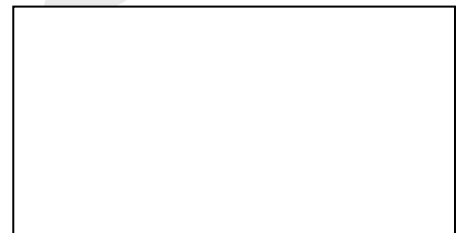
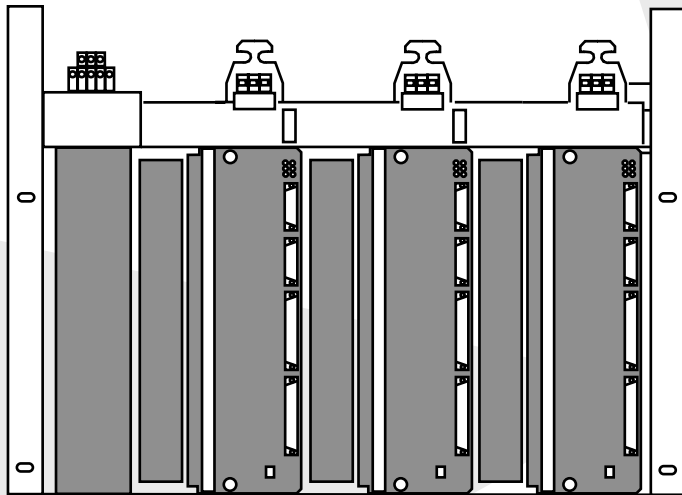


# BF/400 VAC RACK

gb



This is a general manual describing a series of racks receiving servo amplifiers having output capability for driving AC brushless servo motors.

This manual may be used in conjunction with appropriate and referenced drawings pertaining to the various specific models.

**Maintenance procedures should be attempted only by highly skilled technicians (EN 60 204.1 standard) using proper test equipment.**

The conformity with the standards and the "CE" approval are only valid if the items are installed according to the recommendations of the racks and amplifiers manuals. The user will be responsible for any non following of connection recommendations and drawings.

Any contact with electrical parts, even after power down, may involve physical damage.

Wait for 3 minutes after power down before handling the rack or the amplifiers (residual voltage).

INFRANOR does not assume any responsibility for any physical or material damage due to improper handling or wrong descriptions of the ordered items.

INFRANOR reserves the right to change any information contained in this manual without notice.

Any intervention on the items, which is not specified in the manual, will immediately cancel the warranty.

*This manual is a translation of the original document and does not commit INFRANOR's responsibility. The french manual is the only reference document.*

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Issue: **2.2**

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# Chapter 1 – General

## 1 – CONFORMITY WITH THE EUROPEAN STANDARDS: "CE" APPROVAL

### 1.1 – General description

The 400 V rack type of the "B" series is "BF/400". The "F" means "floating" power bus voltage, because it is not referenced to the chassis.

This range is ALWAYS equipped for rear mounting.

The motor outputs and the supply inputs are ALWAYS on a terminal bar.

The logic inputs - outputs of the X5 rear connector allow the serial connection of the protection signals AMP, READY and POWER READY. All connections are ALWAYS made on the top of the rack (power supply, motors, logics).

The "BF/400" rack is to be directly connected to the 400 VAC mains. A progressive loading system is integrated in order to limit the inrush current at power up. A current smoothing reactance coil can be used for improving the current harmonics. But this rack can, of course, also work with an insulation transformer.

The whole SMT-BD1-400/15, 30, 45, 60 range is particularly well suited for the "BF/400" rack. The SMT-BD1/400/I amplifiers width is 24 TE.

The **power supply unit** ALWAYS includes the auxiliary supply, the power supply and the braking system. It is mounted on a chassis fixed on the left rack flange. Its width is 12 TE.

The braking system is equipped with a safety function indicating its correct operation. This function is called "D/R OK" (braking system OK): it controls a relay that can be serially used with the "Σ POWER READY" signal of the X5 connector (pins 3 and 4) in order to interrupt the power contactor in case of incorrect operation.

The power supply can be equipped with a 70 A or 90 A rectifier bridge.  
The braking system includes all options **D2**, **Dp** and **E**.

	OPTION D2	OPTION dp	OPTION E
Resistor	33 Ω on rack flange	33 Ω external	2 x 33 Ω = Req = 16,5 Ω
Continuous resistance	280 W	280 W	560 W
Peak power	27 KW	27 KW	55 KW

The "D2" option is factory mounted and wired on the left rack flange whereas the options "Dp" and "E" require external mounting and wiring.

**The braking resistor is under high voltage (800 V) and may become very hot. It is mandatory to mount it at a correctly cooled place or outside the cabinet. But, in any case, the resistor housing of D2, Dp and E must be mounted at least 30 cm away from any part that could burst into flame because of the heat radiated by the braking resistor.**

The "BF/400" rack answers the requirements of the **EN 55011** standard regarding the **electromagnetic compatibility**, with **optional** input filter for the mains rejection.  
The **common mode filter** of the motor output as well as the **mains filter** of the auxiliary supply are integrated in the rack, **as standard**.

The **fan** must always be mounted on the top of the rack.

## 1.2 – Reference to the standards

The SMT-BD1/400/I amplifiers mounted into the **BF rack in 400 VAC**, which is equipped with the mains filter F-400-70, have been approved for their conformity with the EMC standards:

- **EN 55011, Group 1, Class A, regarding radioelectric disturbances**
- **CEI 801 - 2 - 3 - 4, regarding the immunity.**

The tests have been performed by the external laboratory of the SCHAFFNER company, which is approved for its competence regarding EMC.

