

SSD Parvex SAS

8, avenue du Lac - B.P. 249

F-21007 Dijon Cedex

www.SSDdrives.com



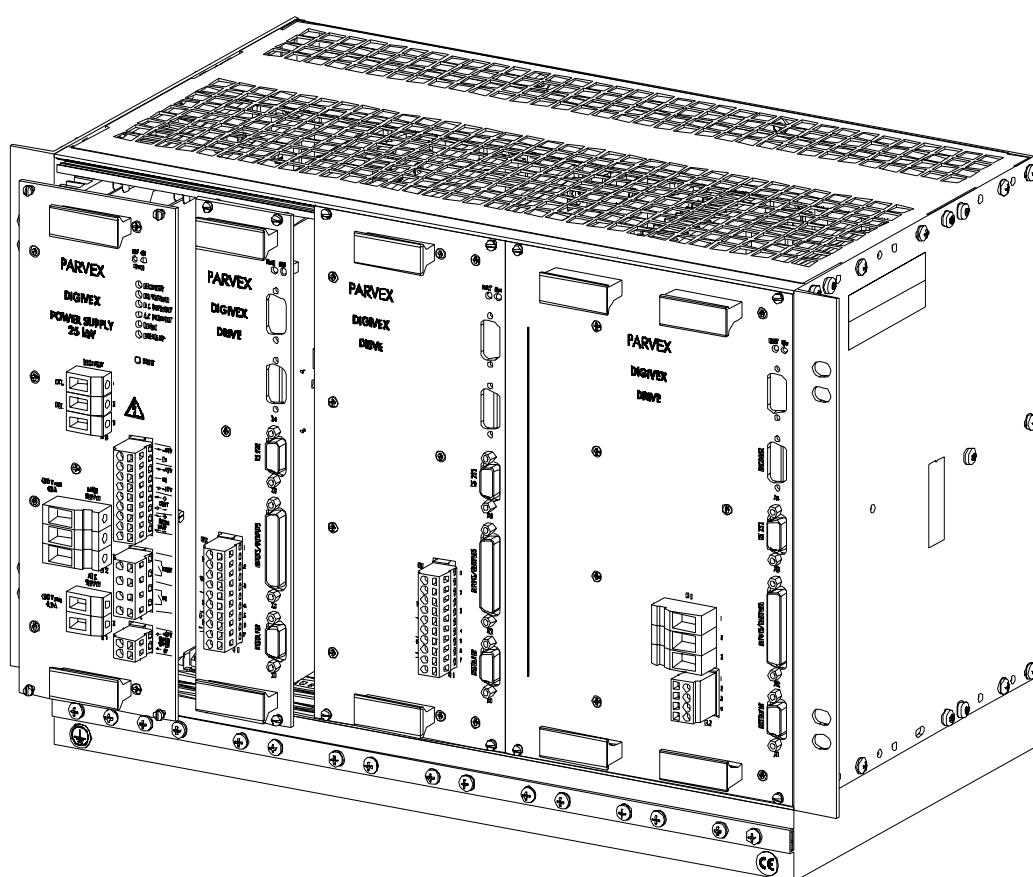
DIGIVEX REVERSING POWER SUPPLY

Power 15KW

For DIGIVEX Servo-Amplifiers

User and commissioning manual

PVD 3492 GB – 01/2003



PRODUCT RANGE

1 - « BRUSHLESS » SERVODRIVES

TORQUE OR POWER RANGES

- **BRUSHLESS SERVOMOTORS, LOW INERTIA, WITH RESOLVER**
 Very high torque/inertia ratio (high dynamic performance machinery):
 ⇒ NX -HX - HXA 0,9 to 320 N.m
 ⇒ NX - LX 0,3 to 54 N.m
 High rotor inertia for better inertia load matching:
 ⇒ HS - LS 3,3 to 31 N.m
 Varied geometrical choice :
 ⇒ short motors range HS - LS 3,3 to 31 N.m
 ⇒ or small diameter motors : HD, LD 9 to 100 N.m
 Voltages to suit different mains supplies :
 ⇒ 230V three-phase for «série L - NX»
 ⇒ 400V, 460V three-phase for «série H - NX»
- **"DIGIVEX DRIVE" DIGITAL SERVOAMPLIFIERS**
 ⇒ SINGLE-AXIS DSD
 ⇒ COMPACT SINGLE-AXIS DLD
 ⇒ POWER SINGLE-AXIS DPD
 ⇒ MULTIPLE-AXIS DMD
- **"PARVEX MOTION EXPLORER" ADJUSTING SOFTWARE**

2 - SPINDLE DRIVES

- **SPINDLE SYNCHRONOUS MOTORS**
 - ⇒ "HV" COMPACT SERIES
 - ⇒ "HW" ELECTROSPINDLE, frameless, water-cooled motor
 - **"DIGIVEX" DIGITAL SERVOAMPLIFIERS**
- From 5 to 110 kW
up to 60,000 rpm

