	Enter here the nominal value in V, of the voltage of your power supply.
Set Point Mode	The VHF1400A can be controlled in Speed or in Torque Mode The parameters settings describe in this section are valid for the Speed Mode Control only and you **must key in here:** • **0** for Speed Mode Control
START / STOP	Definition of the START and STOP mode. If you enter: • **0** for **KEYPAD** control, you will be operating the drive using the 2 push buttons on the keypad. If you enter: • **1** for **TERMINAL BLOCK** control, you will be operating the drive using the terminals 7, 8 and 9 of the terminal block X2. The type of contacts used (impulse or permanent) will be set at the next step. **Note: The STOP function is not linked to this choice. Both, the KEYPAD "Stop" and the TERMINAL BLOCK "STOP" are in serial and always active.**

Menu B – Part 1: Operation related parameters (continued…)

Display	Description
START / STOP Term. Block control	Set-up of the type of contacts used for START and STOP. This step is shown only if you have entered **1** at the previous step. **Connections** to terminals 7, 8 and 9 of the terminal block X2 are shown in the paragraph "**START/STOP functions"** page 13. Just key in and enter: • **0** for **impulse contacts** • **1** for **permanent contact**
Speed display units	Here you pre-set the displayed units for the speed. • Enter **0** for **Hz** • **1** for **RPM**, the number of poles of the motor will be taken into consideration automatically.
Motor reversing enable 0=NO , 1=YES	If you want to lock any reversing of the rotating direction of the motor you can do it here. Enter: **0** Reversing forbidden **1** Reversing according assignment either from KEYPAD or TERMINAL BLOC X2

Motor reversing	Motor reversing means changing the direction of the rotation. This function can be allocated to the KEYPAD or to the TERMINAL BLOCK. Enter:
	• **0** for **KEYPAD**
	• **1** for **TERMINAL BLOCK.** The reversing function will be performed by:
	  • closing a cpntact over terminals 41 and 42, or
	  • crossing the 0 V with an ± 10 V analogue speed reference
	
	For safety reason the factory setting is 1 to avoid KEYPAD reversing by mistake, pushing key E instead of F after 2ndF.

Stop by default ? 0=Coast , 1=Stop.	For all non-destructive failure where the STOP can be monitored, like **Converter temperature, External Interlocks, ….** We can choice between 2 ways of stopping the motor: **0** Coast to rest **1** Braking down using the deceleration's ramp
Delay time (s)=	For all non-destructive failure where the turn off can be delayed, like **Converter temperature, External Interlocks, Motor temperature, …** a delay time of 0 to 5 s can be input here. This function is to allow the CNC to monitor the machine motion before the converter trips.

Menu B – Part 1: Operation related parameters (continued…)

Display	Description
Freq. Ctrl source	At this step you can set if you want to control the output frequency of the drive, respectively the motor speed using the KEYPAD or the TERMINAL BLOCK X2. • Enter **0** for the **KEYPAD** control. You will here set the speed using the function **2ndF F** followed by the value of the **frequency** in Hz **or** the **speed** in RPM depending on your setting of the displayed unit – see **Speed display units** above. • Enter **1** for the **TERMINAL BLOCK** control. The speed control input signal defined under **Freq. Ctrl 1** to **Freq. Ctrl 5** will be applied to TERMINAL BLOCK X2. The connections are described in paragraph **"The Speed Reference Input"** pages 18 / 19.
Freq. Ctrl 1	If you want to control the drive output frequency, respectively the motor speed using an analog signal coming from a potentio-meter or from an other source like a PLC or a CNC, you have the possibility here to define the type and level of this signal Frequency or speed reference input signal: • Enter **1** if your signal is **0 … 10 V** • Enter **0** for **other** (you will jump to next step: Freq. Ctrl 2)
Freq. Ctrl 2	• Enter **2** for **±10 V** • Enter **0** for **other** (you will jump to next step: Freq. Ctrl 3)
Freq. Ctrl 3	• Enter **3** for **0 …20 mA** • Enter **0** for **other** (you will jump to next step: Freq. Ctrl 4)
Freq. Ctrl 4	• Enter **4** for **4 …20 mA** • Enter **0** for **other** (you will jump back to step: Freq. Ctrl 1) If you have entered **0** at this step, either you have not found a value corresponding to your speed control signal or you have just jumped over the correct setting before. If you did not found your control signal please contact your supplier.
Motor partition select.	At this step you decide the way you want to select the active partition using either the **KEYPAD** or the **TERMINAL BLOCK X2** • Enter **0** for KEYPAD control. At the next step, you will have to enter the partition No you want to be active. The **first partition is No "0".** • Enter **1** for **TERMINAL BLOCK X2**. The selection of the active partition will be made using the terminals 35, 36 and 37 of the TERMINAL BLOCK X2.
PASSWORD:	To be able to read and / or modify the content of the available 32 partition you have to enter here the correct access password, which is 616.

Menu B – Part 2: Motor related parameters

This section of the menu B related to parameters that are linked to a specific partition. Eight partitions can be entered and recorded. They can be different motors or specific values for the same motor: for example if you want to limit the maximum torque or the maximum speed at a lower value for reverse operation you enter a new partition and specify the torque or the speed you want. For the reverse operation you select then this specific partition. So remember, the following parameter group of the menu B can be entered **eight** times.

