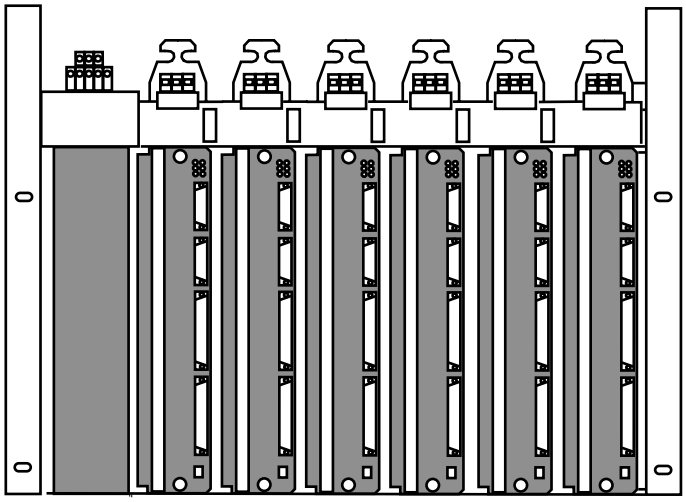
BF RACK

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.

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

Wait for 30 seconds 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.

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

Issue: **2.0**

Contents

Chapter 1 – General description

1 – COMPLIANCE WITH THE EUROPEAN STANDARDS: "CE" CERTIFICATION

1.1 – General description

The rack type of the **"B" series** is "**BF**". 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 connector on the rack backpanel allow the serial connection of the AMP. READY and POWER READY signals.
All connections are ALWAYS made on the top of the rack (power supply, motors, logics).

The "BF" rack is operating with a **380 V / 220 V (400 V / 230 V) autotransformer**. But it can, of course, also work with an insulation transformer.

The whole "B" range (SMT-BSi and SMT-BD1) is particularly well suited for the "BF" rack.
But the "BF" rack is not compatible with the bipolar amplifiers of the "B" series.

The axis width of the "B" series amplifiers (12 TE, 18 TE or 24 TE) is depending on their current ratings.

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 "∑ 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 35 A, 70 A or 90 A rectifier bridge.
The braking system includes all options of the "B" series: D, E, D2 and D1.

	Option D	Option D2	Option E	Option D1
Resistor	15 Ω	10 Ω	2 x 15 Ω parallel mounted	2 x option E
Rated power	140 W	280 W	560 W	1 120 W
Peak power	10 KW	16 KW	21 KW	42 KW

On both options "D" and "D2", the resistor is included in the power supply unit or mounted on the left rack flange, whereas it is external on options "E" and "D1".

The braking resistor is under high voltage (400 V) and may become very hot. It is recommended to mount it at a correctly cooled place or outside the cabinet. But the "D2" or "E" resistors housing must in any case be placed at least 30 cm away from any element that may burst into flame because of the braking resistor heat radiation.

The "BF" rack answers the requirements of the **EN 55011** standard regarding the **electromagnetic compatibility**, with **optional** input filter for the mains rejection.
But 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. The various fan types are depending on the amplifier continuous current.

1.2 - Reference to the standards

The "B" series amplifiers mounted into the **BF rack**, which is equipped with the mains filter BF 35/70, have been approved for their conformity with the Electromagnetic Compatibility standards:
EN 55011, group 1, Class A, regarding conducted and radiated radioelectric disturbances
CEI 801-2-3-4 regarding immunity.

The test results and conditions of the LCIE laboratory (Laboratoire Central des Industries Electriques), which is approved by the European Community, are referenced under n° 416040 - 416041 - 416042 - 416043.

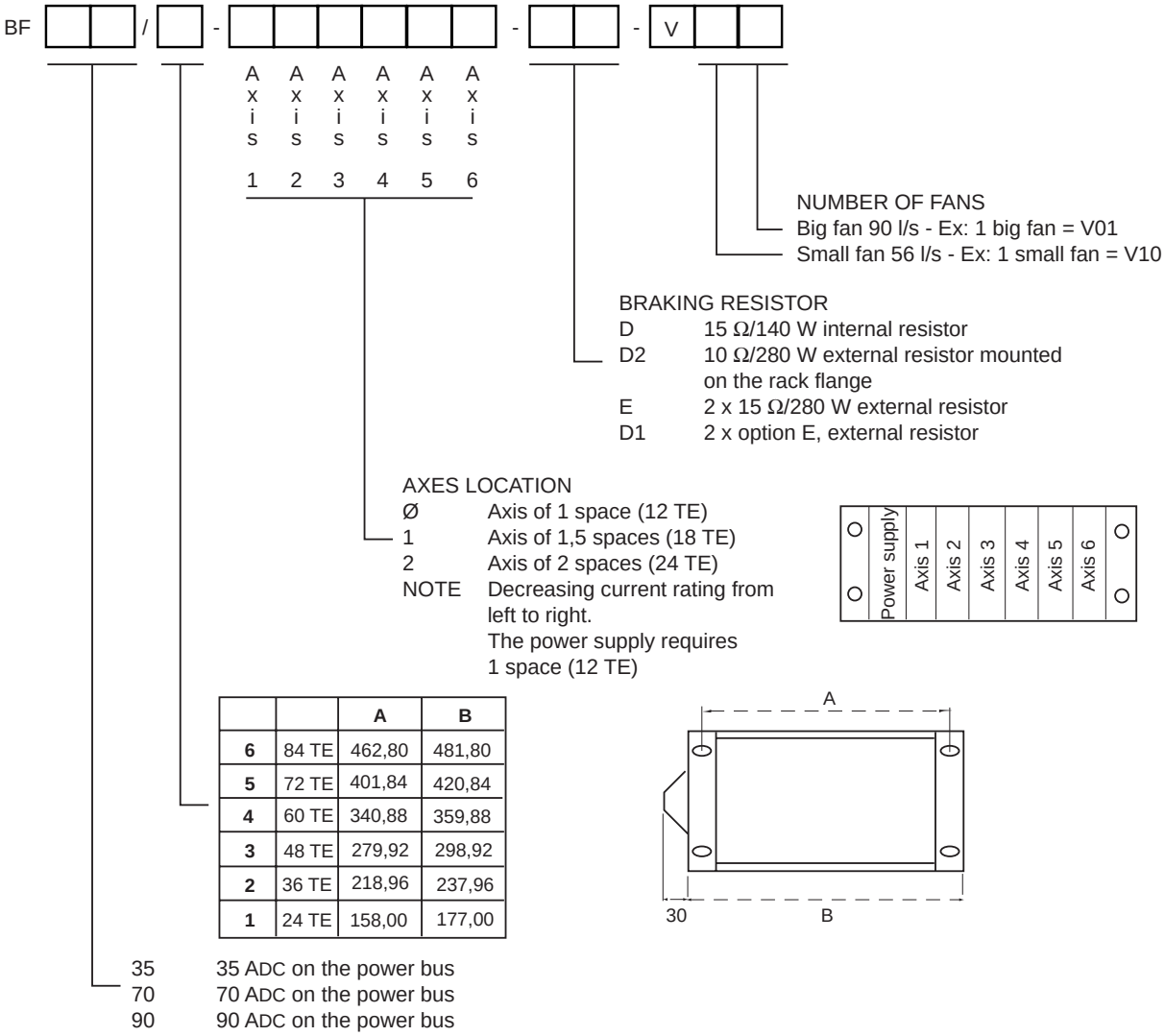
The results of the tests made according to the Low Voltage directive are referenced in the LCIE report n° 413777.