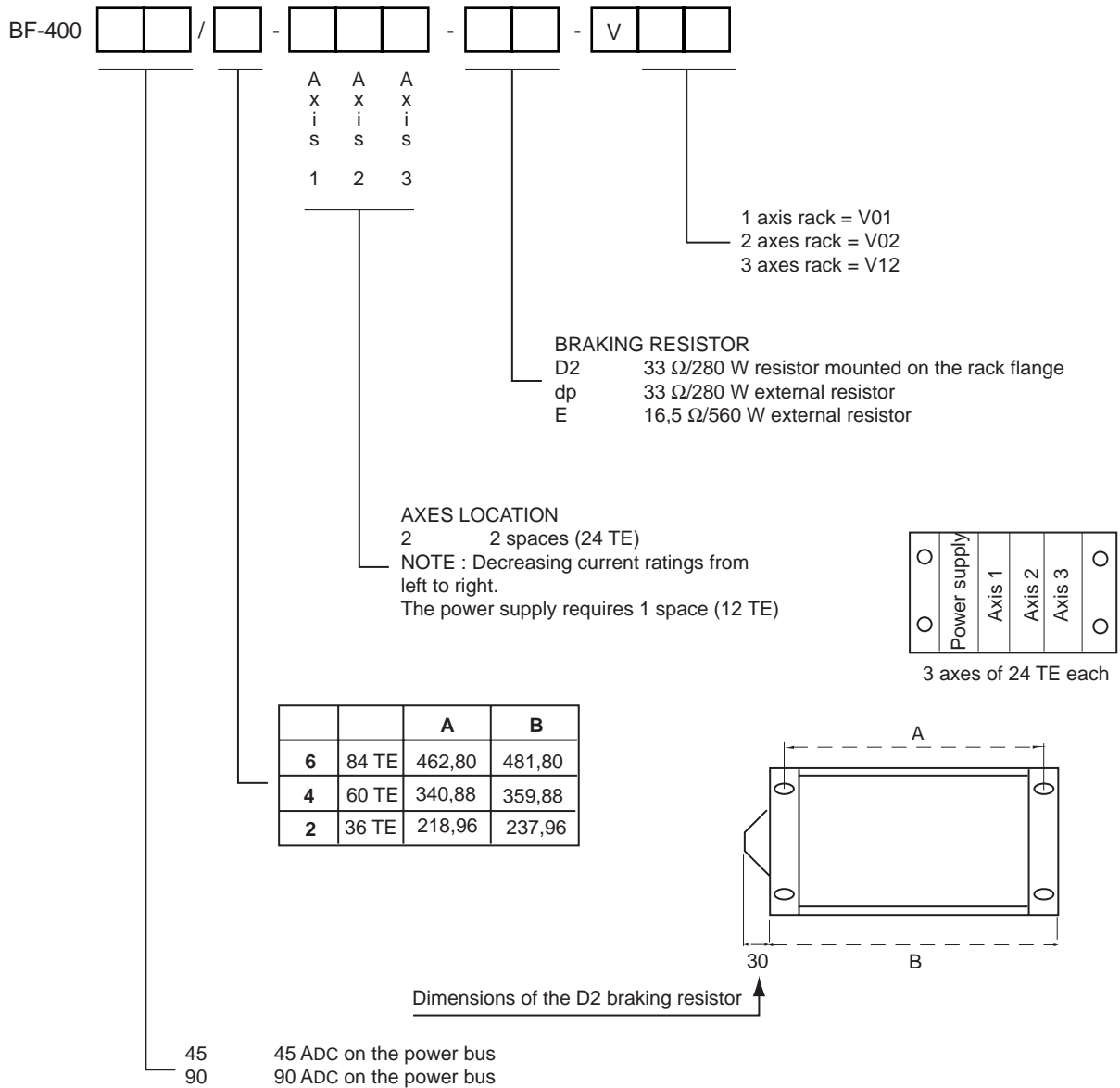
The results of the tests made according to the Low Voltage directive are referenced in the LCIE report n° 413777.

Standard for the electrical equipments of industrial machines: EN 60204.1.

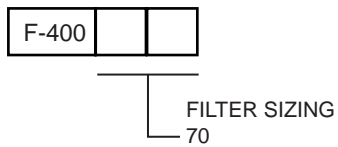
## 1.3 – "CE" mark

The racks have been "CE" marked since 1995.

### 2 – ORDERING CODE OF THE "BF/400" RACK



### 3 – ORDERING CODE OF THE MAINS FILTER



## Chapter 2 – Specifications

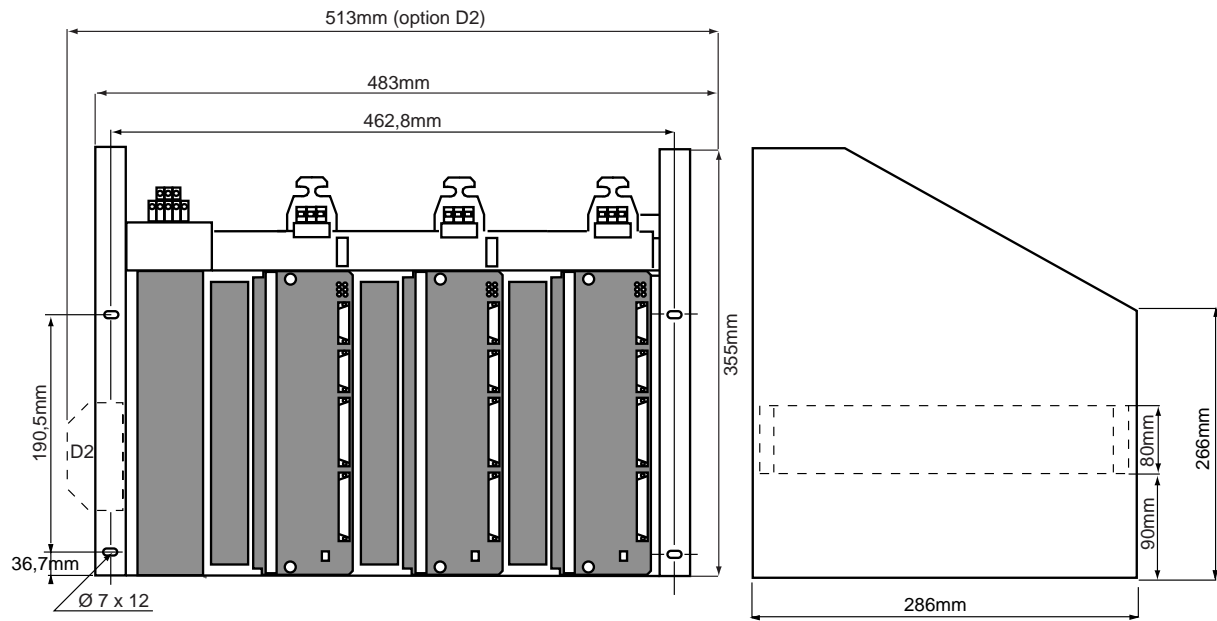
### 1 – MAIN TECHNICAL DATA

Rated AC input voltage	400 Vac three-phase +/- 15 %
Maximum AC input voltage	480 Vac three-phase(including all tolerances)
Minimum AC input voltage	340 Vac three-phase
Rated auxiliary supply voltage	230 Vac single-phase +/- 10 %
Minimum auxiliary supply voltage	100 Vac single-phase
Maximum auxiliary supply voltage	260 Vac single-phase (including all tolerances)
Maximum section of the supply connector	6 mm <sup>2</sup>
Maximum section of the motor connector	4 mm <sup>2</sup>
Rated output current on the DC bus	45 A for version 45 A 90 A for version 90 A
Output current of the auxiliary supply	1 A
Triggering threshold of the braking system	785 Vdc +/- 10 V
Minimum braking resistance (option E)	2 x 33 Ω separately controlled, that is Req = 16,5 Ω
Possible rated braking power (option E)	560 W
Peak braking power (max. 0,5 s) – option E	55 kW
Maximum section of the braking resistor cables	2,5 mm <sup>2</sup>
Conformity with the standards - <b>CE approval</b>	EMC standards: - immunity: CEI 801-2-3-4, - Conducted and radiated disturbances: EN 55011, group 1, class A Electrical standards for industrial machines: - EN 60204-1: Insulator 2500 Vdc - Leakage current > 3 mA (EMI filter)

The conformity with the standards and the "CE" approval are only valid if the items are installed according to the [recommendations of the racks and amplifiers manuals](#).