Display	Description
Motor partition No	During the programming process, you have to **Enter** now the **Partition No** to which the following parameters are related. During the operating process, you will select at this step the active partition. • Having selected KEYPAD control for the partition selection by entering **"0"** at the previous step, you can now **input** the **partition No** by just entering its numerical value 0 to 7. The first partition is No 0, the last one No 7. • Having selected **TERMINAL BLOCK** control for the partition selection by entering "**1"** at the previous step, the selection will be done by applying +25 V to the terminals 35, 36, 37 of the **TERMINAL BLOCK X2.** As source for the +25V you can use any of the +25V terminals, the closest one is on terminal 38. The sequence of the partition selection using the TERMINAL BLOCK X2 is the following: • Partition No 0 = default value in **TERMINAL BLOCK** mode if no selection is applied to terminals 35, 36, 37 • Partition No 1 = terminal 35 • Partition No 2 = terminal 36 • Partition No 3 = terminals 35+36 • Partition No 4 = terminal 37 • Partition No 5 = terminals 35+37 • Partition No 6 = terminals 36+37 • Partition No 7 = terminals 35+36+37
Asynchronous Motor 0=OK 1=Change	You preset here if you are working with an asynchromous or synchronous motor. • Enter **0** for an ansynchronous motor • Enter **1** if you want to change to a synchronous motor
Synchromous Motor 1=OK 0=Change	You confirm here the choice of the previous step • Enter **1** to confirm • Enter **0** if you want to go back to previous step
Prec. feedback /No of pulses	For the speed respectively the position feedback, our VHF1400A accept signals coming from a Sin-Cos sensor or an encoder. The feedback connect to the drive using the D-Sub **CN2** • **Enter** the number pulses per revolution; i.e if you use a gear, it is the number of teeth, if you have an encoder it is the number of lines. • Minimum value 64 You have the possiblity to test if the number of teeth entered here matches the installed gear. How to proceed: see Menu L
Shape sensor's signal 0=sinus 1=square	You define here the type of feedback signal. • Enter **0** if you use a Sin-Cos, sine waves sensor • Enter **1** if you use a TTL encoder To auto-tune the cos/sin feedback, see menu L

Menu B - Part 2: Motor related parameters (continued...)

Display	Description
Acceleration time	The **acceleration** time is set in seconds, between 0.1 to 255. This is the acceleration time needed to reach the full speed of the motor. If the set speed is the half of the full speed, the time to reach this speed will be the half of the acceleration set time. The minimum acceleration time is limited by the maximum available current i.e. the programmed overload factor, respectively set by the spindle manufacturer to avoid spindle damages. In the menu D, this time can only be increased.
Deceleration time	The **deceleration** time is set in seconds, between 0.1 to 255. This is the deceleration time needed to reach zero speed from the full speed of the motor. If the set speed is the half of the full speed, the time to stop will be the half of the deceleration set time. The minimum acceleration time is limited by the maximum available current i.e. the programmed overload factor, respectively set by the spindle manufacturer to avoid spindle damages. In the menu D, this time can only be increased.
Nom. motor voltage	This is the rated motor voltage in Volts. This value is shown on the motor plate and/or in the motor data sheet.
Max. motor operating frequency ***"Auto-tuning" required***	This is the maximum motor operating frequency in Hz. If the characteristic U (P) / F is linear, this value is identical to F_N. **This frequency has to be inputted in Hz**. ***Modification of this parameter will require to proceed to a new auto tuning.***
Number of poles	This is the number of poles and not the number of pairs. It must be an even number. This value is shown on the motor plate and/or in the motor data sheet.
Nominal current of motor ***"Auto-tuning" required***	This is the motor nominal current in A at nominal power. This value is shown on the motor plate and/or in the motor data sheet. ***Modification of this parameter will require to proceed to a new auto tuning.***
Admissible overload	Referred to the nominal current value entered at the previous step, you can define here the maximum admissible overload factor for your motor. • Enter a number between 0.50 to 1.50 time the nominal current This value is limted by the maximal current of the inverter.

Menu B - Part 2: Motor related parameters (continued...)

Asynchronous motor

Display	Description
Base speed < max. speed	If the motor has a straight P/F characteristic from = speed to full speed, enter here: **0** If the motor has a base speed (lowest speed at nominal voltage) which is lower than the max. speed, the P/F characteristic has a break point. In this case enter here: **1**
Base speed (speed at break point) ***"Auto-tuning" required***	You have entered a **1** at previous step. Now you have to enter here your base speed i.e. the speed at full voltage receptively break point. **Input in RPM.** This value is shown on the motor plate and/or in the motor data sheet. ***Modification of this parameter will require to proceed to a new auto tuning.***
Motor power at break point ***"Auto-tuning" required***	As you have a break point in your voltage / speed characteristic, input here the nominal power of the motor at the base speed, respectively break point, in Watts. ***Modification of this parameter will require to proceed to a new auto tuning.***
Nominal power of motor ***"Auto-tuning" required***	This is the motor rated power in Watts, at nominal motor speed and rated voltage. This value is shown on the motor plate and/or in the motor data sheet. ***Modification of this parameter will require to proceed to a new auto tuning.***
Nominal speed at nominal power ***"Auto-tuning" required***	Enter here the nominal speed of the motor in RPM. This is the speed at nominal power, in fact the theoretical speed less the slip. This value is shown on the motor plate and/or in the motor data sheet. ***Modification of this parameter will require to proceed to a new auto tuning.***

Synchronous motor

Display	Description
Nominal power of motor ***"Auto-tuning" required***	This is the motor rated power in Watts, at nominal motor speed and rated voltage. This value is shown on the motor plate and/or in the motor data sheet. ***Modification of this parameter will require to proceed to a new auto tuning.***
Field weakening **0 = no 1 = yes**	Confirm here if the motor is running without or with field weakening at higher speed • Enter **1** to confirm • Enter **0** if you don't use the field weakening **Note:** the maximal field weakening ratio is 2 : 1, this for safety reason in case of power failure.
Speed field weakening begin	Using the field weakening feature, you have to enter at which speed this process should start. With the above max ratio of 2:1, this speed must be ≥ 50% of the max. speed of the motor.
Demagnetizing current = A	Enter the requested demagnitizing current at full speed i.e. max. speed of the motor.

Menu B - Part 2: Motor related parameters (continued...)