3 - DC SERVODRIVES

- **"AXEM", "RS", "RX" SERIES SERVOMOTORS** 0.08 to 13 N.m
- **"RTS" SERVOAMPLIFIERS**
- **"RTE" SERVOAMPLIFIERS** for DC motors + resolver giving position measurement

4 - SPECIAL ADAPTATION SERVODRIVES

- **"XD" SERVOMOTORS** for explosive atmosphere 0.7 to 20 N.m
- **"AXL" COMPACT SERIES SERVOREDUCTORS** 5 to 700 N.m

5 - POSITIONING SYSTEMS

- **COMMANDE NUMERIQUE « CYBER 2000 »** 1 à 2 axes
- **"CYBER 2000"** NC 1 to 2 axes
- **VARIABLE SPEED DRIVE - POSITIONER**
 - ⇒ SINGLE-AXIS DSM
 - ⇒ POWER SINGLE-AXIS DPM
 - ⇒ MULTIPLE-AXIS DMM
- **ADJUSTMENT AND PROGRAMMING SOFTWARE** PARVEX MOTION EXPLORER

CONTENTS

SAFETY INSTRUCTIONS.....	2
1. GENERAL	4
1.1 Digital servodrive	4
1.2 DIGIVEX REVERSING POWER SUPPLY module general characteristics	5
1.3 Presentations / Block diagram	5
1.4 Return of braking energy to mains supply	7
2. DIGIVEX REVERSING POWER SUPPLY CONNECTION	11
2.1 Front-panel terminal blocks	11
2.2 Power component size requirements	12
2.3 Mains supply connection	13
2.4 "Low-level" auxiliary supply connection	14
2.5 Control signal connection (X2 and X3 terminal blocks)	15
2.6 X1 terminal block "Brake Supply" connection	18
3. LEDS AND OPERATING DIAGNOSTICS	18
4. INITIALIZATION AND STOP SEQUENCES	19
5. LABELLING - CODING	20

Characteristics and dimensions are liable to modification without notice.

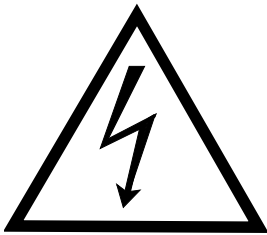
YOUR LOCAL CORRESPONDENT

SSD Parvex SAS
8 Avenue du Lac / B.P 249 / F-21007 Dijon Cedex
Tél. : +33 (0)3 80 42 41 40 / Fax : +33 (0)3 80 42 41 23
www.SSDdrives.com

SAFETY

Servodrives present two main types of hazard :

- Electrical hazard



Servoamplifiers may contain non-insulated live AC or DC components. Users are advised to guard against access to live parts before installing the equipment.

Even after the electrical panel is de-energized, voltages may be present for more than a minute, until the power capacitors have had time to discharge.

Specific features of the installation need to be studied to prevent any accidental contact with live components :

- Connector lug protection ;
- Correctly fitted protection and earthing features ;
- Workplace insulation (enclosure insulation humidity, etc.).

General recommendations :

- Check the bonding circuit;
- Lock the electrical cabinets;
- Use standardised equipment.



- Mechanical hazard

Servomotors can accelerate in milliseconds. Moving parts must be screened off to prevent operators coming into contact with them. The working procedure must allow the operator to keep well clear of the danger area.

All assembly and commissioning work must be done by **qualified** personnel who is familiar with the safety regulations (e.g. VDE 0105 or accreditation C18510).

Upon delivery

All servoamplifiers are thoroughly inspected during manufacture and tested at length before shipment.

- Unpack the servoamplifier carefully and check it is in good condition.
- Also check that data on the manufacturer's plate comply with data on the order acknowledgement.

If equipment has been damaged during transport, the addressee must file a complaint with the carrier by recorded delivery mail within 24 hours.

Caution :


The packaging may contain essential documents or accessories, in particular :

- User Manual,
- Connectors.

Storage

Until installed, the servoamplifier must be stored in a dry place safe from sudden temperature changes so condensation cannot form.

Special instructions for setting up the equipment

	CAUTION
	<p>For this equipment to work correctly and safely it must be transported, stored, installed and assembled in accordance with this manual and must receive thorough care and attention..</p> <p>Failure to comply with these safety instructions may lead to serious injury or damage.</p> <p>The cards contain components that are sensitive to electrostatic discharges. Before touching a card you must get rid of the static electricity on your body. The simplest way to do this is to touch a conductive object that is connected to earth (e.g. bare metal parts of equipment cabinets or earth pins of plugs).</p>

1. GENERAL

This document supplements the technical instruction PVD 3464 concerning the Digivex Servoamplifier. It describes a power supply variant - DIGIVEX REVERSING POWER SUPPLY - which is designed to return braking energy to the mains supply. The DIGIVEX POWER SUPPLY version described in instruction PVD 3464 is designed to dissipate braking energy via a resistor.