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

1.3 – CE marding

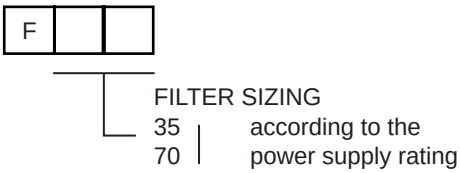
The racks have been CE marked since 1995.

2 – ORDERING CODE OF THE BF RACK



		A	B
6	84 TE	462,80	481,80
5	72 TE	401,84	420,84
4	60 TE	340,88	359,88
3	48 TE	279,92	298,92
2	36 TE	218,96	237,96
1	24 TE	158,00	177,00

3 – ORDERING CODE OF THE MAINS FILTER



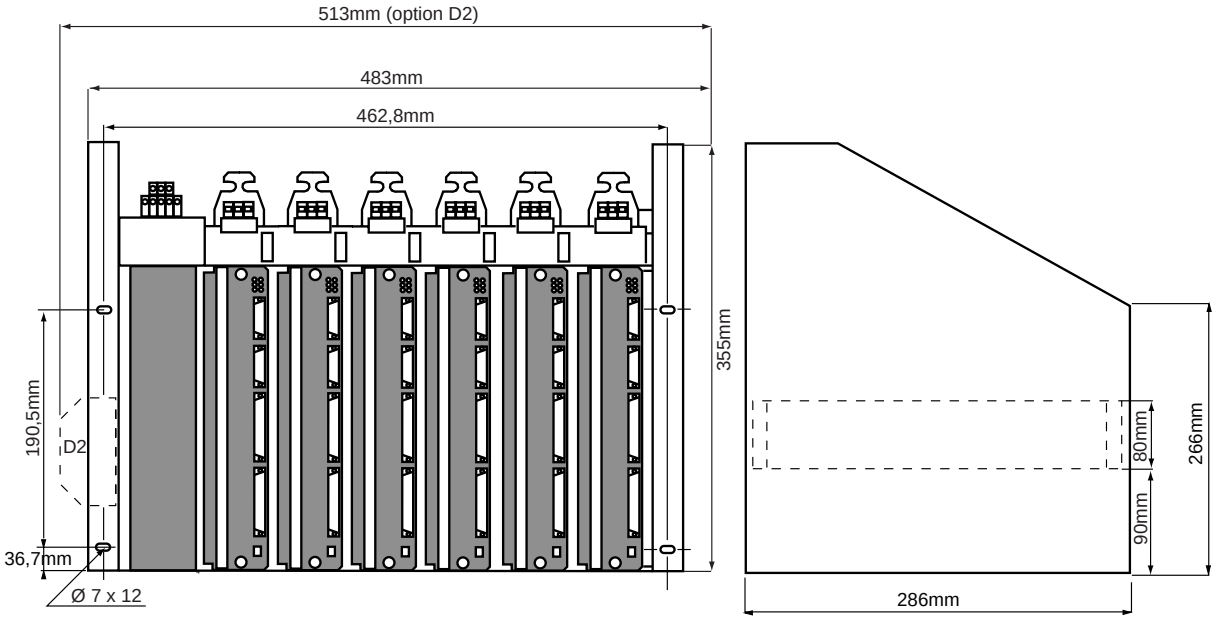
Chapter 2 – Specifications

1 – MAIN TECHNICAL DATA

Rated DC bus voltage	Three-phase 220 Vac
Maximum AC input power voltage	210 to 240 Vac +/-10 % (including all tolerances)
Minimum AC input power voltage	100 Vac
Rated auxiliary power voltage	Single-phase 210 Vac to 240 Vac +/-10 % (including all tolerances)
Minimum auxiliary supply voltage	100 Vac
Maximum auxiliary supply voltage	240 Vac +10 % (including tolerances)
Maximum section of the supply connector	6 mm^2
Maximum section of the motor connector	4 mm^2
Rated output current on the DC bus	35 A version 35 A 70 A version 70 A 90 A version 90 A
Output current of the auxiliary supply	1 A
Triggering threshold of the braking system	395 V +/-5 V
Minimum braking resistor (option E)	7,5 Ω
Rated braking power (option D1)	1 100 W
Peak braking power (max 1 s) – option D1 -	42 KW
Maximum section of the braking resistor cables	2,5 mm^2
Conformity with the standards – **CE** approval	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 1500 Vac/1min - 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 6 AXES BF RACK, 12 TE