**2 – DIMENSIONS OF A 3 AXES BF RACK, 24 TE**



**NOTE:** The heatsink does not modify the dimensions.

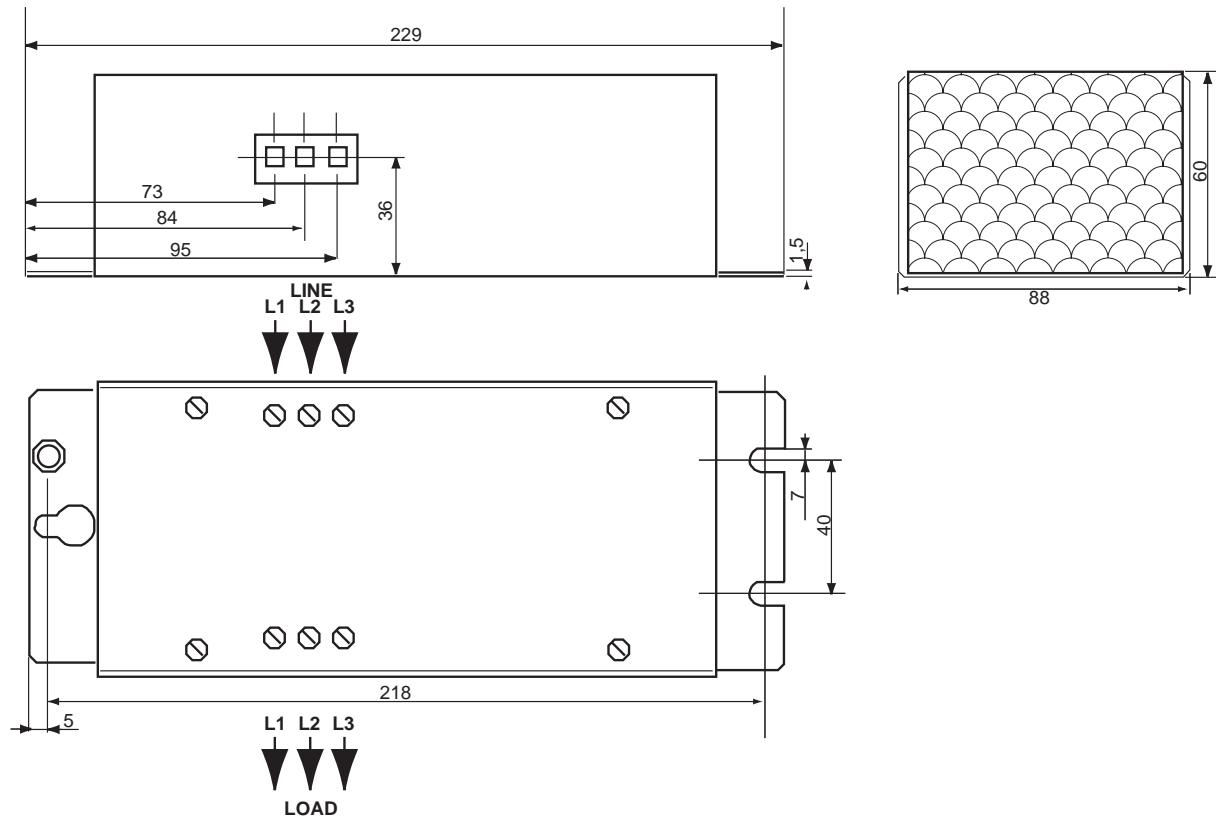
**Example**

3 axes rack: Axes 1 to 3 = 24 TE.

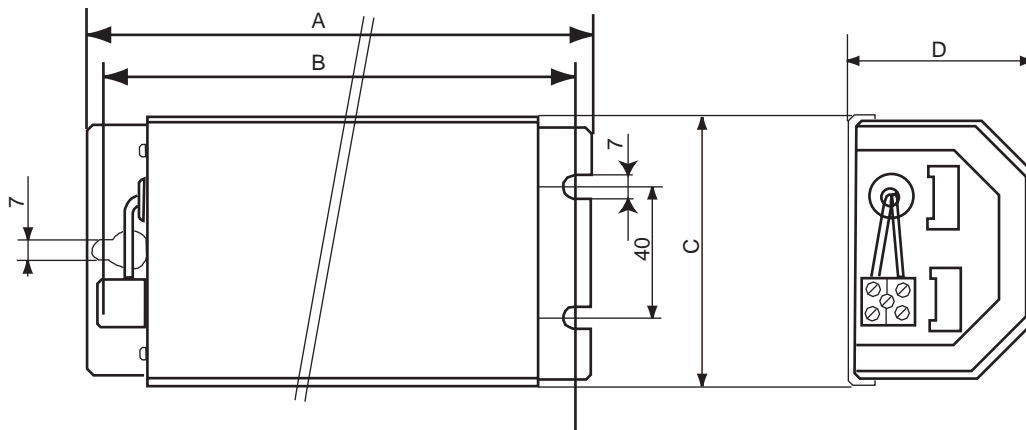
**NOTE**

For other dimensions than 3 axes, [see table of Chapter 1, part 2: "Ordering code of the BF/400 rack"](#).

### 3 – MAINS FILTER DIMENSIONS



### 4 – DIMENSIONS OF THE EXTERNAL RESISTOR WITH PROTECTION HOUSING (dp, E)

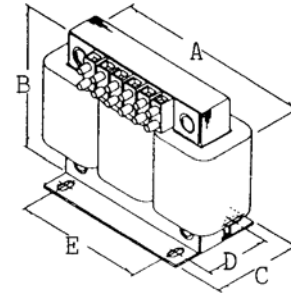


BRAKING RESISTOR	POWER	A	B	C	D
dp	280 W	290	278	83	57
E	560 W	290	278	145	52

### DIMENSIONS OF THE REACTANCE CHOKES

This table is mentioned for information. INFRANOR does not supply, as standard, these reactances.