Display	Description
Default frequency	In case of selection of the **Freq. ctrl source** selection from the **KEYPAD** frequency control, the value entered or shown here will be taken as speed reference input when the inverter is being turned ON. In programming mode you can change the value just by entering a new one. Here again, the input must be in Hz, input in RPM is not allowed and will lead to a mis-setting. In operating mode you can record here the last input made by **2ndF F**, using the quick recording process **2ndF J.**
Motor current ref. Itrip A =	Enter here your motor reference current in A. Value between 0 and max. motor overload. Exceeding this limit can be allocated to a relay in Menu C
Prohibited frequency	With the VHF1400A is possible to define up to three prohibited operating frequency fields. This feature can be used to avoid to have the system running at speeds where a vibration resonance area exist or may exist. Any speed reference inside of the prohibited area will run at the closest lowest or highest limit of the area. • Enter **0** if you don't want to use this feature • Enter **1** if you want to activate it. The three prohibited area (middle values and bandwidths) will be defined in the next 6 steps. Here again, the input must be in Hz, input in RPM is not allowed and will lead to a mis-setting.
Skip frequency 1	Prohibited area 1 - based frequency • Enter first prohibited frequency in Hz. This value is the middle of the bandwidth set in the next step.
Skip bandwidth 1	Prohibited area 1 - frequency bandwidth • Enter bandwidth in Hz.
Skip frequency 2	Prohibited area 2 - based frequency • Enter first prohibited frequency in Hz. This value is the middle of the bandwidth set in the next step.
Skip bandwidth 2	Prohibited area 2 - frequency bandwidth • Enter bandwidth in Hz.
Skip frequency 3	Prohibited area 3 - based frequency • Enter first prohibited frequency in Hz. This value is the middle of the bandwidth set in the next step.
Skip bandwidth 3	Prohibited area 3 - frequency bandwidth • Enter bandwidth in Hz.

Menu B - Part 2: Motor related parameters (continued...)

Display	Description
Pre-set frequency control by terminal block	If you have selected the **Freq. ctrl source** from the **TERMINAL BLOCK** in the Menu B- Part 1, you have the possibility to define up to seven pre-set speeds. The selection of one of those pre-set speeds will be done applying +24V to the terminals 1, 2 or 3 of the TERMINAL BLOCK X2. If this feature has been activated and no selection made through terminals 1 , 2, or 3, the analog reference input will be active. • Enter **0** if you don't want to use this feature • Enter **1** if you want to activate it. Here again, the input must be in Hz, input in RPM is not allowed and will lead to a mis-setting.
Pre-set frequency 1	Having selected to activate the pre-set speeds feature by entering "**1"** at the previous step, in the programming process you must here enter your first pre-set frequency. • Enter pre-set frequency **1** • In operating mode, the selection is made applying +25V to terminal 1 of TERMINAL BLOCK X2
Pre-set frequency 2	• Enter pre-set frequency **2** • In operating mode, the selection is made applying +25V to terminal 2 of TERMINAL BLOCK X2
Pre-set frequency 3	• Enter pre-set frequency **3** • In operating mode, the selection is made applying +25V to terminals 1 and 2 of TERMINAL BLOCK X2
Pre-set frequency 4	• Enter pre-set frequency **4** • In operating mode, the selection is made applying +25V to terminal 3 of TERMINAL BLOCK X2
Pre-set frequency 5	• Enter pre-set frequency **5** • In operating mode, the selection is made applying +25V to terminals 1 and 3 of TERMINAL BLOCK X2
Pre-set frequency 6	• Enter pre-set frequency **6** • In operating mode, the selection is made applying +25V to terminals 2 and 3 of TERMINAL BLOCK X2
Pre-set frequency 7	• Enter pre-set frequency **7** • In operating mode, the selection is made applying +25V to terminals 1, 2 and 3 of TERMINAL BLOCK X2
Position control source	As we have the possibility to select up to eight stop positions, we have to define the control source of those positions: • Enter **0** for **KEYPAD** control. The active stop position is the one entered at the programming step **Position set point KP** or **Teach-in operation** described above. **To use the recorded "teach-in" position as stop position, you must here select the KEYPAD position control source.** • Enter **1** for **TERMINAL BLOCK X2,** the selection is done by selecting the active stop position by applying +25V to the terminals 31, 32, 33 of TERMINAL BLOCK X2 . • Activation of the STOP position through terminal 12/X2

Menu B - Part 2: Motor related parameters (continued...)

Display	Description
Setting stop position 1	Having selected **TERMINAL BLOCK** control for the stop position selection by entering "**1"** at the previous step, in the programming process you must here enter your first stop position. If you want to use the recorded value in teach-in mode, this position has to be entered as a stop position. • Enter **Stop position 1** as xxx.x degree(s) referred to the zero position of the sin/cos sensor or encoder. • In operating mode, the selection is made when no +25V is applied to one of the terminals 31, 32 or 33
Setting stop position 2	• Enter **Stop position 2** as xxx.x degree(s) referred to the zero position of the sin/cos sensor or encoder. • Selection is made by applying +25V to terminal 31
Setting stop position 3	• Enter **Stop position 3** as xxx.x degree(s) referred to the zero position of the sin/cos sensor or encoder. • Selection is made by applying +25V to terminal 32
Setting stop position 4	• Enter **Stop position 4** as xxx.x degree(s) referred to the zero position of the sin/cos sensor or encoder. • Selection is made by applying +25V to terminals 31 and 32
Setting stop position 5	• Enter **Stop position 5** as xxx.x degree(s) referred to the zero position of the sin/cos sensor or encoder. • Selection is made by applying +25V to terminal 33
Setting stop position 6	• Enter **Stop position 6** as xxx.x degree(s) referred to the zero position of the sin/cos sensor or encoder. • Selection is made by applying +25V to terminals 31 and 33
Setting stop position 7	• Enter **Stop position 7** as xxx.x degree(s) referred to the zero position of the sin/cos sensor or encoder. • Selection is made by applying +25V to terminals 32 and 33
Setting stop position 8	• Enter **Stop position 8** as xxx.x degree(s) referred to the zero position of the sin/cos sensor or encoder. • Selection made by applying +25V to terminals 31, 32 and 33
Position reference	If you know the "zero" position of you sin/cos sensor or encoder input, you are able to enter the stop position referring to this zero position: • **Enter 0** for **KEYPAD** operation If you want to record the position at which your spindle has been placed: • **Enter** 1 for **teach in** operation
Position set point KEYPAD	You have entered at the previous step **"0"** for **KEYPAD,** now you have to enter the stop position xxx.x in degree and confirm it with **ENTER**
Teach-in operation	You have entered at the previous step **"1"** for **teach in** operation**,** now you have to record the stop position. To do it: • Turn the motor shaft until the desired stop position is reached. **You must do at least 5 complete rotation in the same direction before to stop to the position to be recorded. The system will be testing for index location and number of teeth.** • Confirm recording of the displayed stop position with **ENTER**
Data Menu B OK?	If the data input of the menu B, part 1 and part 2 are correct, you confirm their validity by entering no **2ndF**, **ENTER**. **Note:** Any modification of one or more of the parameters with ***"Auto-tuning" required***, will automatically call now the **menu M** for **Auto-tuning** and the only input accepted at the first step of the auto-tuning menu will be **"1"**. It will not be possible to run the system without having proceeded to the auto tuning. For more information, see **Menu M: Auto-tuning**

