User Manual Interruption Generator PFS32

PFS32 stand alone with TRA2000

SRC32 includes, the DIPS source and the rack, with space in the top section, for the PFS32 and TRA2000

Title:	EMC Test System Interruption Generator PFS32
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EMC TESTER

Interruption Generator PFS32

ATTENTION

This user manual provides information necessary for operation of the test equipment.

Throughout the users manual, standard references are used as an aid to understanding only.

The relevant standard(s) **must** be obtained and used in conjunction with this users manual

Declaration of Conformity

See sheets attached at the end of this user manual:

- **Declaration of conformity to product standards**
- **Declaration of conformity to low voltage directive**
- **Declaration of conformity to EMC directive**

Contents:

1 Description

1.1.1 System Introduction

The new IEC61000-4-11 Ed2, clearly defines the **three phase** application of DIPS and Interrupts on AC Power lines up to 16A per phase. In addition to clarifying the three phase application, this new standard contains a supplementary requirement for an **80%** DIP level.

PFS32 Interruption generator is designed for this new application.

PFS32 is a 4 unit high module that connects to the TRA2000 and extends that units interrupt capability up to 32A for three phase applications. The PFS32 can operated as stand alone equipment together with the TRA2000 or inserted into the SCR32 rack.

PFS 32 & SRC 32 are accessories to the TRA2000 Immunity Test system.

SRC 32 is mounted in an 18 unit high rack, with space in the top section, for the PFS32 and TRA2000 to be fitted. SRC32 adds 32A DIPS source capability to the TRA2000 and PFS32.

TRA2000 system is a compact test solution and represents excellent value for money.
The PFS32 and SRC32, are further examples of EMC PARTNER **innovative solutions**, designed to meet customer requirements.

1.1.2 Voltage interruptions, Dips

DIPS means a sudden reduction of the voltage at a point in electrical system, followed by voltage recovery after a short period of time from a few cycles to a few seconds.

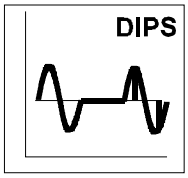


Figure: 1.0.4

Voltage failures occur following switching operations, short-circuits, fuses blowing and when running up heavy loads. These are man-made faults, produced unintentionally, and include operation of domestic appliances, electronically controlled machine tools, switching operations in the public lighting system, economy lamps, etc.

The quality of the electrical power supply is increasingly becoming a central topic of discussion. The interference sources in the mains, caused by electronic power control using non-linear components such as thyristors which are increasingly used in domestic appliances, such as hotplates, heating units, washing machines, television sets, economy lamps, PCs and industrial systems with speed-controlled drives. Simultaneously an increase in electronic systems sensitive to interference is apparent in all sectors of electrical power system.

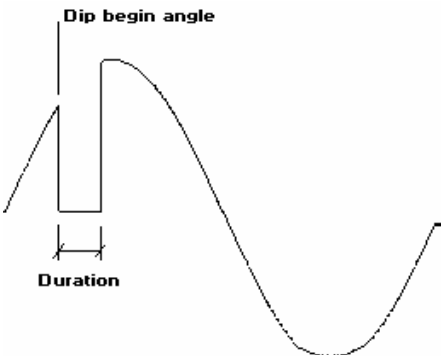
In order to achieve electromagnetic compatibility, both the interaction of the electrical equipment connected to the supply and its noise immunity must be determined.

The electromagnetic compatibility of electronic equipment must be guaranteed e. g. Europe Union 31. December 1995.

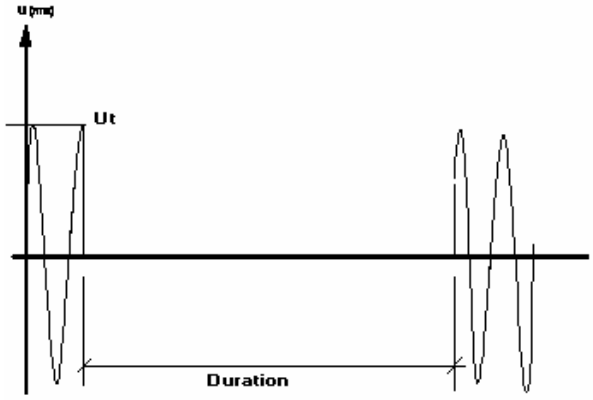
1.1.3 Definition of interrupts and dips

Only one phase is shown. The voltage outputs are defined as follows :