REF.	L400/25	L400/35	L400/80
I rated (A)	25	35	80
A (mm)	183	183	274
B (mm)	142	145	211
C (mm)	86	97	142
D (mm)	60	66	88
E (mm)	76	76	92
Mass (kg)	6,8	7,3	23



80 A and less

### SPECIFICATIONS

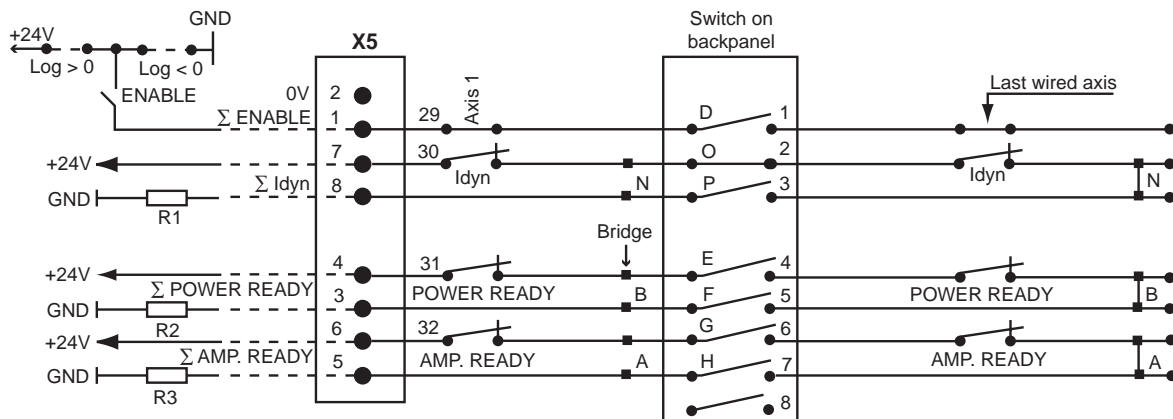
- Min. Inductance: 0,4 mH
- Non saturable for 3 I rated.

# Chapter 3 – Connections

## 1 – RACK BACKPANEL CONNECTION

### 1.1 – Connection diagram

The AMP. READY, POWER READY and Idyn signals can be serially or individually wired for all axes according to the configuration below. The ENABLE signal can also be wired individually or as a common signal to all axes on the front panel connector X4.



The jumpers A, B, N are located on the backpanel - see section 2 -.

symbolizes the closed contact of the BD1 amplifier relays.

The POWER READY signal is only available on the rack backpanel connector X5. If the POWER READY signal is not used, make jumper JK on the amplifier in order to get the AMP. READY signal taking into account the power status. The POWER READY signal includes both power supply status and braking system operation (DR OK).

### 1.2 – Configuration table

JUMPER/SWITCH	ENABLE	AMP. READY	Idyn	POWER READY and DR OK
A closed on last wired axis Switches G and H "ON"		serial		
A closed on each axis Switches G and H "OFF"		Independent		
B closed on last wired axis Switches E and F "ON"				serial
B closed on each axis Switches E and F "OFF"				Independent
N closed on last wired axis Switches O and P "ON"			serial	
N closed on each axis Switches O and P "OFF"			Independent	
Switch D "ON"	Common to all axes			
Switch D "OFF"	Independent with X4 on each axis			

**As standard, all these signals are serially wired: jumpers A, N and B are closed on the last wired axis and switches D, E, F, G, H, O and P are all ON.**

**DEFINITION OF THE BACKPANEL X5 CONNECTOR**

PIN	FUNCTION	REMARK
1	ENABLE signal of all axes	Common ENABLE signal to all axes
2	0 Volt	
3 and 4	POWER READY signal of all axes	POWER READY relay of all serially connected axes
5 and 6	AMP. READY signal of all axes	AMP. READY relay of all serially connected axes
7 and 8	Idyn signal of all axes	OPTION (Idyn of all serially connected axes)

The X5 connector allows to have:

- the logic ENABLE signal common to all axes,
- the POWER READY relay **serially wired on all axes**,
- the AMP. READY relay **serially wired on all axes**,
- the Idyn relay **serially wired on all axes**.

SPECIFICATIONS :	Umax : 50 V	I <sub>max</sub> = 100 mA	P <sub>nom</sub> = 5 W
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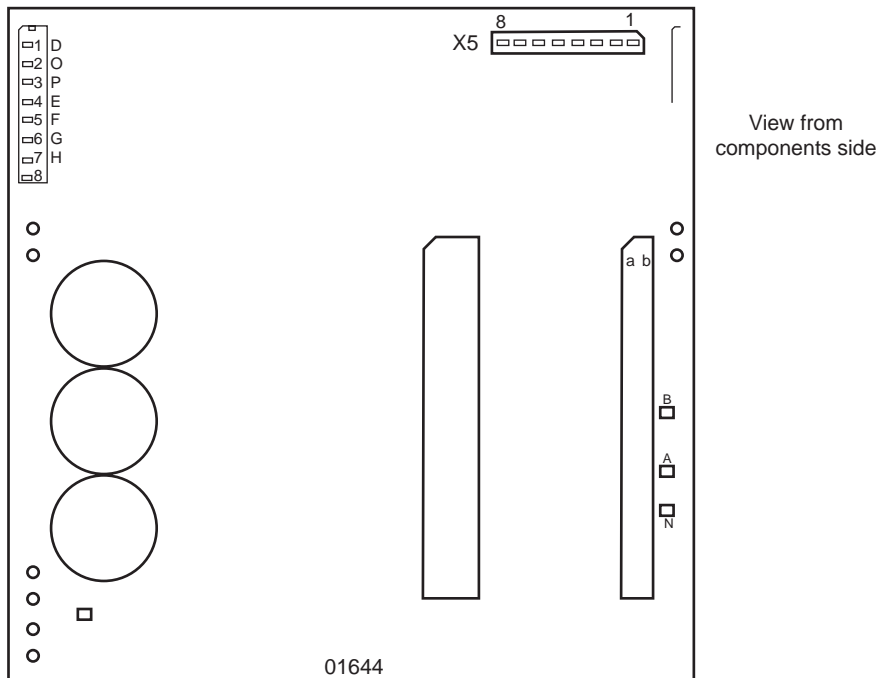
**IMPORTANT**

On some INFRANOR amplifier types, the Idyn relay may have another function, particularly the control of the motor brake relay on the ranges BD1/m, BD1/h, BD1/p and BD1/s. In this case, the Idyn relay must be independent on the rack backpanel (switches O and P = OFF).

