

ACOMEL



A Flux Vector Drive with integrated:

- Auto-tuning
- Shaft orientation
- Line regen

For use with induction or synchronous motors

VHF1400A – Technical Specifications

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Modifications reserved

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 $V_{RMS} : 0 \dots U_{IN}$
- 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 kW @ 3 x 400 V |
|-----------------------------|--|------------|------|---------------------------------------|
| | Nominal | Continuous | Peak | |
| 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 kW @ 3 x 400 V |
|-----------------------------|--|------------|------|---------------------------------------|
| | Nominal | Continuous | Peak | |
| 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 kW @ 3 x 400 V |
|-----------------------------|--|------------|------|---------------------------------------|
| | Nominal | Continuous | Peak | |
| 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.

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.

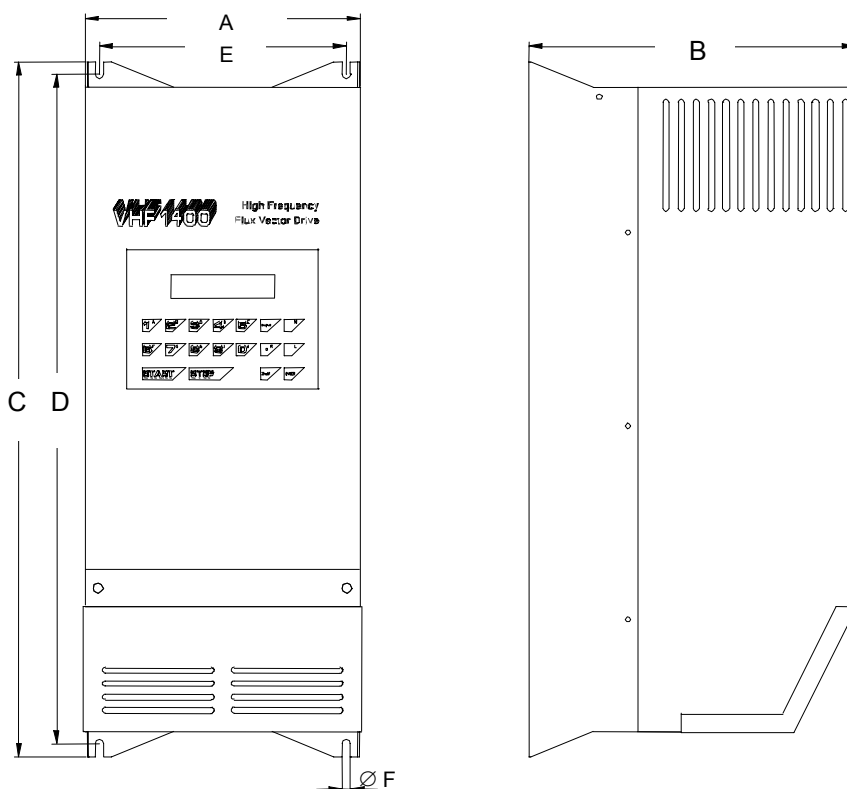
Suggested choke values: **60 μ H** for the VHF1415A, 1430A, 1440A, and 1455A
30 μ H for the VHF1472A and 1490A

For **synchronous 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 Watts |
|----------|--------------------------|------------|-----------|---------------------------|
| | Nominal | Continuous | Peak | |
| 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