Menu C : Allocation of the digital and analog output

Access in STOP mode only

The digital outputs are: relay RE1, output No 1 = terminals 18, 19, 20
relay RE2, output No 2 = terminals 48, 49, 50
relay RE3, output No 3 = terminals 21, 22, 23
relay RE4, output No 4 = terminals 51, 52, 53
relay RE5, output No 5 = terminals 24, 25, 26

The digital outputs are located on the TERMINAL BLOCK X2. To allocate one or more of the available functions, just put the corresponding relay No (1 to 5) after the displayed **"Relay No. =**

Functions to allocate to one of the digital outputs	Allocation	Comments on the allocated function
Reached speed	Relay No. =	The allocated relay pull as soon the speed of the motor is higher than 95% of the set value.
Zero Speed	Relay No. =	The allocated relay contact will switch as soon the output frequency of the converter is lower $\leq$ 0.07% of F_{MAX} . This function is only active in STOP mode.
START / STOP	Relay No. =	The allocated relay contact will switch as soon the converter is in START mode
Position reached	Relay No. =	The allocated relay contact will switch as soon the position of the motor shaft is inside of the **"Position Window"** - see Menu M.
Failure	Relay No. =	**This function is an inverted one.** In failure free status, the allocated relay is powered on. The relay will fall down for any failure.
External interlocks	Relay No. =	The allocated relay contact will switch as soon the external interlock circuitry is open. Terminals 39 / 40 of the TERMINAL BLOCK X2. If this function is not used, a strap must be placed between terminals 39 and 40.
Converter overload	Relay No. =	The allocated relay contact will switch if the output current exceeds the maximum current of the converter. This current value is shown in the **Menu A.**
Auxiliary power supplies out of tolerances	Relay No. =	The allocated relay will pull as soon as one of the auxiliary voltages (24V, $\pm$ 15V and 5V) is out of tolerance.
Motor temperature - PTC	Relay No. =	The allocated relay contact will switch if the motor temperature is to high respectively is the resistance of the circuitry between terminals 16 and 17 of the TERMINAL BLOCK X2 exceed 3000 Ω. If this function is not used, a strap must be placed between terminal 16 and 17.

Menu C : Allocation of the digital and analog output (continued...)

Functions to allocate to one of the digital outputs	Allocation	Comments on the allocated function
Alarm converter temperature - heatsink 70°C	Relay No. =	The heatsink of the converter is equipped with a temperature sensor. A first alarm will be given when the temperature of the heatsink reaches 70°C and the allocated relay will be switched. This is just an alarm, the converter will continue to operate without any limitation in time.
Alarm converter temperature too high	Relay No. =	If the temperature of the heatsink continues to rise, a second alarm level will be issued when the temperature reaches 80°C and the allocated relay will be switched. The converter will be turned down 5 s after this alarm has been given.
Converter temperature too high - heatsink ≥ 80° C	Relay No. =	The allocated relay switches if the heatsink temperature exceeds 80°C, respectively 5 s after the above temperature alarm has been given.
Mains anomaly	Relay No. =	Tolerance between 200VAC –15% and 480V +10% i.e. between 170 V and 530 V
Programmable analog input AN1	Relay No. =	Voltage applied to analog input 1 will be compared to a reference threshold level set in the next step.
Threshold level AN1	xxx V	Enter here the value of the analog input 2 for which the allocated relay will be activated. Value 0 ... 10 V
Time delay for AN1	xx s	Enter a delay to activate the relay link to threshold 1. Value 0 ... 60 s
Programmable analog input AN2	Relay No. =	This input is allocated to the torque mode. Voltage applied to analog input 2 will be compared to a reference threshold level set in the next step.
Threshold level AN2	xxx V	Enter here the value of the analog input 2 for which the allocated relay will be activated. Value 0 ... 10 V
Time delay for AN2	xx s	Enter a delay to activate the relay link to threshold 1. Value 0 ... 60 s
Motor overload Im > Itrip	Relay No. =	This relay will be activated if the motor current exceed a limit value entered in the next programming step
Motor current reference Itrip	xxx A	The current displayed here is the value programmed in the active partition in the menu. **Caution: c**hanging this value here, will modify the one recorded in the partition.
Time delay Im > Itrip	xx s	Enter a delay to activate the relay link to the motor overload. Value 0 ... 60 s

Failures with inverted function (relay pulls if no failure) can be allocated to the same output, but never be combined with other information.