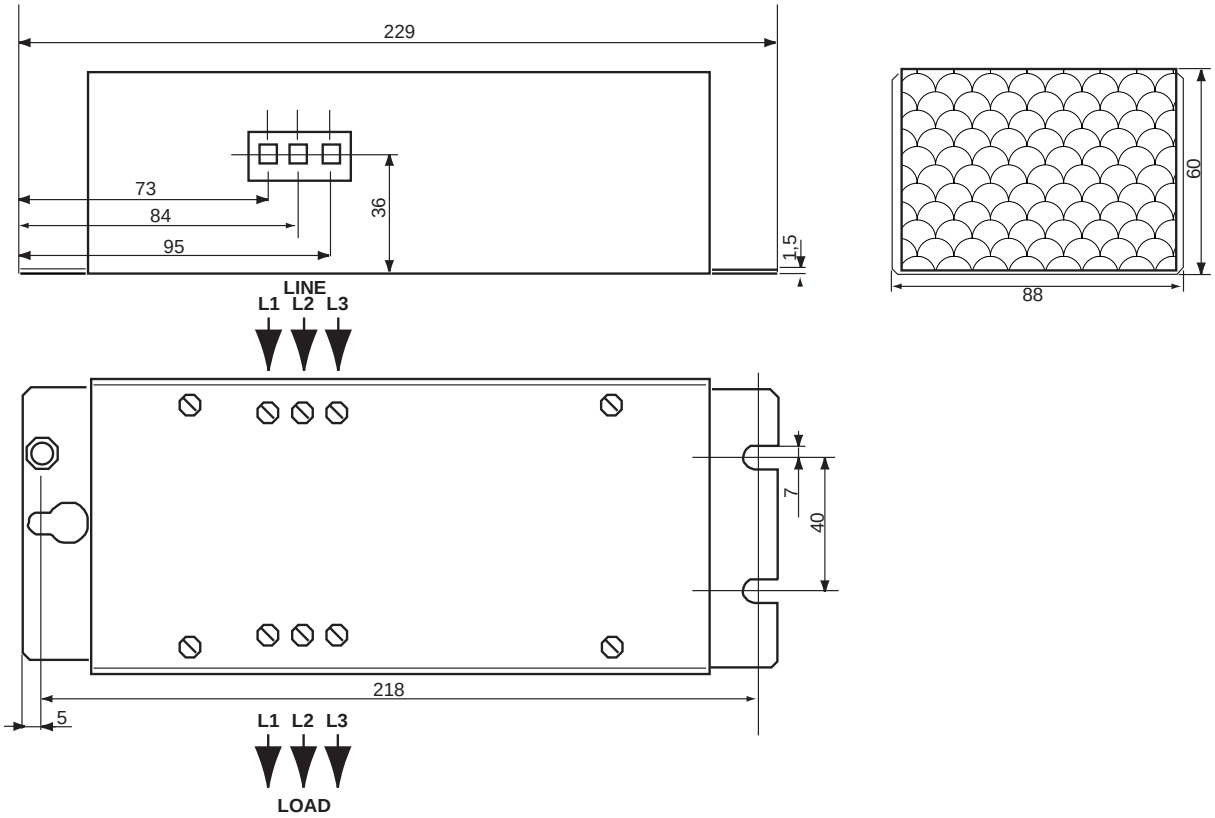
NOTE: The heatsink does not modify the dimensions.

Example: 6 axes rack: Axes 1 to 6 = 12 TE each.

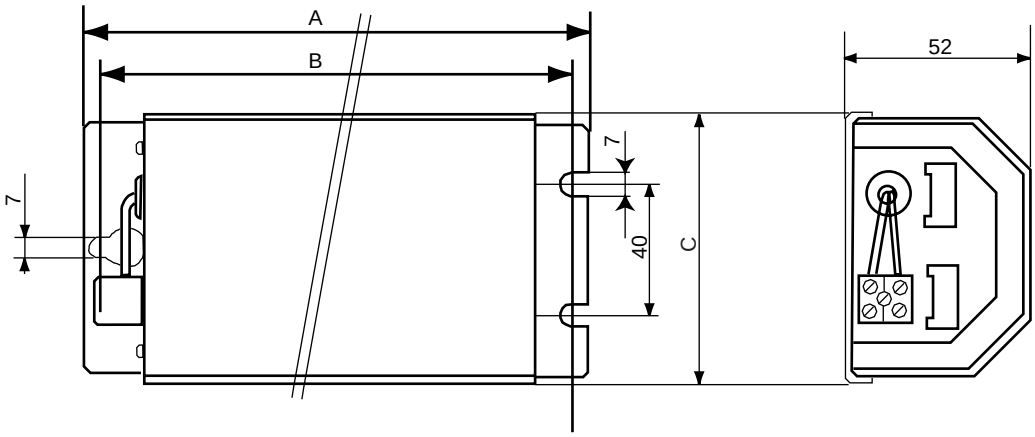
NOTE

For other rack dimensions than 6 axes, see chapter 1, part 2: "Ordering code of the BF rack".