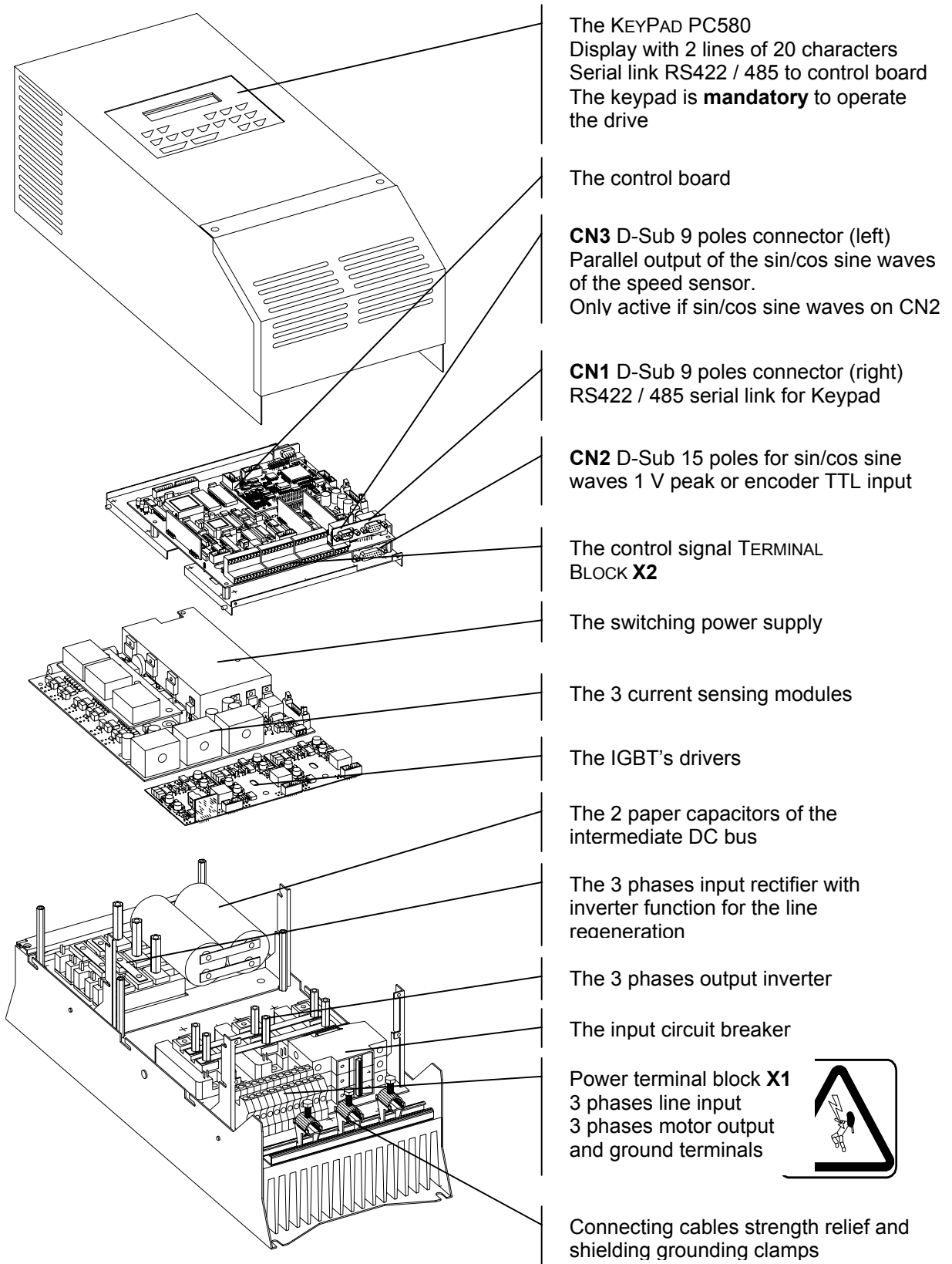


| Type | Overall dimensions | | | Mounting screws location | | | Weight kg |
|----------------------|--------------------|----------------|---------------|--------------------------|---------------|----------------|--------------|
| | Width A mm | Height C mm | Depth B mm | Slot F mm | Width E mm | Height D mm | |
| 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 |