The analog outputs are: output No 1 = terminal 27
output No 2 = terminal 28

Functions to allocate to one of the analog outputs	Allocation	Comments on the allocated function
Speed: 10 V = maximum speed "N"	Output No =	The allocated analog output will reach 10 V when the motor speed is equal to the maximum speed defined in the corresponding partition
SAN1: 1=N, 2=Im 3=T, 4=Pw, 5=Fr	x	Allocation of one of the internal parameter to the analogue output SAN1: **1 = Speed** 10 V = maximum speed of the motor **2 = Motor current (A)** 10 V = max. converter output current **3 = Motor torque** 10 V = nominal torque * overload factor **4 = Active power** 10 V = nominal power * overload factor **5 = Slip** 10 V = nominal slip
SAN1: 1=N, 2=Im 3=T, 4=Pw, 5=Fr	x	Allocation of one of the internal parameter to the analogue output SAN2

Menu D: The parameters accessible in START mode

Access allowed in START mode

The following parameters have been described in the menu B. **For complete information please refer to Menu B.**

Display	Description
Acceleration time	Default value as set in menu B. Can only be increased Reset to default value when the drive in turned ON
Deceleration time	Default value as set in menu B. Can only be increased Reset to default value when the drive in turned ON
Frequency control source	Keypad = 0, Terminal block = 1
Position control source	Keypad = 0, Terminal block = 1
Offset compensation	Allow to compensate for an offset on the analogue speed reference input. This step appears only if an analog speed reference input is used.
0=F 1=GB 2=D 3=I 4=E	Selection of the user language.

Menu E : reversing from KEYPAD

2ndF E will reverse the rotation direction of the motor, but only if **0** has been programmed in the corresponding step of the **Menu B - part 1**. If reversing from the **TERMINAL BLOCK** X2 has been selected the following message will be displayed: **"Reversing assigned to T. Block!!!"**

Menu F : Setting a new speed using the KEYPAD

2ndF F will allow to change the speed of the motor, but only if **0** has been programmed in the corresponding step of the **Menu B - part 1**. Following messages can be displayed:

Display	Description
New frequency = Hz	If frequency has been selected as unit in **Menu B - Part 1** See "**Speed display units"**
New speed = RPM	If speed has been selected as unit in **Menu B - Part 1** See **"Speed display units"**
Freq. ctrl assigned on T. Block	If **TERMINAL BLOCK** has been selected in Menu B - Part 1 See **"Motor reversing"**

To enter the new speed just type in the desired value of the frequency in Hz or the speed in RPM and confirm with **ENTER**

Menu G : Selection of the display block

Allow to select between 2 blocks of information to be displayed.
Any time you enter **2ndF G** you will switch to the next display block.

Block 1 - Default block

Stop Mode:	Inom	G*	(I_{nom} = I nominal of motor - Partition No)
	F	STOP	(F = reference speed for next START)
Start Mode:	I_m	G*	(I_m = current of the motor)
	Fs	START	(F_s = actual speed)

Block 2

I_w	P	(Active current and power in W)
M	S	(Torque in Nm and Slip in %)

Menu H : Display of the last 8 failures

Allow to display the last 8 failures recorded in a FIFO table.

Menu I : RESET

2ndF I will RESET the drive and allow to start again if the cause of the failure has been removed.

Menu J : Save the last speed reference as default

In the **KEYPAD** operation this instruction allows a fast save of the last inputted speed reference value, without to go through the all **Menu B**.

Menu L: Setting up the feedback

Caution: the motor will turn during this process and it will turn in the opposite direction than the correct rotation of the motor.

In case of a high-speed spindle, this process will set the motor speed at 2% of the maximum speed and then accelerate to 12% of the maximum speed. If a standard 50 or 60 Hz motor is connected, this process will be done between 2% and 52% of the maximum speed. This process will be repeated 3 times. The calculated offsets and amplitudes parameters will be recorded separately for each motor partition.

This auto tuning will not affect the calculated and recorded parameters of the motor auto and fine tuning as per menu M.

Display	Description
PASSWORD:	To be able to enter this menu, key in here the correct access password, which is 616.
Test nb. teeth/revol **0 = no 1 = yes**	You can here test if the number of teeth for a gear or lines for an encoder, you entered in menu B is correct. Enter here: • **0** if you don't want to proceed to the test • **1** if you want to proceed **Note**: Make sure that the number of poles entered for the motor is correct, if not the result will be wrong. This test will count the number of teeth or lines with a maximum error of 2. If the result matches your input by ± 2, your input is correct.
Number of teeth/revol. **found = ….**	At this step, the system return the number found. If the result doesnot match your input by ± 2 check the your input. **Note**: Make sure that the number of poles entered for the motor is correct, if not the result will be wrong.

Synchronous motor

FOLLOWING 3 STEPS ARE DISPLAYED ONLY FOR THE **SYNCHRONOUS MOTOR**	
Found Orientation (Auto-tune) =	Display a value representing the orientation of the magnetic field of one of the pair of pole versus the index of the sensor
Used orientation **0=Autom. 1=man.?**	Here you set if you want to work with the orientation found by the auto-tuning process or if you want to use a corrected value entered manually. Enter: **0** To use the automatic calculated value **1** To use a corrected value **Note:** Any time you power up the drive, at the first START, a new orientation will be calculated and the new "Automatic value" will be stored and used untill the next power down of the drive.
Desired manual orientation =	Enter a value, which is slightly different of the above. The optimal value can be determined by the fine-tuning process. **Note:** After the automatic orientation which is done at the first START after a new power up, the "automatic value" will be replaced by the manual one you have previously keyed in .