3 – MAINS FILTER DIMENSIONS

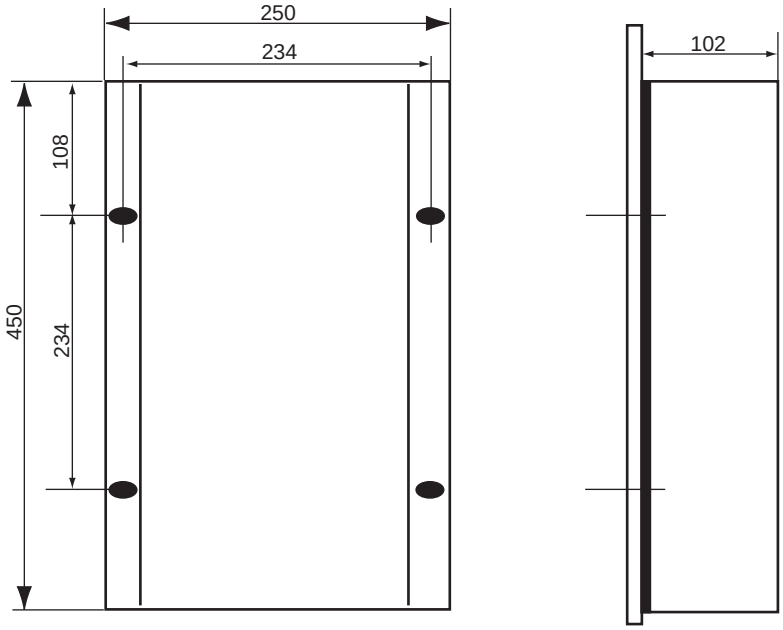


4 – EXTERNAL BRAKING RESISTOR DIMENSIONS



BRAKING RESISTOR	POWER	A	B	C
D2	280 W	290	278	83
E	560 W	290	278	145

EXTERNAL BRAKING RESISTOR D1 (1100 W)

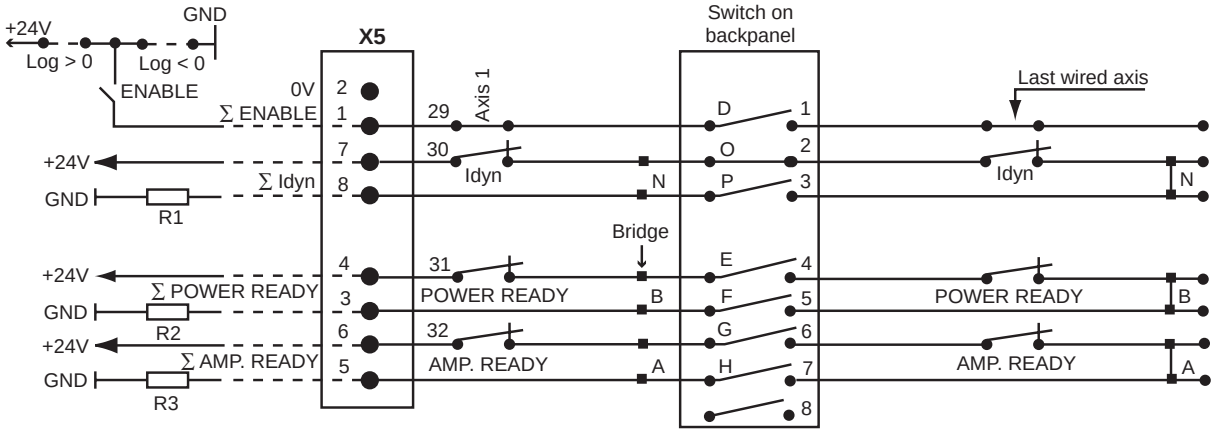


Chapter 3 – Connections

1 – RACK BACKPANEL CONNECTION

1.1 – Connection diagramm

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 – Tableau de configuration

JUMPER/SWITCH	ENABLE	AMP.READY	Idyn	Power Ready and DR OK
A closed on last wired axis Switchs G and H « ON »		Serial		
A closed on each axis Switchs G and H « OFF »		Independent		
B closed on last wired axis Switchs E and F « ON »				Serial
B closed on each axis Switchs E and F « OFF »				Independent
N closed on last wired axis Switchs O and P « ON »			Serial	
N closed on each axis Switchs 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 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, Imax = 100 mA, Prated = 5 W.

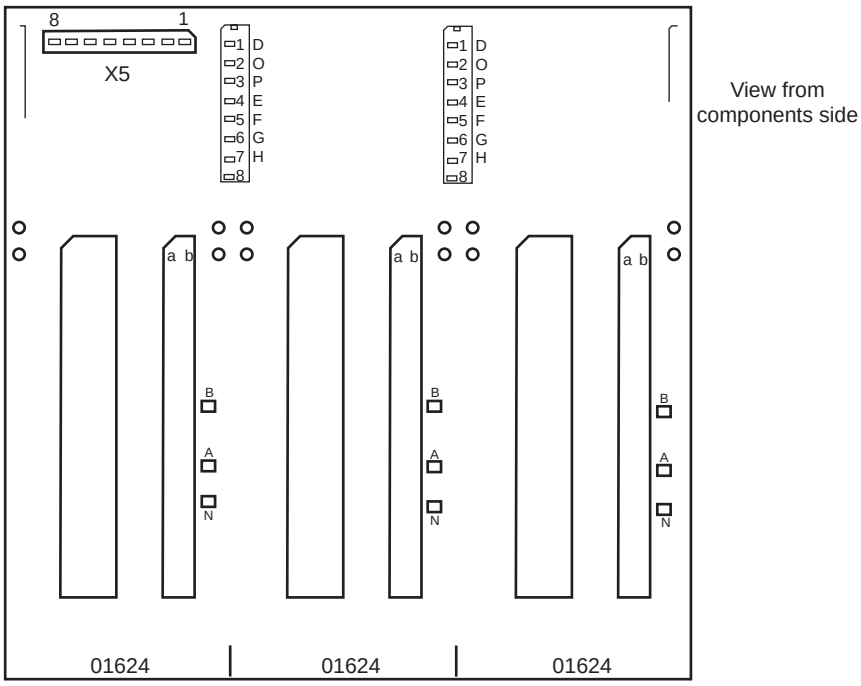
IMPORTANT

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).