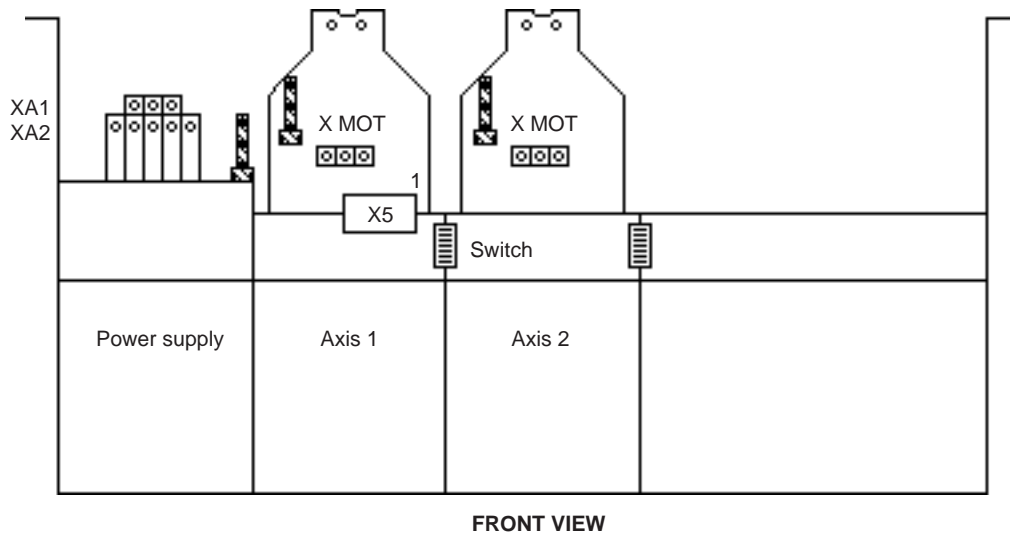
**2 – SETTING-UP DIAGRAMS OF THE BACK PANEL (X5 SWITCH, JUMPERS)**

Rack front view

**24 TE BACKPANEL**

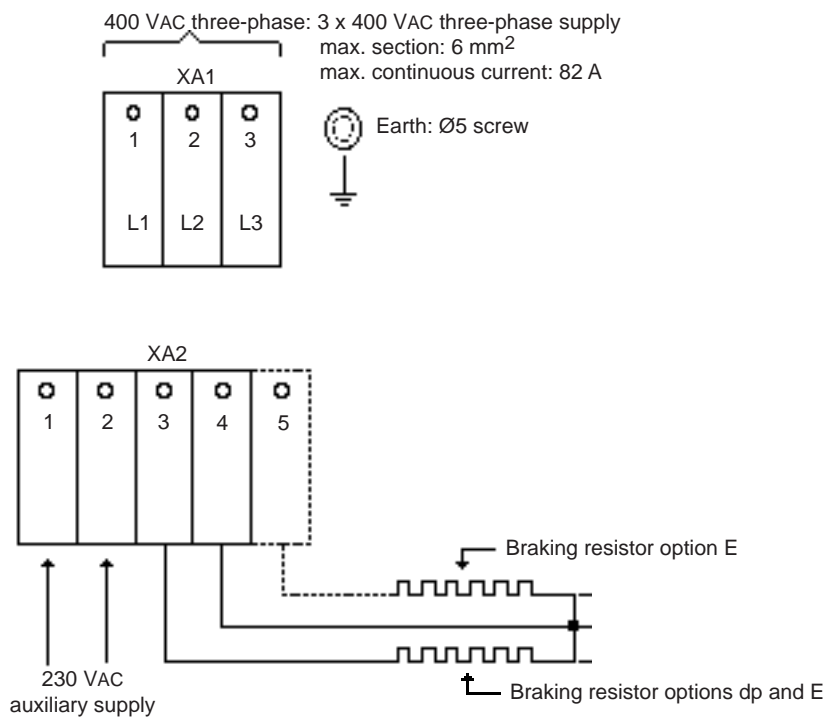


### 3 – SETTING-UP OF THE CONNECTION CONNECTORS



### 4 – XA1 AND XA2 SUPPLY CONNECTORS

The **power supply connector** includes the power supply inputs (XA1), the auxiliary supply and the connections for the braking resistor(s), according to the selected option (XA2).



#### NOTES

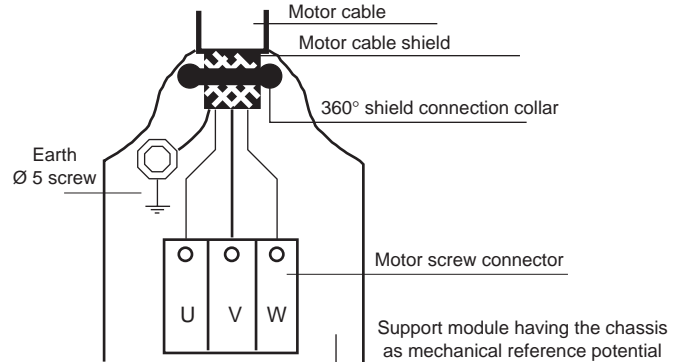
Power cables must not run in the proximity of low potential cables.

Option D2: the braking resistor is mounted and wired on the left rack flange, pins 3 and 4 of XA2 are free but unusable.

Options dp and E: the braking resistor is mounted and wired outside the rack.

## 5 – X MOT MOTOR CONNECTOR

The **motor connection connector** is particularly well suited for the electromagnetic compatibility and the motor cables shield connection over 360° to the chassis is easy to make by means of a clamping collar. The ground connection is made by a fastening lug according to the safety standards regarding the grounding.



Maximum section: 4 mm<sup>2</sup>.  
Maximum continuous current: 44 Arms.

### NOTE

The conformity with the EMC standards requires the mandatory shielding of the motor cables, with a 360° connection at both ends. The motor cables must not run in the proximity of input command and resolver cables.

## 6 – 400VAC THREE-PHASE MAINS OPERATION

To improve the current harmonics on 400 VAC mains operated items, a reactance sized to match the rack or amplifier current rating can be used. **This choke is connected in series with the rack input..**

**Reactance choke ref.: L-400/25/35/80.**

The direct mains operation without reactance choke requires an appropriate supply cable section with a factor of 1,5 with regard to the rack rating.

**The power supply must ALWAYS be three-phase connected via a differential three-phase circuit breaker.**

EXAMPLE: Type Réflex XC40 + Unit Vigi 300 mA, ref. 20340 (by Merlin Gérin).

The circuit breaker sizing is depending on the application or on the rack or amplifier ratings:

10 A = ref. 18134 ; 15 A = ref. 18135 ; 20 A = ref. 18136 ; 25 A = ref. 18137 ; 32 A = ref. 18138 ; 38 A = ref. 18139 (by Merlin Gérin).