Menu L : Setting up the feedback (continued…)

Following steps will appear only if the feedback has been set as Sin/Cos in Menu B	
Auto-tuning sensor **0 = no 1 = yes**	If you want to auto-tune the Sin/Cos sine waves sensor, enter here: • **0** if you don't want to proceed to the test • **1** if you want to proceed
Ampl&Offset sensor **Default 0=ok 1=no?**	The program contains preset default values for the amplitudes and offsets factors. Key in: • **0** if you want to keep and operate with those values • **1** if you want operate with the auto-tuning results **Default values:** each factor is set to the numerical value of 8192. This value represents an average and is not directly linked to a physical dimension, i.e. volts! **Note:** If you selected **"0"** to keep the "Default values" the next 4 sets will be "read only" and will just display those defaults. In the opposite if you have entered **"1"**, the auto-tuning values will be displayed and, if you wish, you **can modify** them.
Offset of sensor (sin) =	Display the auto-tuning value of the offset of the sinus signal. A value higher than 8192 means that the measured offset is greater than the average, a value smaller than 8192 that the offset is smaller.
Offset of sensor (cos) =	Display the auto-tuning value of the offset of the cosines signal.
Amplitude of sensor (sin) =	Display the auto-tuning value of the amplitude of the sinus signal.
Amplitude of sensor (cos) =	Display the auto-tuning value of the amplitude of the cosines signal.

Synchronous motor

Fine tuning the orientation

The orientation found during the auto-tuning process can slightly differ from the ideal one. This variation will impact the torque / current performance of the motor. They are two empiric methods to fine-tune this orientation value.

1. **Fine tuning using the speed**
   This process is easy to be done if the motor is using the field weakening capability.
   - Set the demagnetizing current to zero
   - Set the speed at max. value
   - Check the speed reached in the saturation in both directions
   - Vary manually the orientation angle until the speeds in both directions are identical
   - Set the magnetizing current back to the specified value

   If the motor has no field weakening area, **check with the motor manufacturer**, which is the max. over speed mechanically accepted. Then set the max. speed equal to this value and process as above.
   - At the end of the process don't forget to set the max. speed back to the one specified for this motor.

2. **Fine tuning using the current**
   This process is done under load and compares the currents for various orientation angles under a constant load.
   - The process consists to find out the lowest current for a given load.

3. **When do I have to fine tune?**
   - The first time the motor is powered up.
   - After rework of the motor.
   - After disassembling of the feedback, senor and / or gear.

Note: As the orientation angle has been manually keyed in at the end of the fine-tuning process they will remain recorded even after the drive has been powered down.

Menu M : Auto-tuning of the motor

The inputs made in the **Menu B - Part 2**: motor related parameters, must be at the end confirmed by entering **2ndF Enter.** This inputs, as well any modification of the basic motor parameters, the ***"Auto-tuning" required*** parameters (nominal current, power, speed, voltage, slip) will automatically connect you to the Menu M to process to the auto-tuning of the system.

The auto-tuning process will calculate the inertia of the motor and its attached load (if present) and, based on the result, determine the regulation factors and gains for the speed and position loops. The induction motors being large inertia motors, it is not necessary to have the load attached for the auto tuning, except if the load is a large inertia one and can impacts the total result.

In case of a high-speed spindle, this process will set the motor speed at 2% of the maximum speed and then accelerate to 12% of the maximum speed. If a standard 50 or 60 Hz motor is connected, this process will be done between 2% and 52% of the maximum speed. This process will be repeated 3 times. The calculated loop regulation parameters will be recorded separately for each motor partition.
Caution: the motor will turn during this process and it will turn in the opposite direction than the correct rotation of the motor

During the **Auto-Tuning** process, first the correct phase sequence of the motor connection is checked. If required you will be asked to reverse two phases (in case the motor would run in the wrong direction versus the encoder signals).

Display	Description
PASSWORD:	To be able to enter this menu, key in here the correct access password, which is 616.
Auto-tuning	You have access to the **Menu M** by entering **2ndF M** • Enter **0** if you want to go to next step. If you have access to the **Menu M** by closing the **Menu B** with **2ndF ENTER** • Only **1** can be entered as the auto-tuning has not been done earlier with the same motor parameters
Position rigidity	You can here enter the factor of the position stiffness i.e. the dynamical reaction of the position regulation loop. Value between 0 and 70, higher is the factor, higher is the stiffness. If this factor is to high, the system can become unstable. In this case just reduce this factor until you reach a satisfactory rigidity.
Position window	The positioning time is in relation with the position window. Smaller is this window, longer will be the time required to get the output signal **"Position reached".** The corresponding digital output will be activated only once the position inside of this window. • Enter the position window in degree.
Priority STOP time = (s)	Set here the minimum deceleration time to be used when the input X2/29 is activated. This time defined by the spindle manufacturer is the shortest possible STOP time without damaging the spindle. The braking current is limited to the max. programmed overload.
Corrective Factor	For Engineering Fine Tuning – see page 43
System Constant	For Engineering Fine Tuning use. **Read only parameter**
Dynamic Factor	For Engineering Fine Tuning use. Default value 100% Can be set between 10% and 300%. See instruction page 43.
Filter factor of the analog speed reference input	Enter here a filtering factor between 2 ... 32 Higher is the factor, higher is the filtering of the analog input. this will avoid speed variations due to noise pulses on you analog input line

Fine tuning of the speed loop parameters

The fine tuning the VHF drive is required to get the best performances out of the motor. Basically what we do, is to repeat the auto-tuning process, varying the value of the **Dynamic Factor** parameter in the Menu M, looking for the lowest possible **System Constant** value.

How to proceed:

1. After having completed the parameters in the Menu B and proceeded to the **first Auto-Tuning,** the program jump direct to the **System Constant** of the menu M.
2. Note the value of the **System Constant**
3. Go to the next step, **Dynamic Factor**, using **Arrow Down**
4. The **Dynamic Factor,** which will be used to fine tune the regulation parameters is by default set to 100% and can be set between 10% to 300%.
5. Input a value of 90, confirmed by **ENTER**.
6. The program jump to the start of menu M: **Auto-Tuning**
7. Confirm with **ENTER**
8. A new **Auto-Tuning** is completed and the program jump to the **System Constant**
9. Note the value of the **System Constant.** Did it **decrease?**

- If **YES**, repeat steps 3 to 9 above, continuing to decrease the **Dynamic Factor** until you get the lowest possible **System Constant**, and keep as **Dynamic Factor** the one corresponding to this lowest **System Constant** value.
- If **NO**, repeat steps 3 to 9 above, increasing first the **Dynamic Factor** to 110, then continuing to increase it until you get the lowest possible **System Constant**, and keep as **Dynamic Factor** the one corresponding to this lowest **System Constant** value.