The general wiring requirements as given in instruction PVD 3464 apply to the DIGIVEX REVERSING POWER SUPPLY. The same is true of compliance with standards.

1.1 Digital servodrive

All these servodrives comprise:

- Brushless servomotors, with permanent magnets, whose emf is of a sine-wave form, with position measurement by resolver. HX, HS, HD range servomotors. HV and HW range spindle motors can also be used (these two motor ranges are covered by separate documentation).
- A multiple-axis electronic control system made up of:
 - ◆ a rack, see instruction PVD 3464.
 - ◆ a power supply module that receives the 400V(460) /50-60Hz mains supply directly and provides 550V bus voltage. This module also commands energy dissipation.
- Control modules connected to the servomotor (power and resolver), see instruction PVD 3464.

1.2 DIGIVEX REVERSING POWER SUPPLY module general characteristics

TYPE	MAINS SUPPLY	MEAN BUS CURRENT	RATED BUS VOLTAGE	RECOVERY
DIGIVEX REVERSING POWER SUPPLY	400 V three-phase 48 - 62 Hz Max 460V +10%	30 A	550 V	RETURN TO MAINS SUPPLY

The module's dimensions are identical to that described in the instruction PVD 3464. The rack composition (power supply + servoamplifiers) follows the same rules.

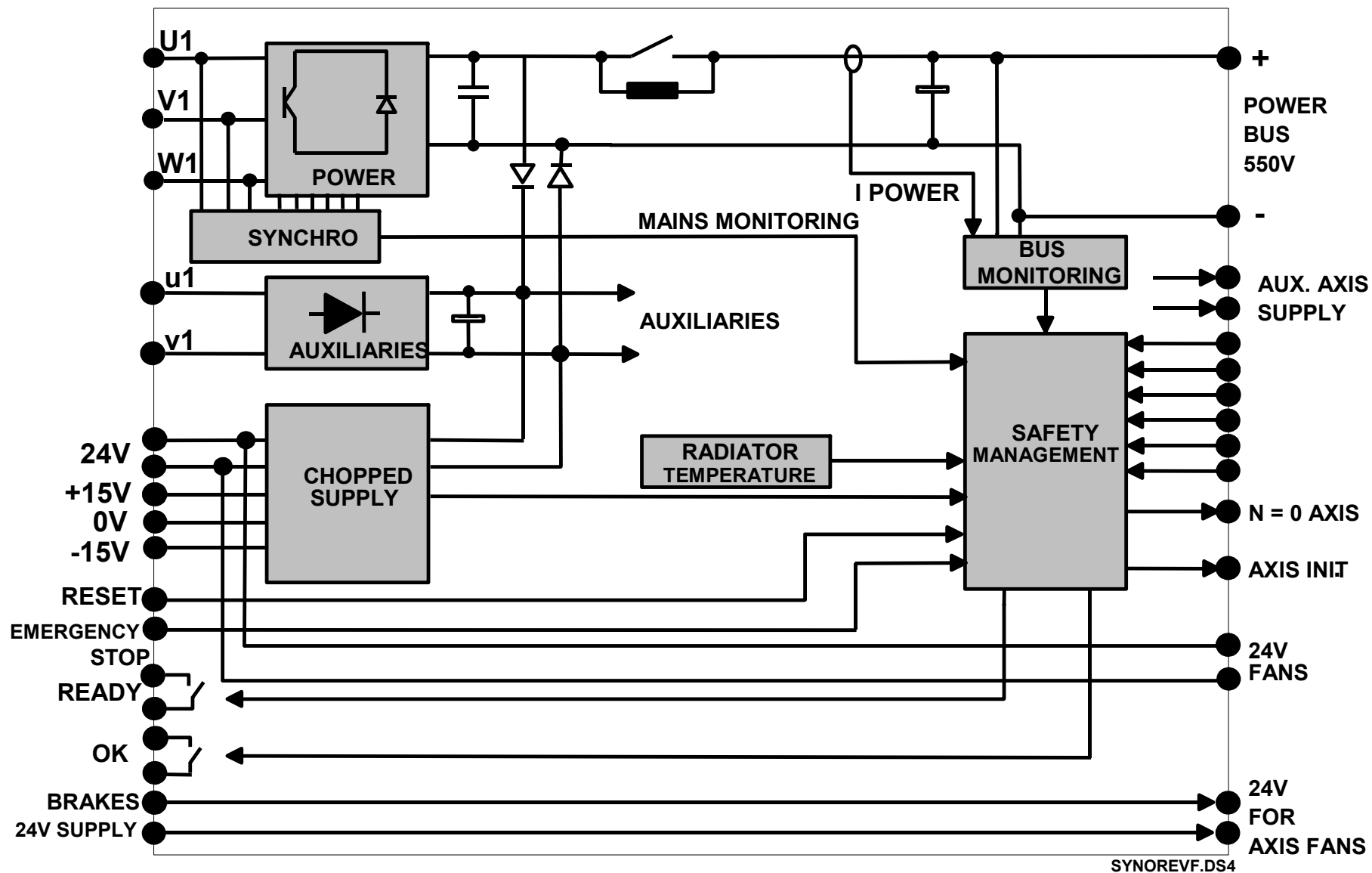
1.3 Presentations / Block diagram

The power supply is placed in the left-hand part of the rack:

- It receives the 400V(460) three-phase mains supply (terminal block B2) and provides the dc voltage power output (550 V internal bus) to the DIGIVEX servoamplifiers.
- It receives the 400V(460) single-phase auxiliary mains supply (terminal block B1) and provides a dc voltage of 550V. Each DIGIVEX DRIVE generates its own voltages from this "low-level bus" $\pm 15V$, 5V, 24V.
- It may receive a 24V source (terminal block X1) for the servomotor brakes and distributes it to the axes via the internal bus.
- It provides the 24V and $\pm 15V$ "customer" auxiliary supplies (terminal block X3).
- It ensures the logic interface with the main contactor control (terminal block X2).
- It ensures the interface with the emergency stop control and external reset (terminal block X3).

A series of LEDs can be used to check the power supply and drive status

15 kW Reversing Power Supply for Digivex Servo-Amplifiers

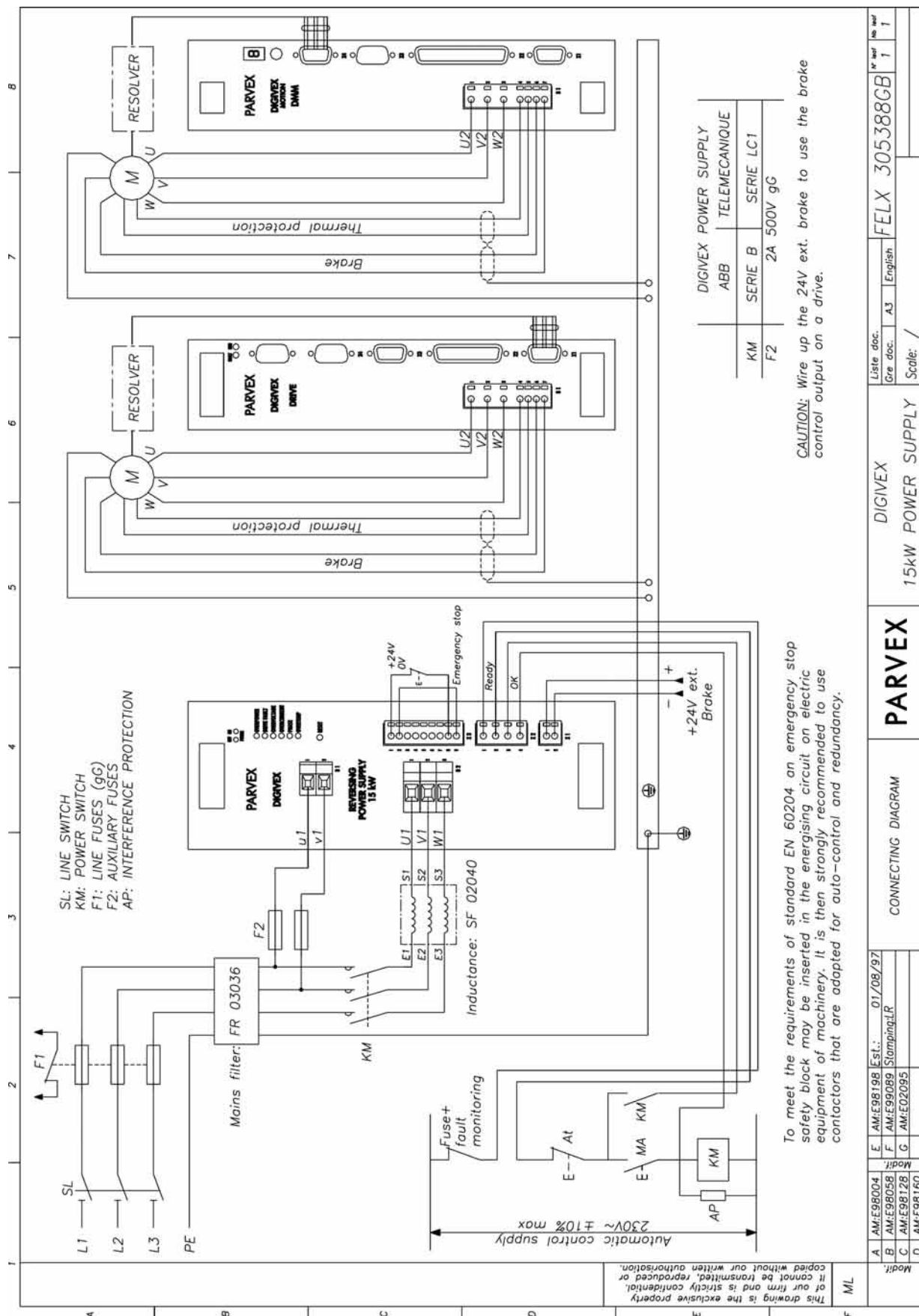


1.4 Return of braking energy to mains supply

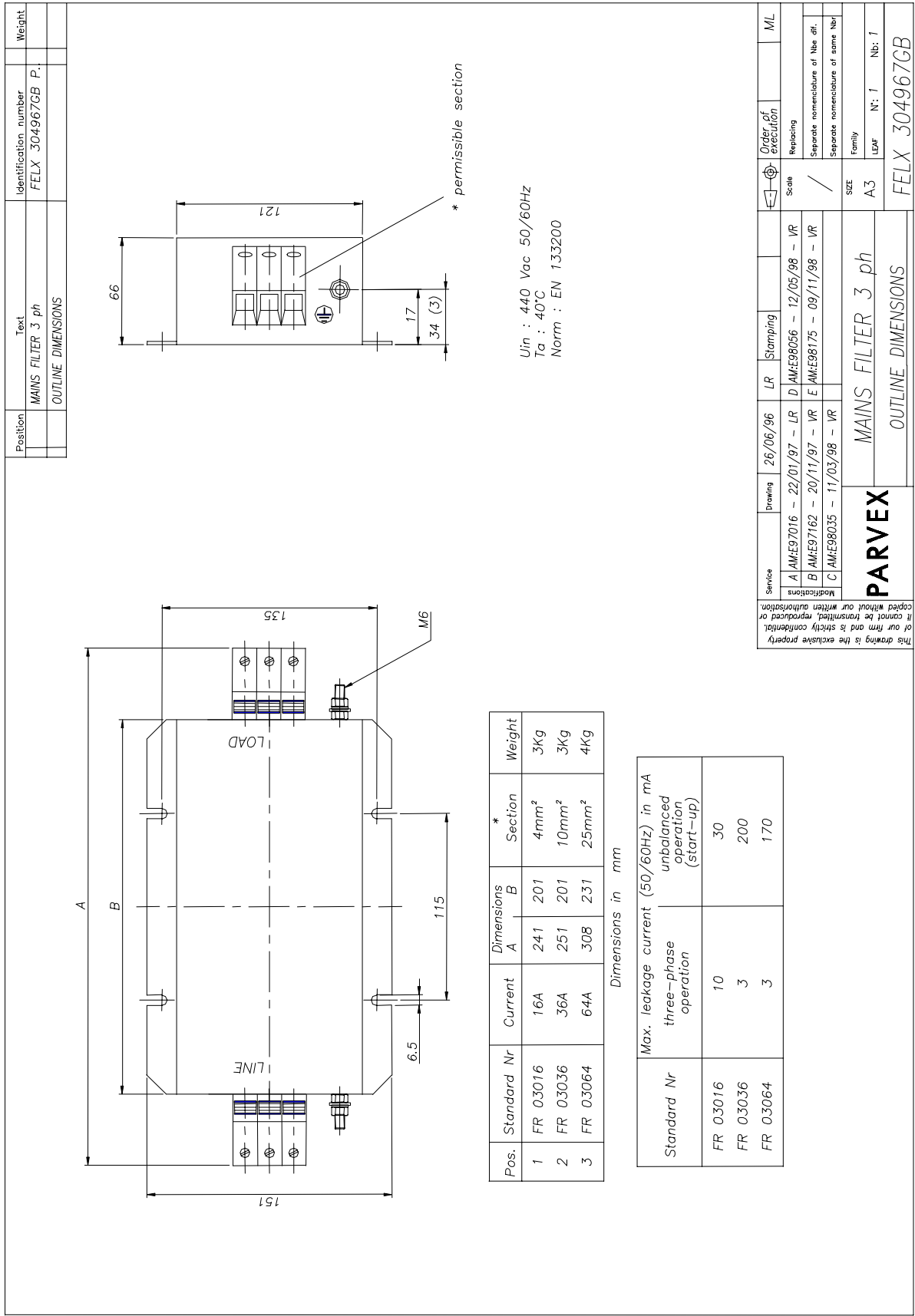
The bi-directional bridge of the REVERSING POWER SUPPLY is used to return the energy generated during braking to the mains supply. This feature enables operation under permanent braking regime at 15 kW and 20 kW for 2 seconds under the pulse regime.

The mean power required of the supply, both in motor regime and braking regime, must not exceed 15 kW.

It is mandatory to fit an inductor (product number SF02040) between the DIGIVEX REVERSING POWER SUPPLY and the mains (see connection drawing FELX 305388). This inductor does not dispense with the use of a mains filter. The mains supply must have available power of at least 20 kVA. The mains voltage must not vary by more than 5% when the power absorbed or restored by the DIGIVEX REVERSING POWER SUPPLY varies from 0 to 20 kW.