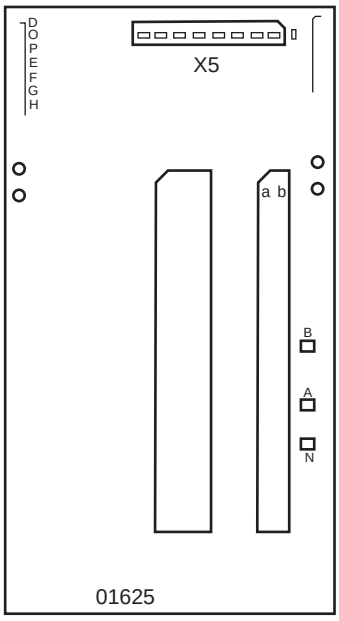
2 – SETTING-UP DIAGRAMS OF THE BACKPANEL (X5 SWITCH, JUMPERS)

Front view of the rack

12 TE BACKPANEL

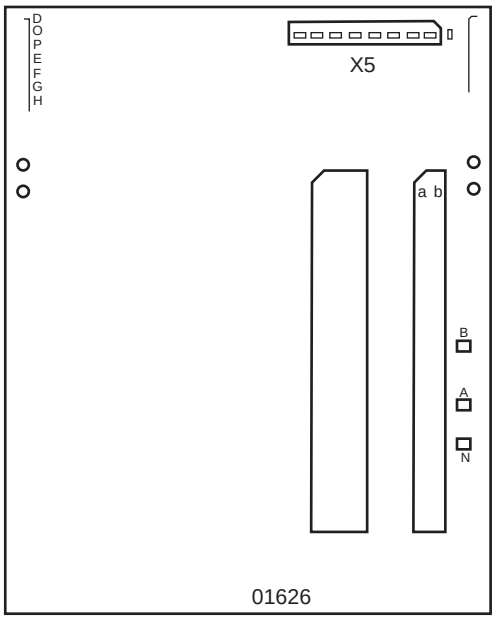


18 TE BACKPANEL



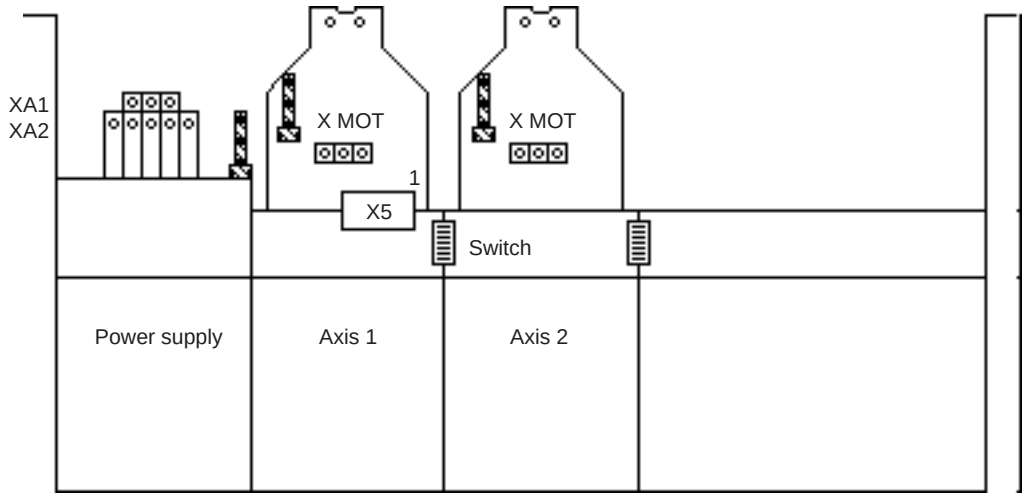
View from components side

24 TE BACKPANEL



View from components side

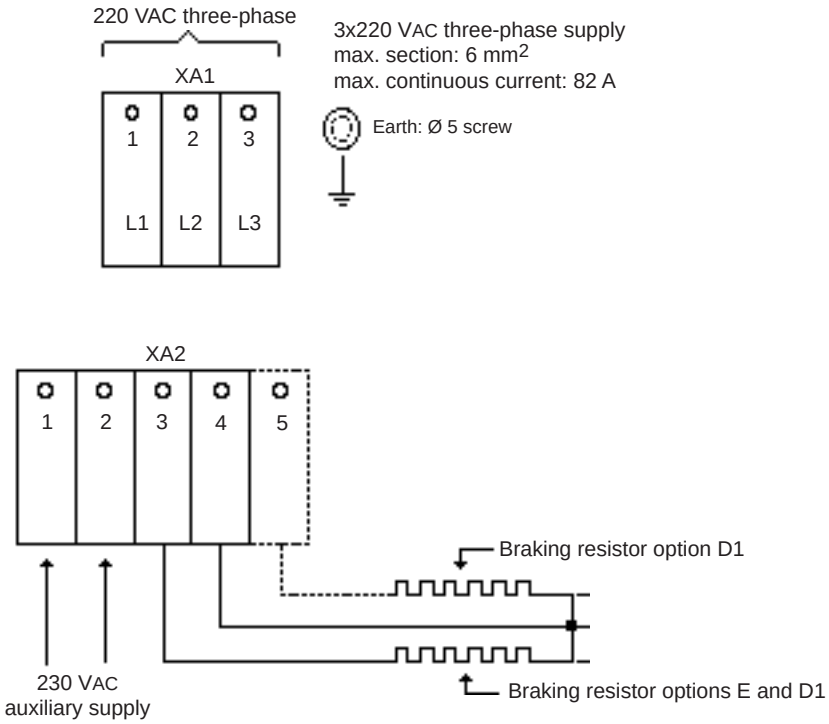
3 – SETTING-UP OF THE CONNECTION CONNECTORS



FRONT VIEW

4 – XA1 AND XA2 SUPPLY CONNECTORS

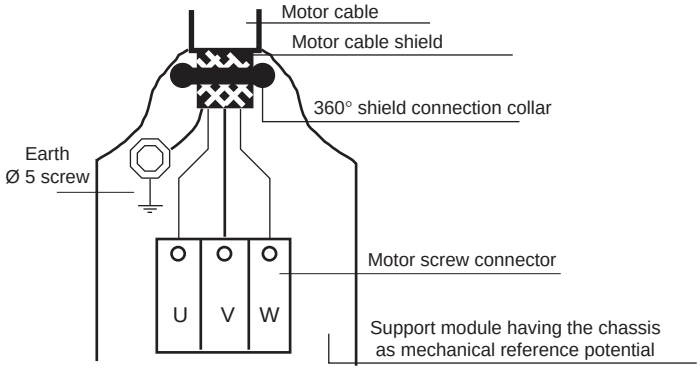
The **power supply connector** includes the power supply inputs (XA1), the auxiliary supply and the connections for the braking resistor(s), according to the selected option (XA2).