NOTES:

1. The lowest **System Constant** area is rather flat and modification of the **Dynamic Factor** in this area will not have a major impact of the **System Constant.** The **Dynamic Factor** you will keep should correspond to the middle of this area.
2. During this iteration process you should notice a change of the behavior during the auto tuning. Lower is your “system Constant”, more dynamic should the auto tuning be and the motor should run better (less vibration and less “nervous”). You should even be able to hear a difference.

Fine tuning step 2

Once you have completed the above fine-tuning and **only afterwards,** if your motor is still “nervous”, you can proceed to the second step of the fine-tuning as follow

1. Go into menu M and read the **System Constant** value.
2. Go back one step to the **Corrective Factor** and key in “616 ENTER”, this will allow you to change this factor.
3. Make it first **equal** to the **System Constant** and check the behavior of the motor, i.e. its dynamic regulation.
4. If the motor doesn’t run to your satisfaction, reduce the Corrective factor step by step, checking each time if the researched running smoothness has been reached.
5. As soon you reach an acceptable running smoothness, stop to decrease the **Corrective Factor**.
6. Be aware that reducing the **Corrective Factor** will reduce the dynamic of the regulation. This will be obvious at any load change, the system will need longer to compensate the change and the speed drop / increase will be **larger.**
7. Don’t do a new auto tuning with a modified Corrective Factor. If you need or want to redo your Auto-Tuning, set first the Corrective Factor at 500.

VHF1400A – List of Error messages

Messages	Explanation
No communication	Fatal error. No communication between the KEYPAD PC580 and the drive. Check connecting cable.
Not allowed in STOP !!!"	You tried to reverse direction in STOP
Please go through menu B !!!	One or more motor parameters requesting a new Auto-Tuning have been modified and the confirmation to the last step of Menu B not entered. See : **Datas menu "B" ok yes-> "2ndF" "ENTER**
Reversing assigned on T.Block	The direction reversing function has been assigned to TERMINAL BLOC X2 in menu B and you try to reverse direction from the KEYPAD
Freq ctrl assigned on T.Block	The speed control function has been assigned to TERMINAL BLOC X2 in menu B and you try to change the speed from the KEYPAD
Motor reversing forbidden	Direction reversing has been locked in the menu B
Wrong direction change ”U“ and ”V“	After Auto-Tuning if the rotation direction of the motor doesn’t match the connection of the sensor.
Wrong direction	As above. Displayed after **2ndF H**, followed by time
"Start" programmed through T.Block	START function is allocated to TERMINAL BLOC X2 and you tried to start using the KEYPAD
"Start" programmed through keypad !!	START function is allocated to KEYPAD and you tried to start using the TERMINAL BLOC X2
"Stop" circuit open !!!	When you try to START
Range coding through T.Block	Partition selection is allocated to TERMINAL BLOC X2 and you want to select it using the KEYPAD
Access forbidden during WORK	The drive is in START mode and you try to access to Menu B or C using the KEYPAD
Access locked	The access to Menu B and C is locked by the KEY function on TERMINAL BLOC X2/5 AND X2/6
Do a STOP first then one RESET	This message is displayed when you try to do a RESET after a failure with the START contact still closed and the START / STOP function is made using a permanent contact.
Error still present !!!	Displayed after a RESET if the cause of the failure has not been removed
Current too low !!!	Displayed when entering the motor current in the Menu B and this motor current is < 10% of the maximum current of the drive.
Motor overload Im>Iref	The converter tripped because the motor current was higher than the programmed reference current. This function is programmed in menu C and a relay will be allocated to it. A time delay can be allocated too.
Motor overload	As above. Displayed after **2ndF H**, followed by time
Converter temp. to high !!!	The temperature of the heatsink exceed 75°C
Converter temp.	As above. Displayed after **2ndF H**, followed by time
Motor temperature to high !!!	Overheating of the motor, detected by the PTC
Motor temp.	As above. Displayed after **2ndF H**, followed by time
External interlocks !!!	External interlock circuitry open See TERMINAL BLOC X2/39 – X2/40
Ext. interlocks	As above. Displayed after **2ndF H**, followed by time
Converter overloaded	Displayed in case of short-circuit at the output or high current peak exceeding the capacity of the drive or one input phase is missing.
Conv. overloaded	As above. Displayed after **2ndF H**, followed by time

VHF1400A – List of error messages (cont….)

Messages	Explanation
Defect auxiliary supply !!!	In case of problem with the auxiliary power supply 24, ± 15 or 5 VDC
Def. aux. supply	As above. Displayed after **2ndF H**, followed by time
Mains out of tolerance !! !	Displayed if your mains voltage is lower than 170 VAC respectively higher than 530 VAC. Any value in between is considered being within the tolerances
Mains out tol.	As above. Displayed after **2ndF H**, followed by time
Speed sensor is missing !!!",	Feedback input missing. Displayed if the bridge between pin 1 and 15 in the D-Sub connector CN2 is missing
No Speed sensor	As above. Displayed after **2ndF H**, followed by time
Indexing function not available !!!	Displayed when you try to do a positioning and the position index of the feedback is missing
Indexing funct.	As above. Displayed after **2ndF H**, followed by time
No errors recorded !!!	Displayed after **2ndF H** if the memory of failure is empty

Assistance and Trouble shooting

All our products are manufactured in accordance with an accurate quality process. Before delivery they are checked for many hours under power. The quality system and production process guarantee that all products are shipped free of default.

The respect of the installation procedure describes in this manual and a correct definition of the application should avoid any commissioning problems.

Should you meet some problems during installation or commissioning of the frequency inverter our technical staff are available for assistance. Please contact your local supplier or the local DANAHER MOTION subsidiary.