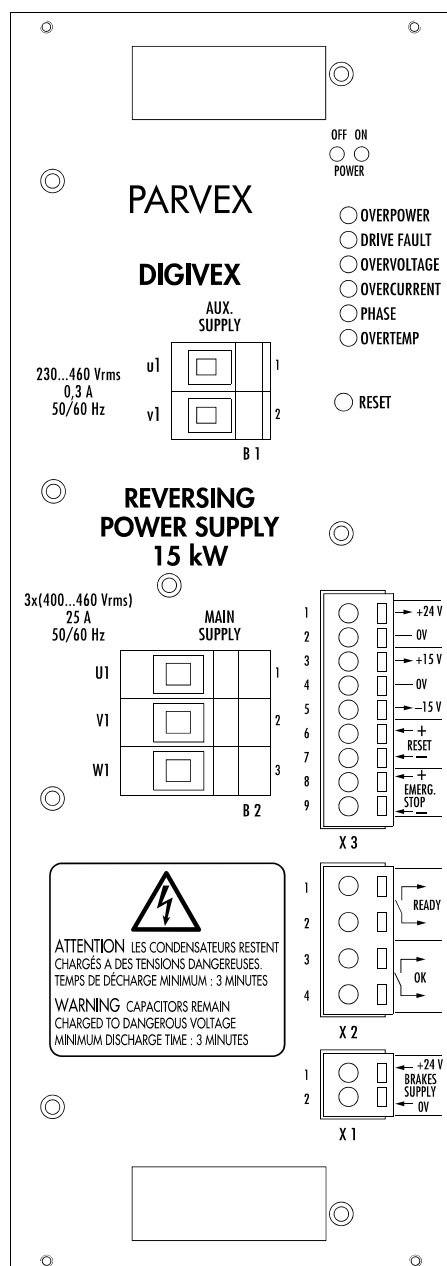


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2. DIGIVEX REVERSING POWER SUPPLY CONNECTION

2.1 Front-panel terminal blocks



All the connections are brought to the front panel:

- B1 : "Auxiliary" power supply (low-level)
- B2 : Mains input
- X1 : 24V power supply for brake
- X2 : Main contactor automatic control interface
- X3 : 24V, $\pm 15V$ outputs, reset and zero speed

General characteristics of terminal blocks

Summary table, showing for terminal blocks B1, B2, X1, X2 and X3:

- the type of terminal block.
- the maximum cross-section (S) accommodated by the terminal block.
- the recommended clamping torque (C) for the terminal block.

TERMINAL BLOCK 15 kW REVERSING POWER SUPPLY BLOCK	
B1	screw-type, S = 4 mm ² flexible wire, S = 6 mm ² rigid wire C = 0.8 Nm
B2	screw-type, S = 6 mm ² flexible wire, S = 10 mm ² rigid wire, C = 1.8 Nm
X1 - X3	spring-type, S = 2.5mm ²

2.2 Power component size requirements

Applicable to the components ahead of the DIGIVEX POWER SUPPLY (fuses, cables, contactors, etc.), these dimensions are dependent on:

- Permanent currents (sine-wave peak) at low speed for each motor, as given in the characteristics (\hat{I}_0).
- The axis simultanetly coefficient.

If this coefficient is assumed to be 1, and $\cos\varphi = 1$, we can write:

$$P_{\text{electric at mains}} \cong 1.1 \text{ Urms. } \sum \hat{I}_0$$

$$I_{\text{rms mains}} = \frac{P}{\text{Urms.} \cdot \sqrt{3}}$$

MAINS INPUT POWER 400 V kW	$\Sigma \hat{I}_0$ A	LINE CURRENT for mains Urms = 400 V A eff.	FUSE RATING Type gG	MAINS FILTER
15	40	25	32	FR 03036

Cable cross-section and contactor ratings must be chosen in consequence.
See instruction PVD 3464.

The equipment complies with European Standard EN55011 with a filter on the power input. The approved filter reference number is FR03036.

2.3 Mains supply connection

Three-phase 400V rms power supply (460V + 10% max.) via terminal block B2 "MAINS SUPPLY":
terminals U1 - V1 - W1

The mains supply voltage at 50/60 Hz must be greater than 200 V rms and less than 510V rms for use with 480V + 10%, a transformer or autotransformer is required (power greater than 20 kVA).

Current : **25A rms.**

Derating with temperature :

- Derating of 2% per degree centigrade above 40°C.
- Maximum ambient temperature 60°C.

A thermal detector causes the "OK" relay to open when the dissipater reaches 85°C.

Derating with altitude: derating of 1% per 100 m above 1000 m.

Terminal block B2 "MAINS SUPPLY": Marked U1 - V1 - W1.

Mains monitoring :

- maximum mains voltage (520V rms).

Power bus monitoring :

- Maximum bus voltage (750 V).
- Minimum bus voltage (200 V).

Dissipated power: 70 W.

2.4 "Low-level" auxiliary supply connection

Terminal Block B1.

Each DIGIVEX DRIVE takes its "low-level" power supply from a "low-level bus" and produces the $\pm 15V / 5V$ levels it requires via a chopped supply and transformer.