NOTES
Power cables must not run in the proximity of low potential cables.
Option D: the braking resistor is wired inside the rack.
Option D2: the braking resistor is mounted and wired on the left rack flange.

5 – XMOT 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 mm².
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.

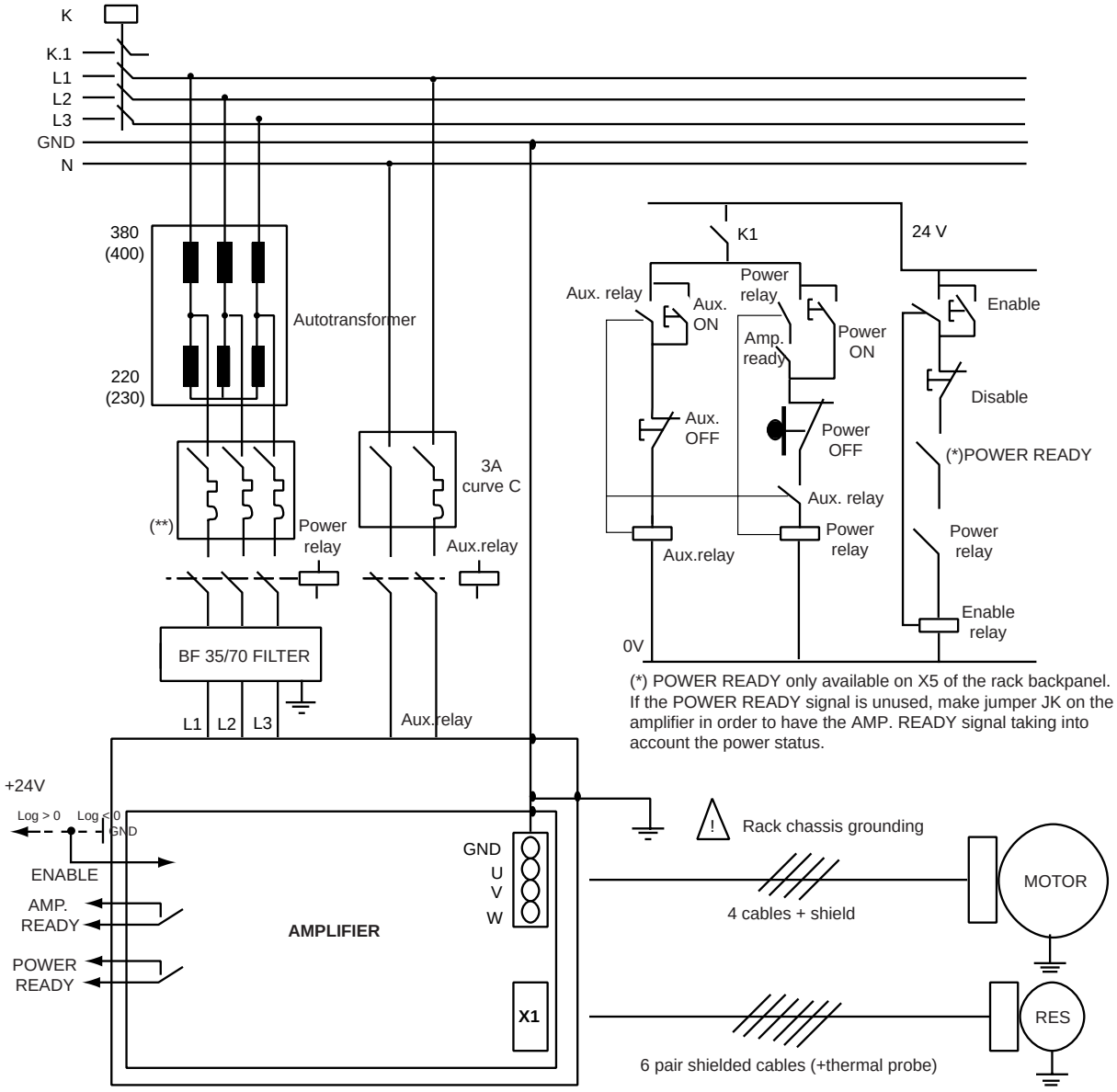
6 – THREE-PHASE CONNECTION VIA A 380V/220V (400V/230V) AUTOTRANSFORMER

The 380 V / 400 V three-phase power supply requires the use of a 380 V / 220 V autotransformer.

The 230 Vac phase/neutral connection is possible for the auxiliary supply.

The auxiliary supply can be connected between two 220 V phases to the autotransformer OUTPUT

The auxiliary supply is connected to the autotransformer output and the power contactor is put after the auxiliary supply connection (see connection diagram).



(**) Magnetothermal circuit-breaker sized at 20/40/60 A for BF 35/70/90

NOTES
With a three-phase connection, all supply lines must ABSOLUTELY be cut off to ALL POLES.

The connection via an autotransformer is the most cost effective one but it is always possible to use a 380 V / 220V (400V / 230V) insulation transformer instead of an autotransformer (same connection as shown above, with a grounded screened transformer).