### NOTE

Fuses cannot be used on the line input because the blowing of one of the three fuses would reduce the lifetime of the whole equipment. A magnetothermal circuit breaker must be used instead of fuses if not using the recommended differential circuit breaker.

**The auxiliary supply must ALWAYS be connected to the 230 VAC single-phase mains.**

The connection to the 230 VAC single-phase mains must made via a phase + neutral circuit breaker:

EXAMPLE: Type DPN, curve C, ref. 20743 or DPN N, curve D, ref. 19233 by Merlin Gérin.

**NOTES**

**On the three-phase connection, for the power supply, or the single-phase connection, for the auxiliary supply, all supply must ABSOLUTELY be cut-off to ALL POLES**

The direct mains connection is more cost effective but it is still possible to use a 400 VAC / 400 VAC insulation transformer (connection similar to the connection diagram with a grounded screen transformer).

**EMC**

The motor output is equipped with a **common mode choke** and the auxiliary supply is also equipped with a **mains filter**.

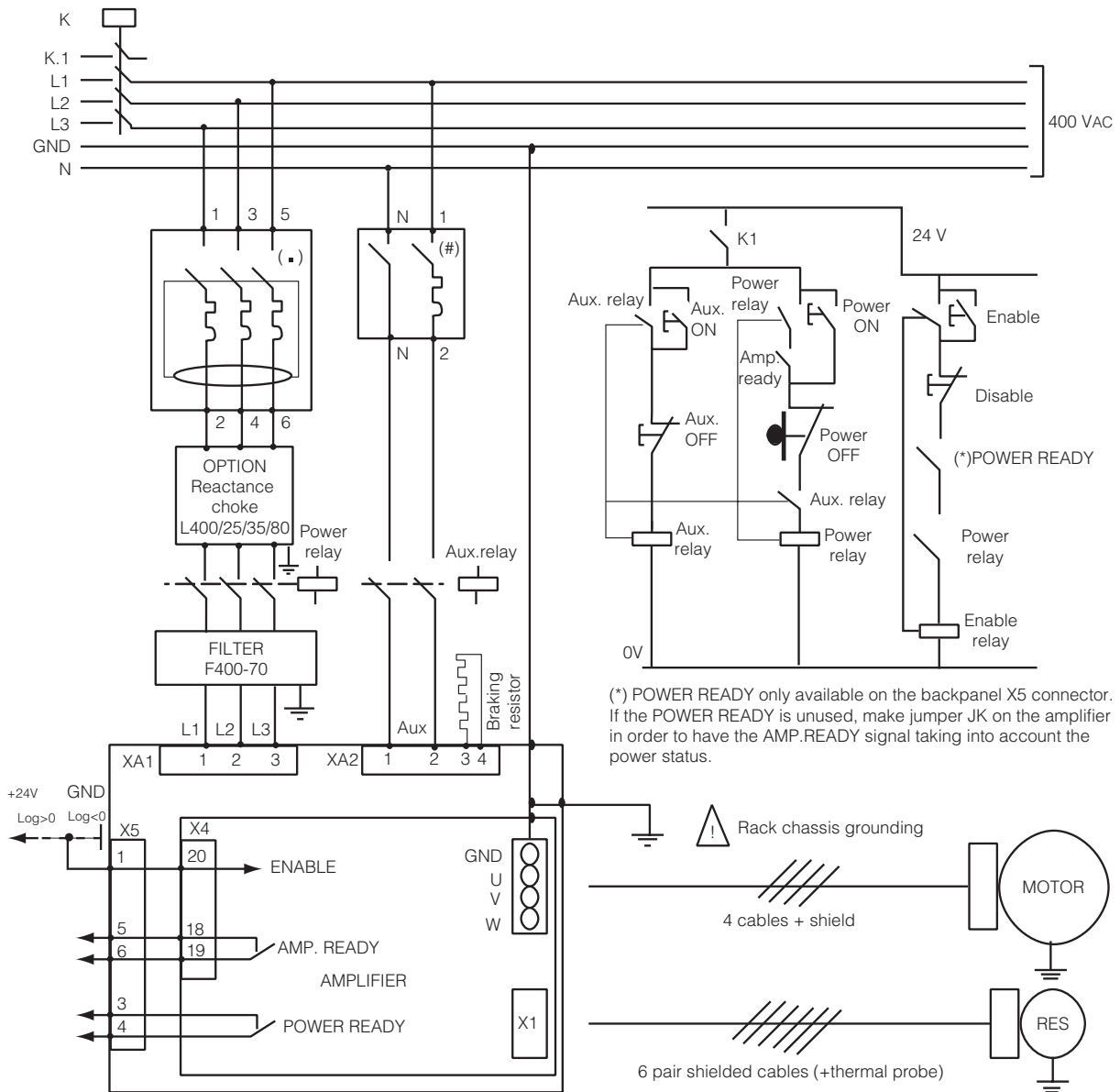
In order to conform with the EN 55011 standard, group 1, class A, the mains filter for the power is **optional** and must be mounted before the 400 VAC three-phase rack input and as close as possible to the rack in order to ensure equipotentiality.

The BF/400 rack chassis **MUST** be GROUNDED in order to ensure the user's physical protection in case of mains isolation failure.

**INFRANOR will withdraw its warranty on any item that does not meet these requirements.**



**CONNECTION DIAGRAM**



(#) 3 A phase-neutral circuit breaker, curve C.

(•) Mandatory differential circuit breaker.

## 7 – MAINS FILTER OPTION

The mains filter is **MANDATORY** for the compliance with the **CE** approval.  
The curves below show the recordings of the conducted and radiated disturbances according to the EN 55011 standard, group 1, class A, with mains filter BF-400/I.

- Mains rejection: curves 8 and 9.
- Radiated electrical field: curve 10.