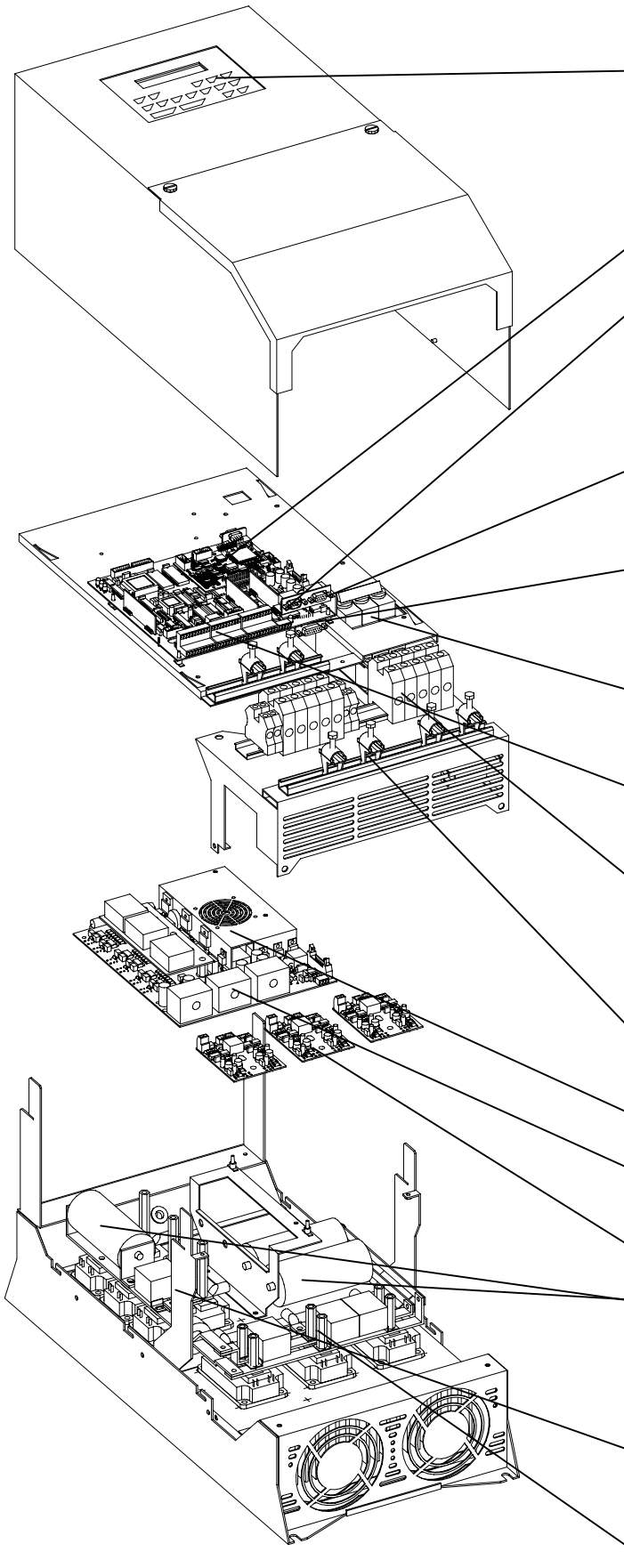
Cabinet enclosure

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



VHF1440A to VHF1490A 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 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 – 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-tuning

| 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



DECLARATION OF CONFORMITY

We: **Danaher Motion S.A**
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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:

| Units | Filter type | I _{Nom} (A) |
|-----------------|---------------|----------------------|
| VHF1415A | FMAC0932-2510 | 25 |
| VHF1430A | FMAC0934-3610 | 36 |
| VHF1440A | FMAC0934-6410 | 64 |
| VHF1455A | FMAC0934-6410 | 64 |
| VHF1472A | FMAC0937-8010 | 80 |
| VHF1490A | FMAC0954-H110 | 110 |

Supplier: Timonta, Mendrisio (Switzerland)

Villars-Ste-Croix, July 2002

The Engineering Manager: A. Schwendener