This "low-level power supply" bus, with voltage between 290V and 750V, is obtained through terminal block B1 from a single-phase source, which may be:

- either 200 - 520V single-phase taken between two phases ahead of the main contactor.
- or a separate 200 - 520V supply. In this case, it is mandatory to provide an isolating transformer (160VA, e.g. primary 200 - 520V single-phase $\pm 10\%$, secondary 230V $\pm 10\%$).

The advantage of these solutions is to be able to cut out separately the power part, and to keep the LED fault display and the encoder emulation counting capability.

Internal fuse:

The fuse is marked F1 and protects the chopped supply: Type 500V / 1.6A.

Auxiliary supply monitoring, power supply present.

- The auxiliary power supply also provides 24V dc for the rack fans, the rack is therefore cooled whenever the low-level supply is present

Low-level consumption: 30 W

2.5 Control signal connection (X2 and X3 terminal blocks)

Unpluggable terminal blocks

TERMINAL BLOCK X2		
1 - 2	Output	"READY" contact
3 - 4	Output	"OK" contact
Potential free contacts U max = 250V Cut-out power = 250VA 1A (Ohmic charge)		

- X2/1.2 : "READY" contact

This contact is closed if:

- the "AUX" bus (low-level) is correct, > 290V dc when started up
- at least one axis is present in the rack
- the drives have not indicated fault conditions when their "low-level" power supplies came on

This contact enables the main contactor to close

- the red "POWER OFF" LED is on

ATTENTION: The KM power contactor can only be closed if the auxiliary supply is present and if the "READY" contact is closed.

- X2/3.4 : "OK" contact

This contact is closed if:

- the "AUX" power supply is correct
- the power supply is present (> 200V dc)
- the drives, low-levels and power, do not indicate any fault conditions

This contact enables the main contactor to self-hold

- the green "POWER ON" LED is on

ATTENTION : Opening the OK contactor must cause the main contactor to open with a maximum 100 ms delay.

The "OK" relays open in the following cases:

- Max. mains supply (more than 520V rms with 0.1s time delay).
- No phase.
- OVERPOWER fault.
- Maximum bus voltage with 0.3 s time delay.
- Minimum bus voltage.
- Fault on one axis, in absence of return of energy to mains.
- Auxiliary power supply fault.
- Overcurrent (0.1 s) time delay or no inductor.

TERMINAL BLOCK X3		
1	Output	24V regulated
2	Output	0V of 24V
3	Output	15V regulated
4	Output	0V of +/- 15V
5	Output	- 15V regulated
6	Input	+ Reset
7	Input	- Reset
8	Input	+ Emergency Stop
9	Input	- Emergency Stop

- X3/1 **24V regulated**

- X3/2 **0V of 24V**

- 24V -50 mA power supply. **Do not use to supply motor brakes.**
- Protection against overloads and short-circuits by resettable fuse.

This power supply is for logic inputs but is also used internally to supply the fans. There is no common point with the metal frame.

- X3/3 **+15V regulated**

- X3/4 **0V of 15V**

- X3/5 **-15V regulated**

- $\pm 15V$ - max. 10mA
- Protection by electronic circuit breaking

This power supply is in common with the DIGIVEX REVERSING POWER SUPPLY internal power supply

- X3/6 - X3/9 Logic inputs

Common characteristics of these different inputs:

- 24V dc opto-coupled inputs (isolation voltage 1 kV)
- type 2 inputs after IEC 1131-2

These inputs may be connected directly to PNP type outputs (external load resistance not required).

	MIN	TYPICAL	MAX
input voltage - level 0	-	0V	5V
input voltage - level 1	11V	24V	30V
Input current - level 0	-	0mA	2mA
Input current - level 1	7mA	13mA	15mA
Response time T "on" (0 to 1)	-	1ms	-
Response time T "on" (1 to 0)	-	1ms	-

- X3/6 et X3/7 **Reset**

A 24V rising edge applied to X3/6 relative to X3/7 causes a reset (clear) after the power supply or drive fault.

Notice that the system can also be reset with the "reset" button on the front panel, or by de-energizing the system completely (power and auxiliaries).

This control has no effect in normal operation.

- X3/8 et X3/9 **Emergency Stop, in speed loop mode only**

A 24V voltage must be applied across terminals X3/8 (+) and X3/9 (-) to enable drive operation. The 24V may be taken from X3 terminals 1 and 2.

The disappearance of the 24V on X3/8 - X3/9 acts on all drives, to provide dynamic braking. This is a help for category 1 or 2 stops under standard EN 60204 Chapter 8.2.2.

2.6 X1 terminal block "Brake Supply" connection

Unpluggable terminal block

This terminal block may receive a 24V power supply for motor brakes. It is redistributed by the drives to the motor power terminals. 24V $\pm 10\%$ rectified / filtered. Protection against overvoltage by 26 Joule varistor.

This protection is active from 30V onward.