INTERRUPTS

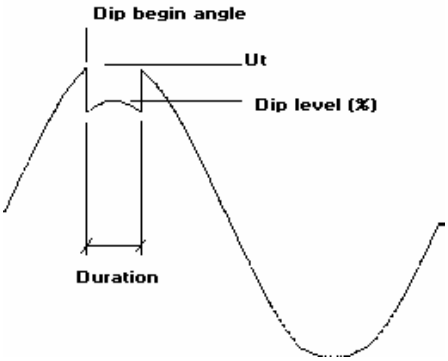


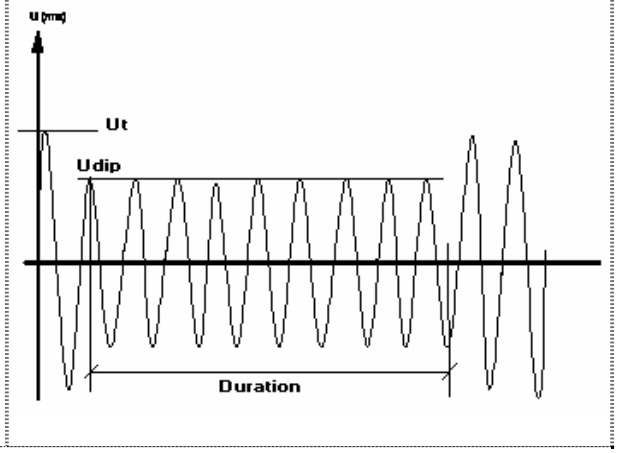
Short Period



Multiple Period

DIPS



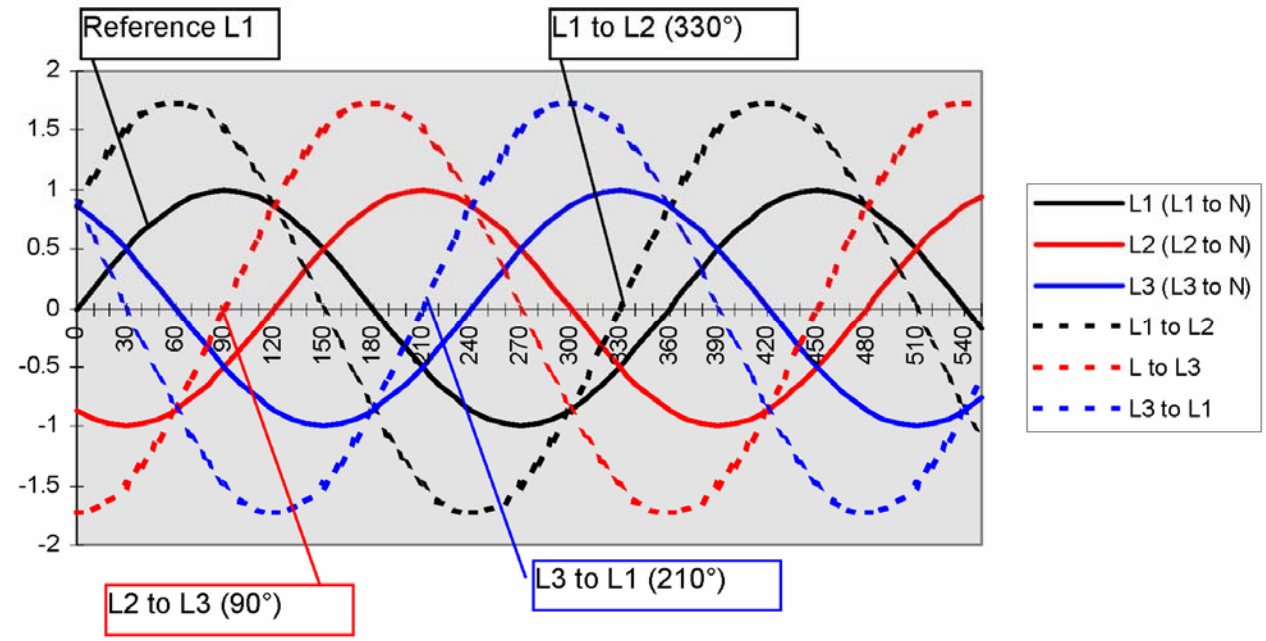


DIPS can only be generated together with the SRC32.

1.1.4 Synchronisation of interruptions and dips

The sequence of the connected phases L1, L2, L3 must be correct. When the sequence is not correct the synchronisation of the interruptions / dips will not be correct. The sequence must be either measured with an three channel oscilloscope or with a phase sequence indicator.

The synchronisation takes place with the L1 phase, with the event then occurring time coincident on the other two phases. This illustrated for both star(Y) and delta (Δ) connections in the following diagram.



For all dips and interruption the zero crossing of L1 is the reference. The software calculate the phase shifting for L2, L3. The operator can select always the phase angle between 0 to 360° for each phase.

Star connections have three phases with defined neutral point which is the reference point for test events. Testing can therefore be performed on each phase individually (L1 to N, L2 to N, L3 to N) and on all three phases simultaneously.

Delta connections on the other hand do not have a fixed neutral point, this means that the reference for any events becomes the phases themselves, dips/ interrupts are once again reference to L1. Automatically the software adds the angle differences for the phase to phase voltage e.g. L1 to L2 (330°), L2 to L3 (90°) and L3 to L1 (210°).