IMPORTANT

The use of the auto-transformer does not allow the insulation between mains and power stage (and consequently the motor) anymore. It is then mandatory to mount a correctly sized circuit-breaker inside the rack in the event of a short-circuit (rectifier bridge, power bridge, motor). Further, **the AMP. READY information** (pins 18-19 of X4) **must be used** for opening the power relay if a failure occurs.

ELECTROMAGNETIC COMPATIBILITY
A **common mode inductance** is mounted on the motor output and the auxiliary supply is also equipped with a **mains filter**. In order to keep the conformity with the EN 55011 standard, group 1, class A, the mains filter on the power is **optional** and must be mounted before the 220 VAC three-phase input.

The GROUNDING of the "BF" rack chassis is MANDATORY in order to avoid any physical damage in case of defective mains insulation.

INFRANOR will withdraw any warranty on items that do not meet these requirements.

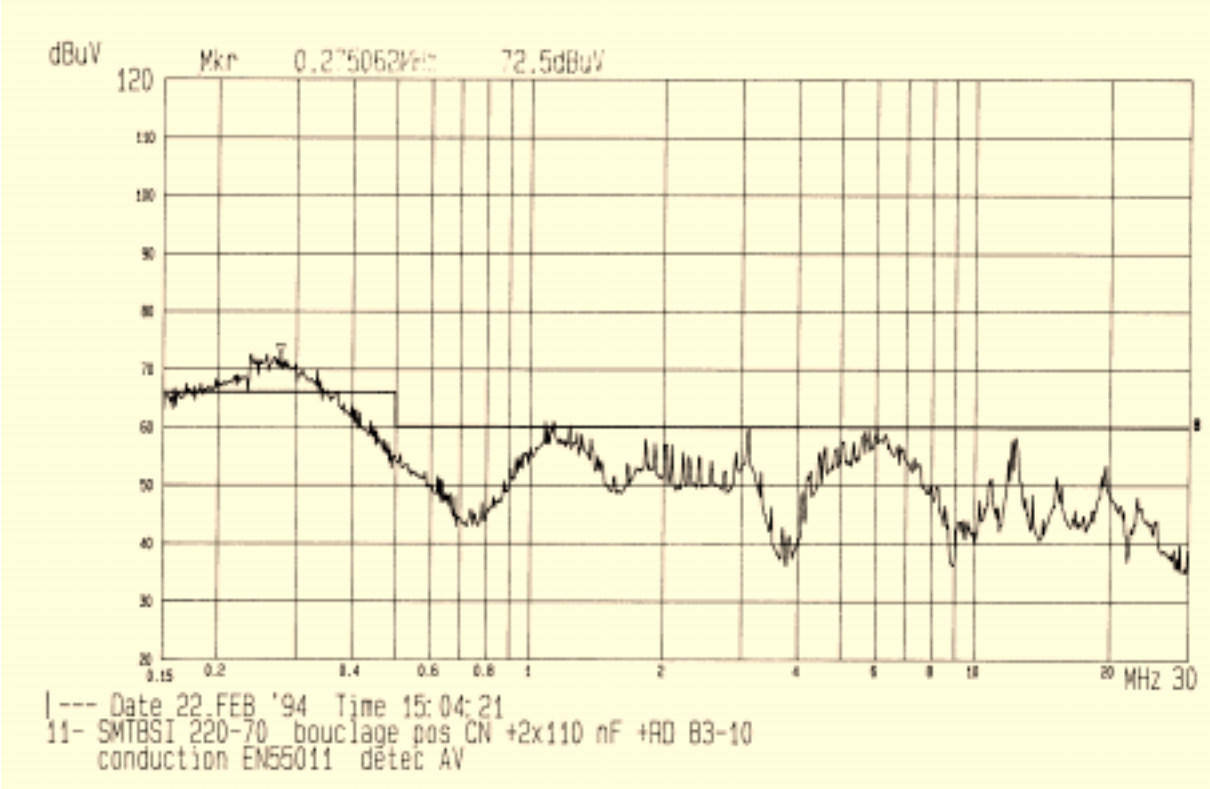
7 – MAINS FILTER OPTION

The mains filter is MANDATORY for the conformity with the **CE** certification.

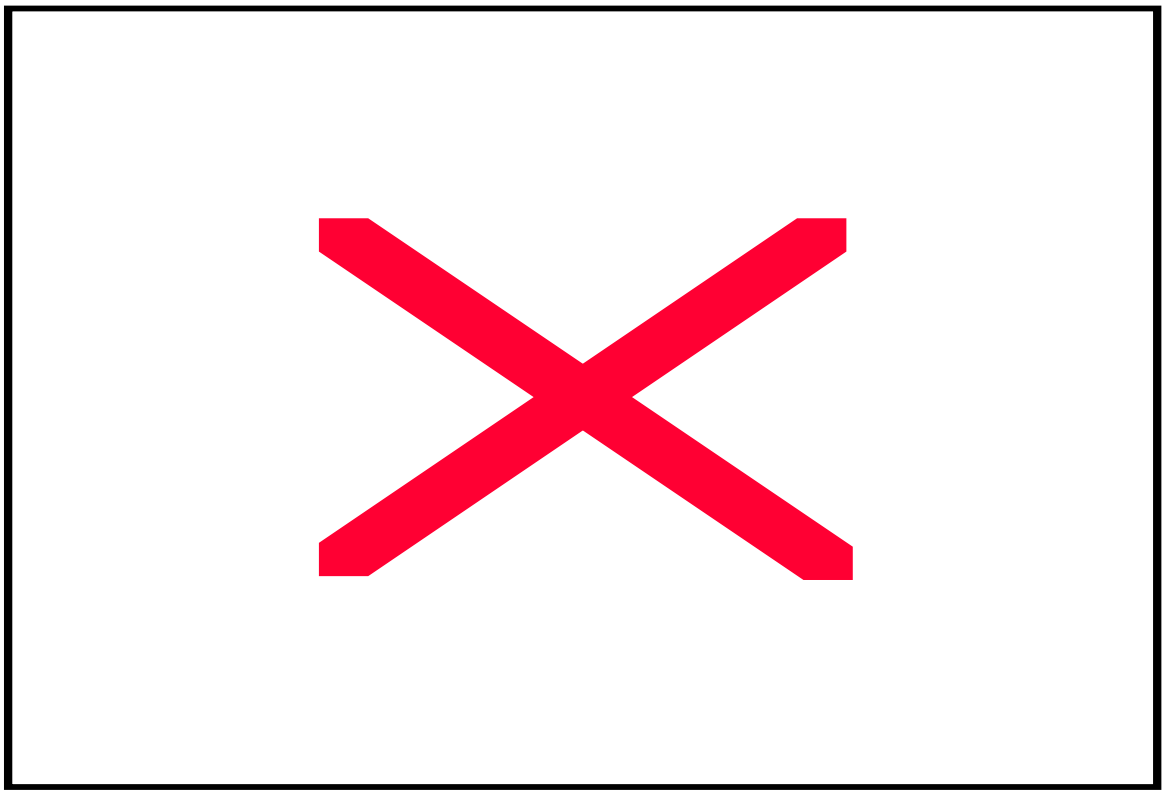
Curve n° 11 shows the conduction level for an average detection, according to the EN 55011 standard, group 1, class A, with a rack connection via an autotransformer (5 dB overshoot at 250 kHz).