Please includes following information:

1. Description of the application
2. Default or problem you met
3. Copy of the programmed parameters
4. Wiring diagram

In case of emergency:

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VHF1400A – The programmed parameters of the Menu A, B, C and M

ASYNCHRONOUS MOTORS

Menu A : Converter data

Display	Please copy Menu A data
Max. current	
Software version	
Delivery date	
Serial number	

Menu B : Operation / Motors

Display	FS	CS
0=F 1=GB 2=D 3=I 4=E	**1**	
Mains voltage	**400**	
Set Point Mode	**0**	
START / STOP	**0**	
START / STOP TB	**0**	
Speed display units	**1**	
Motor reversing 0=NO	**0**	
Motor reversing 1=TB	**1**	
Stop by default 0=Coast	**0**	
Delay time s	**0**	
Freq. Ctrl source	**0**	
Freq. Ctrl 1	**0**	
Freq. Ctrl 2	**0**	
Freq. Ctrl 3	**0**	
Freq. Ctrl 4	**0**	
Motor partition select.	**0**	
PASSWORD:	xxx	xxx
Motor partition No	**0**	
Asynchronous motor	**0**	
Prec. encoder /No of pulses	**256**	
Shape signal sensor 0=sin	**0**	
Acceleration time	**10**	
Deceleration time	**10**	
Nom. motor voltage	**1**	
Max. motor operating frequency	**1.0**	
Number of poles	**2**	
Nominal current of motor	**1.0**	
Admissible overload	**1.0**	
Base speed < max. speed	**0**	
Base speed	**0**	
Motor power at break point	**0**	
Nominal power of motor	**0**	
Nom. speed at nom. power	**1**	
Default frequency	**1.0**	
Motor current ref. Itrip	**1.0**	
Prohibited frequency	**0**	
Skip frequency 1	**0**	
Skip bandwidth 1	**0**	
Skip frequency 2	**0**	
Skip bandwidth 2	**0**	
Skip frequency 3	**0**	
Skip bandwidth 3	**0**	
Pre-set frequency by TB	**0**	
Pre-set frequency 1	**1.0**	
Pre-set frequency 2	**1.0**	
Pre-set frequency 3	**1.0**	
Pre-set frequency 4	**1.0**	
Pre-set frequency 5	**1.0**	
Pre-set frequency 6	**1.0**	
Pre-set frequency 7	**1.0**	

Display	FS	CS
Position control source	**0**	
Position reference	**0**	
Position set point KEYPAD	**1.0**	
Teach-in operation		
Setting stop position 1	**1.0**	
Setting stop position 2	**1.0**	
Setting stop position 3	**1.0**	
Setting stop position 4	**1.0**	
Setting stop position 5	**1.0**	
Setting stop position 6	**1.0**	
Setting stop position 7	**1.0**	
Setting stop position 8	**1.0**	
Data Menu B OK?		

Menu C : Inputs / Outputs

Reached speed	Rel. No =
Zero Speed	Rel. No =
START / STOP	Rel. No =
Position reached	Rel. No =
Failure	Rel. No =
External interlocks	Rel. No =
Converter overload	Rel. No =
Aux. power supplies	Rel. No =
Motor temp. PTC	Rel. No =
Alarm converter temp.	Rel. No =
Alarm converter trip <5s	Rel. No =
Converter ≥ 80° C	Rel. No =
Mains anomaly	Rel. No =
Programmable analog input AN1	Rel. No =
Threshold level 1	V
Time delay	s
Programmable analog input AN2	Rel. No =
Threshold level 2	V
Time delay	s
Motor overload Im > Itrip	Rel. No =
Motor current ref. Itrip	A
Time delay Im > Itrip	s
SAN1: 1=N (Speed) 2=Im (Motor current) 3=T (Motor torque) 4=Pw (Active power) 5=Fr (Slip)	
SAN2: 1=N, 2=Im 3=T, 4=Pw, 5=Fr	

Menu M – Auto-tunning

Display	FS	CS
Position rigidity	**0**	
Position window	**0.1**	
Priority STOP time = (s)	**10**	
Corrective Factor	**500**	
System Constant	**500**	
Dynamic Factor	**0**	
Filter factor	**2**	

FS : Factory setting
CS : Customer setting

DanaherMotion

DECLARATION OF CONFORMITY

We: **Danaher Motion SA**
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declare under our sole responsibility that the products of the family

VHF1400A

are exclusively designed for incorporation in an other machine. The operation of the product is submitted to the conformity of the complete equipment, following the provisions of the directive **89/392/EEC**

The conformity of the above specified products with the provisions of the Directive **73/23/EEC** is supported by the respect of the standards **CEI/IEC 1010-1**

If the mounting and connecting instructions of the installation's manual have been respected, this product will be conform to the standards **EN50081-1** and **EN50082-1** relating to the EMC directive **89/336/EEC**.

Mounting instructions related to the EMC - directive 89/336/EEC

1. The frequency converter must be mounted in a closed metal cabinet.
2. The power connection between converter and motor must be MADE using shield cable.
3. The control connection must utilize shielded cables.
4. The shield of the cables must be grounded at both ends.
5. Power connections and control connection must be placed in separated canals.
6. A line filter must be installed. The machine manufacturer has the option to use a single filter for all of his equipment. In this case the correct definition and sizing of the filter is his responsibility. If the option of a separate filter is selected, this filter will have to match the following specification:

Drive unit	Filtertype	INom (A)
VHF1415A	FMAC-0932-2510	25
VHF1430A	FMAC-0934-3610	36
VHF1440A	FMAC-0934-5010	50
VHF1455A	FMAC-0953-6410	64
VHF1472A	FMAC-0937-8010	80
VHF1490A	FMAC-0954-H110	110

Supplier: Timonta, Mendrisio (Switzerland)

Villars-Ste-Croix, July 2002

The Engineering Manager: A. Schwendener