3. LEDS AND OPERATING DIAGNOSTICS

The following LEDs are arranged on the front panel:

LED	COLOUR	FUNCTION
POWER ON	Green	Power and auxiliary supplies present, with no power supply or drive faults
POWER OFF	Red (steady) Red (flashing)	Power not present or power supply fault Bus short-circuited or pre-load resistor cut
OVERPOWER	Red	Power supplied or returned too high
DRIVE FAULT	Red (steady) Red (flashing)	Drive fault No axis detected in rack
OVERVOLT.	Red (steady) Red (flashing)	Excessive bus voltage (>750V) Excessive mains voltage (Urms >520V)
PHASE	Red (steady)	Mains phase absent
OVER TEMP.	Red	Dissipater temperature >85°C
OVERCURRENT	Red (steady) Red (flashing)	Excessive bus current (> 50A) No inductor on mains

4. INITIALIZATION AND STOP SEQUENCES

For powering up, the auxiliary power supply must be present and the "READY" contact must be closed.

From energizing power, the process is as follows:

To	⇐ Mains supply present
To + 30 ms	⇒ OK relay closes
To + 300 ms	⇒ Capacitor pre-charge internal contactor closes. Mains bridge unlocks
To + 400 ms	⇒ Led « POWER ON » allumée Le fonctionnement de la commande des moteurs est autorisé.

The INIT signal (initialization) allows the drive to be unlocked.

Stoppage by mains failure:

To + 3 ms	⇒ La disposition de l'alimentation de puissance est détectée
To + 100 ms	⇒ Ouverture du contacteur de précharge et du relais OK.
To + 2 s (max)	⇒ Voyant « ON » éteint. Interdiction de fonctionnement de la commande des moteurs. La sortie « Variateur OK » du connecteur X2 des variateurs passe à l'état 0 Le délai de 2 secondes est une valeur maximale. La consommation d'énergie des variateurs modifie ce délai.

For the associated drives:

- For axis controls, the drive is set to zero torque.
- For spindle controls, the motor is short-circuited between phases.

By closing the OK relay allows the main contactor to hold. It opens in the cases listed in §2.5, in the section on the OK contact.

Arrêt suite à une anomalie dans la commande d'un moteur

To	⇒ Détection de l'anomalie
To + 10 ms	⇒ Le variateur ayant détecté l'anomalie, fait passer sa sortie « DRIVE OK » à 0 et allume la led « FAULT ». Le moteur n'est plus commandé.
To + 10 ms + Tf	⇒ Dans le cas d'un moteur de broche, l'anomalie est propagée à l'alimentation lorsque la vitesse moteur est inférieure à 50 tr/min au bout d'un temps Tf (temps de ralentissement/freinage). Dans le cas d'un moteur d'axe, l'anomalie est propagée immédiatement à l'alimentation.
To + Tf + 30 ms	⇒ La led « POWER ON » s'éteint. Les contacts « OK » et « READY » du bornier X2 s'ouvrent. Les moteurs ne sont plus commandés. Les variateurs du rack font passer leur sortie « VARIATEUR OK » à l'état 0.

Arrêt suite à une anomalie de fonctionnement de l'alimentation de puissance

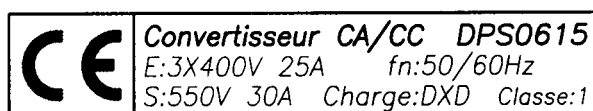
To	⇒ Détection de l'anomalie
To + 3 ms	⇒ Verrouillage du pont réseau.
To + 100 ms	⇒ Ouverture des contacts « OK » et « READY » du bornier X3 de l'alimentation. La led correspondant à l'anomalie s'allume sur l'alimentation. L'automatisme extérieur doit ouvrir le contacteur de puissance KM, au plus tard 100 ms après l'ouverture de « OK ». Les variateurs du rack font passer leur sortie « VARIATEUR OK » à 0. La led « POWER ON » s'éteint. Les moteurs ne sont plus commandés.

Nota : Après une anomalie de fonctionnement, un reset doit être fait sur l'alimentation pour pouvoir repartir. Si l'anomalie a disparu, le contact « READY » se ferme, la puissance peut être remise.

5. LABELLING - CODING

Two labels are affixed to the rear connectors of the DIGIVEX POWER SUPPLY module:

- ⇒ The first gives the serial number and date of manufacture
- ⇒ The second complies with the model below



Meaning of the label indications:

- CA/CC..... Alternating current converter/alternating current
- DPS---..... DIGIVEX REVERSING POWER SUPPLY code
- E : 3x400V --A..... Input voltage and current
- fn : 50/60Hz..... Authorized frequency range
- S : 550V --A..... Output voltage and current
- Load : DXD..... Type of load to be associated (DIGIVEX DRIVE axis module)
- Class : 1..... Service class under standard EN60146, 1 = permanent

Coding : DPS0615 : DIGIVEX REVERSING POWER SUPPLY 15 kW