Curve n° 26 shows the improvement obtained with the mains filter. It allows a 10 dB margin with regard to the maximum level authorized by the standard.

CURVE N° 11



CURVE N° 26



MAINS FILTER CONNECTION
The mains filter must be connected as near the BF rack as possible (max. 30 cm). A metallic braiding must connect the filter ground terminal to a fastening screw of the BF 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:

- FT 35 --→ 35 A,
- FT 70 --→ 70 A.

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 the equipotential. Use rather braidings than wires, even thick ones.

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

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

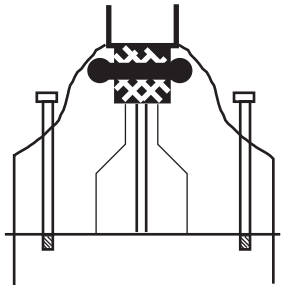
The reference potential is the **earth** (ground).

The input command and the logic cables MUST be shielded.

The motor cable MUST be shielded and connected over 360° at both ends. Connect the shield on the motour or machine housing by means of a metallic collar, as close to the motor as possible, 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 requirements 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 own 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.

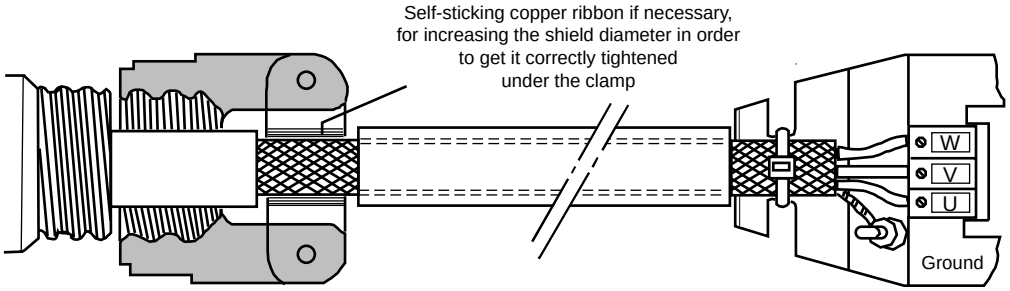


Appendix

SHIELDING RECOMMENDATIONS

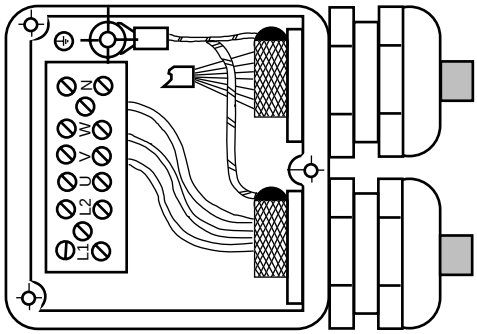
RULE

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



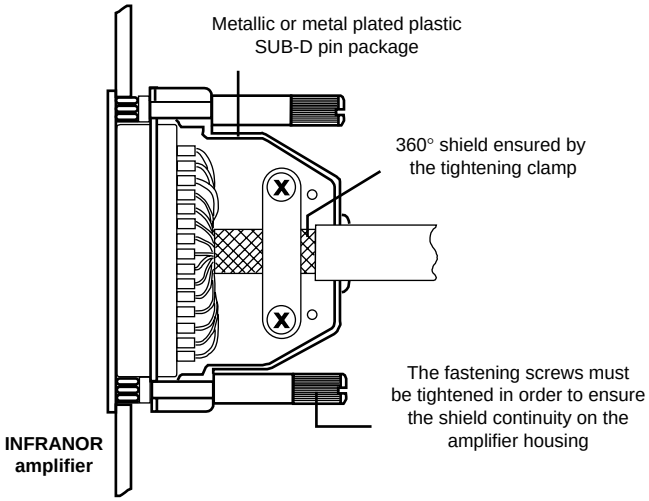
Motor connector for resolver and motor

BF RACK

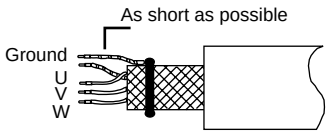


Motor connector box

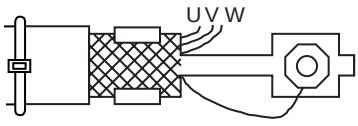
The cable can be soldered on the shield because the connector box is metallic. This solution does not exactly meet the EMC requirements but it is acceptable.



SUB-D connectors



SMT.AS / M.AS



BM 20 A

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.