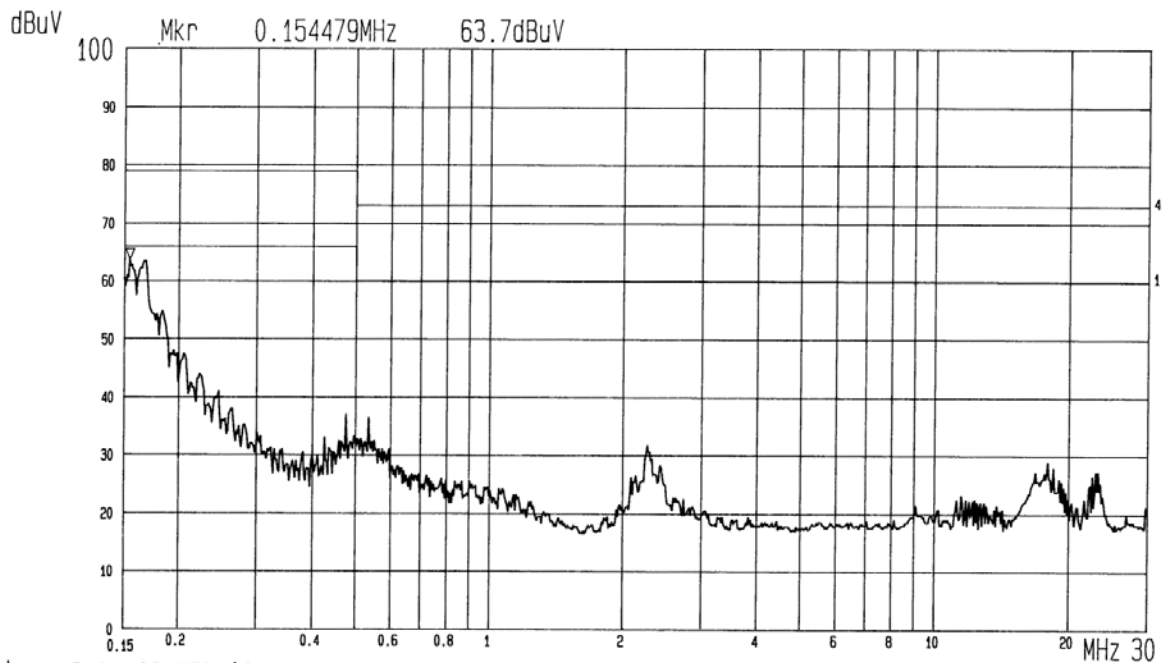
### MAINS FILTER CONNECTION

The mains filter must be connected as close to the BF-400 rack as possible (max. 30 cm). A metallic braiding must connect the filter ground terminal to a fastening screw of the BF-400 rack in order to get the equipotentiality. It is recommended to use the cabinet housing for ensuring the equipotentiality.

The current rating must correspond to the rack current rating, that is:

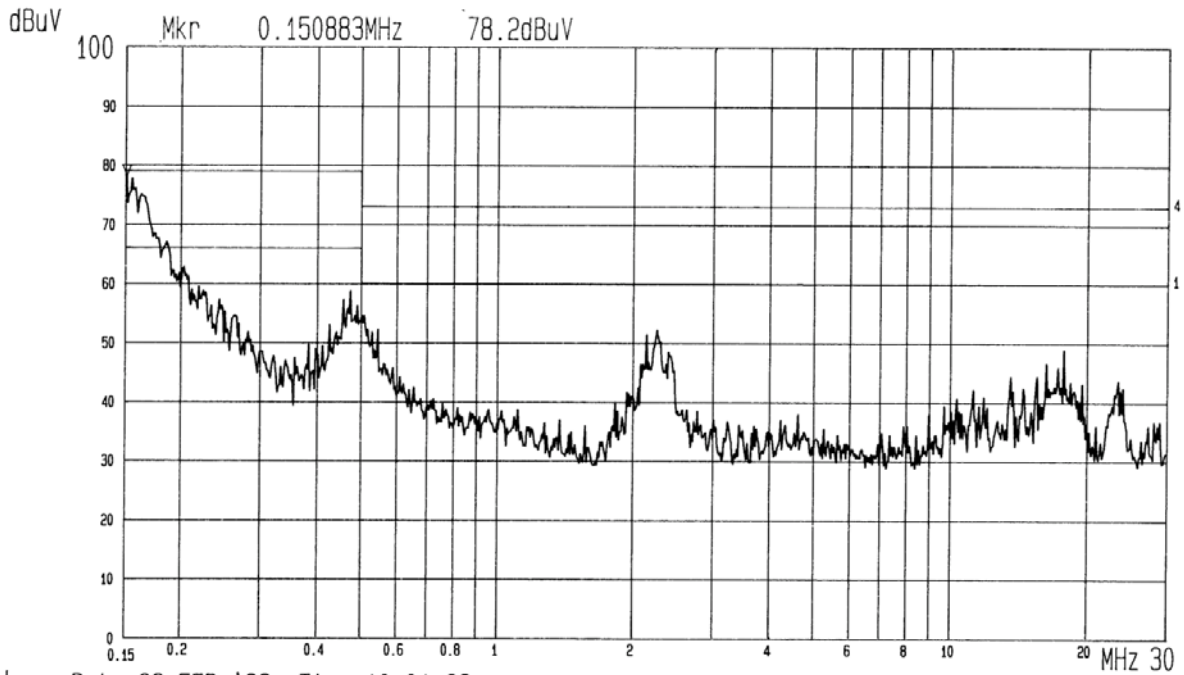
- **F-400/35 for 35 A**
- **F-400/70 for 70 A.**

**CURVE NR. 8**



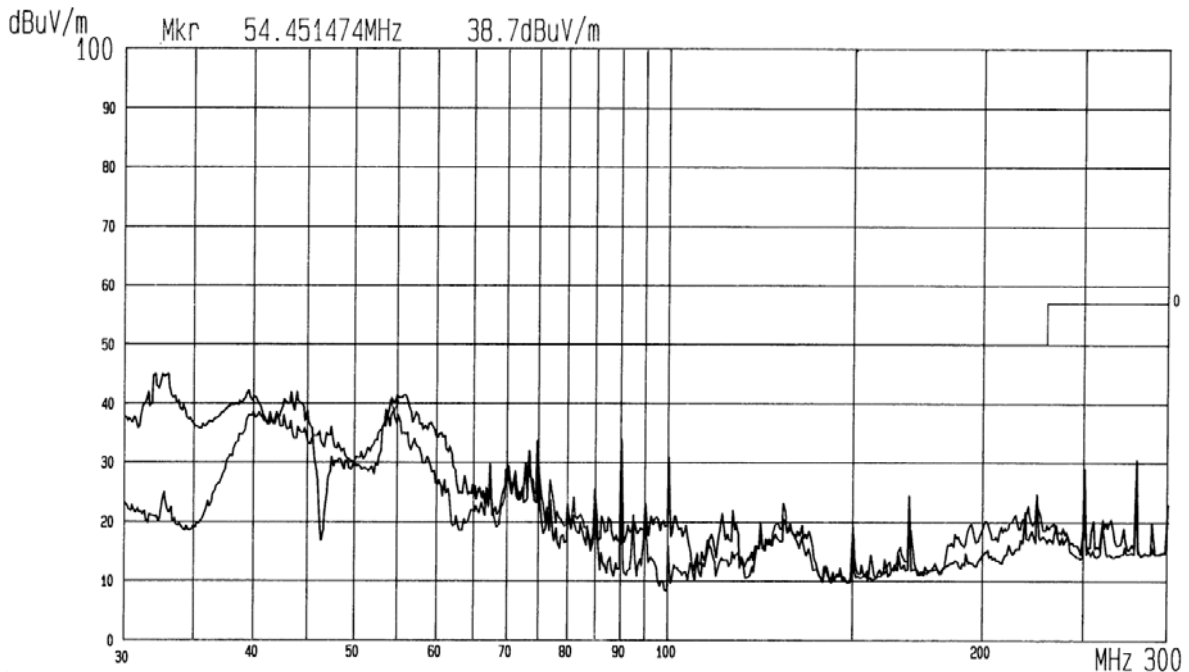
--- Date 28.FEB '96. Time 09:51:03  
8 - VARIATEUR B digital 400 V rotation +100 nF  
EN55011A detection AV phase 3

**CURVE NR. 9**



--- Date 28.FEB '96 Time 10:01:26  
 9 - VARIATEUR B digital 400 V rotation +100 nF  
 EN55011A detection crete phase 3

**CURVE NR. 10**



--- Date 28.FEB '96 Time 10:21:34  
 10 - VARIATEUR B digital 400 V rotation champ E a 3m  
 EN55011A detection QP antenne verticale + horizontale

## 8 – SPECIAL CONNECTION REQUIREMENTS

Wiring and ground connections must be very carefully made.

### CAUTION

Low potential cables **MUST NEVER** run in the proximity of high potential cables.

NC, amplifier, motor and machine housing must be grounded via connections as short as possible. Use the cabinet housing for ensuring the equipotentiality. Use rather braidings than wires, even thick ones.

Keep the equipotentiality between NC/amplifier, machine housing and motor.

The connectors must be **metallic** or **metallized** (according to the **CEI 801 standard**) and must allow "360°" shield connections.

The reference potential is the **earth** (ground).

The input command and the command cables **MUST** be shielded.

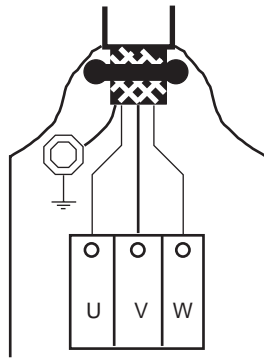
The motor cable **MUST** be shielded and connected at both ends over 360°. Connect the shield to the motor or machine housing, as close to the motor as possible, by means of a metal flange after having removed the paint if the connector is not metallic.

The sensor cable must be shielded. The correct sensor wiring is an **absolutely necessary condition** for the correct operation of the amplifier. If these recommendations are not answered, the described specifications **will not** be obtained. Further, the wiring will not comply with the EMC requirements and will commit the user's responsibility.

The shield connections must be made as follows:

**The connector housing is metallic or plated and allows an "360°" shield connection, according to the CEM - CEI 801 - 2 - 3 - 4 - 5 recommendations.**

DRAWING SHOWING THE CONNECTION BETWEEN METALLIZED HOUSING AND SHIELD

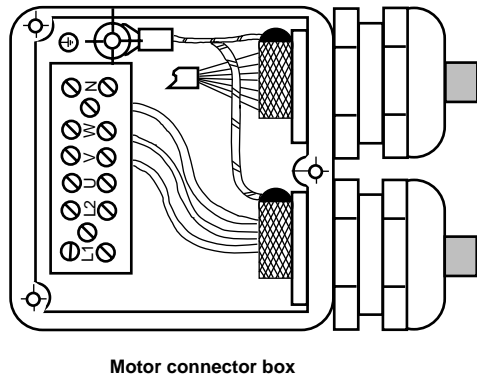
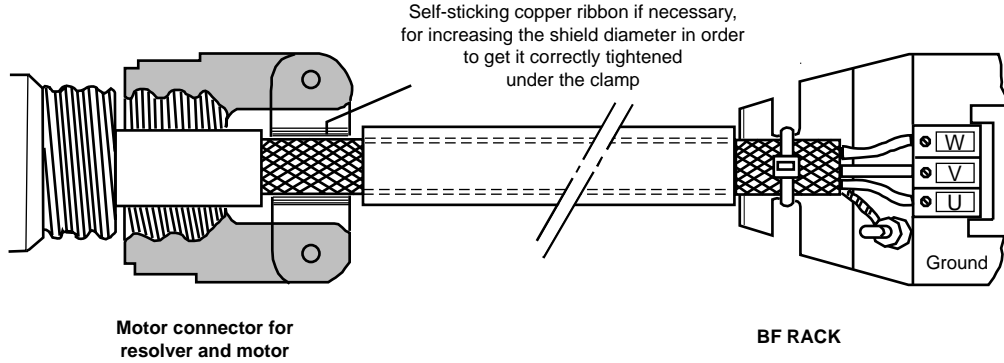


# Appendix

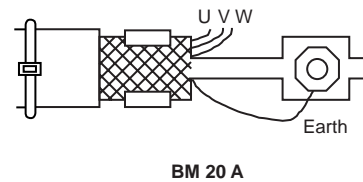
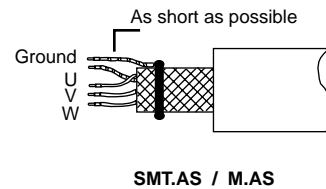
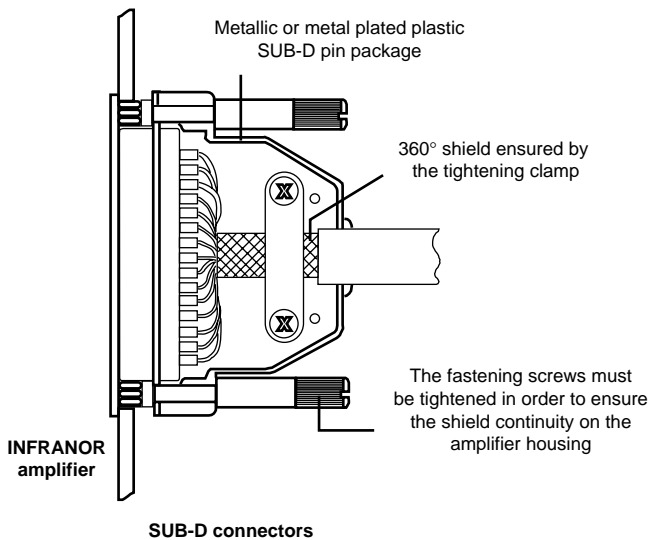
## SHIELDING RECOMMENDATIONS

### RULE

The shield must never be interrupted or corrupted over the whole cable length.



The cable can be soldered on the shield because the connector box is metallic. This solution does not exactly meet the EMC requirements but it is acceptable.



### NOTE

When the 360° shield is made by means of a clamp, it is not necessary to additionally connect a cable on the appropriate connection pin of the SUB-D connector.