1.1.5 Compliance with Standard

PFS32 & SRC32 meet the following basic standards. PFS32 together with the TRA2000 fulfils only the interruption part of the standards.

IEC 61000-4-11, EN 61000-4-11, 2001 Electromagnetic compatibility (EMC) - Part 4 Testing and measuring techniques - Section 11: Voltage dips, short interruptions and voltage variations immunity tests.

IEC 61000-4-11 Ed2, 2004 Electromagnetic compatibility (EMC) - Part 11 Testing and measuring techniques - Section 11: Voltage dips, short interruptions and voltage variations immunity tests.

IEC 61000-4-29, EN 61000-4-29, 2000 Electromagnetic compatibility (EMC) - Part 4 Testing and measuring techniques - Section 29: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests (PFS32 and SRC32 complying only with the section interruption and partly with dips)

IEC 61000-4-34 Ed.1 (2005 FDIS), Electromagnetic compatibility (EMC) - Part 4 Testing and measuring techniques - Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current more than 16A per phase.

1.2 Technical data of the Interruption Generator PFS32

1.2.1 AC Interrupts

Wave-shape with 100 Ω load:		
Standard	IEC 61000-4-11, IEC61000-4-11 Ed2, IEC 61000-4-34 (FDIS)	
Rise & Fall time	1 - 5 µs	10/90% x 1.25
Interrupt Current	32A	
Vmax (phase - phase)	Min. 200V up to Max.480Vac @ 50 / 60Hz	
Vmax (phase - neutral)	Min 100V up to Max 480Vac @ 50 / 60Hz	
Interruption time	50 µs to 30s	
Interrupt phase synchronisation	0 to 360°	± 5°
Inrush current	500A peak 1)	

1) The public power supply must be capable to deliver the 500A

1.2.2 DC Interrupts

PFS32 with TRA2000		
Standard	IEC 61000-4-29 (interruption part only)	
Rise & Fall time	1 - 50 µs	10/90% x 1.25
Interrupt Current	32A	
Umax	500Vdc	
Interruption time	1ms to 29999ms	

1.2.3 EUT Supply

PFS32 with TRA2000		
Vmax (phase - phase)	Min. 200V up to Max.480Vac @ 50 / 60Hz	
Vmax (phase - neutral)	Min 100V up to Max 280Vac @ 50 / 60Hz	
Frequency range	DC - 400Hz	
AC Synchronisation	Star connection - each phase or all phases Delta connection - phase to phase	
Nominal current	32A	
Over-current protection	50A constant current 220A short duration <2s	

1.2.4 PFS32 with SRC32:

PFS32 with SRC32:	DIPS only possible with PFS32 and TRA	
Standard	IEC 61000-4-11, IEC61000-4-11 Ed2, IEC61000-4-34 (FDIS2005)	
DIPS Source voltages	40%, 70%, 80%	
Rise & Fall time	1 - 5 µs	10/90% x 1.25
Dip Current 80%	40A	
Dip Current 70%	46A	
Dip Current 40%	80A	max. 3s
Vmax (phase - phase)	Min. 200V up to Max.480Vac @ 50 / 60Hz	
Vmax (phase - neutral)	Min 100V up to Max 280Vac @ 50 / 60Hz	
Dip time	50 µs to 30s	
Dip phase synchronisation	0 to 360°	± 5°
Inrush current	>500A peak	
Nominal current	32A	
Over-current protection	50A constant current 220A short duration <2s	

1.3 TRANSIENT controller

A TRA2000 with the dips circuit is necessary to control the SCR32 with the PFS32. The TRA2000 can be in the rack of SCR32 standard configuration or stand alone.

Standard configuration

Configuration PFS32 and TRA2000

1.4 Mechanical dimensions

Unit type	Dimensions [mm]	Weight [kg]	Versions
	width x depth x height		
PFS 32	450 x 500 x 190	27	19" Module 4 UH
SRC 32	450 x 500 x 855	307	19" Rack 18 UH

1.5 Power Consumption

The power line input is located on the rear side of the Interruption Generator PFS32.

Voltage between phase and neutral	230/ 115 V (50/60 Hz)	± 10 %
Power consumption	Operation mode < 100 VA Standby < 10 VA	(230 V, 50 Hz) (115 V, 60 Hz)

Following power cords can be ordered:
Europe (CEE-7/VII) UK (BS-1363) Switzerland (SEV Type 12) USA (NEMA5-15P)

1.6 Accessories, dimensions

1.6.1 Inlcuded articles, dimensions

PFS32 (Article No. 103670)

Mechanical Dimensions

Unit Height:	4
Length:	57 cm
Width:	45 cm
Height:	19 cm
Net Weight:	27 kg

Included Articles

According to STL-Variante 20, STL-Version 1

Qty	*PN*	*Description*
1	104801	Brochure TRANSIENT 3000
1	104802	Standard calibration report
1	103194	CD-UM-IN-ALL includes all User Manuals and Instruction sheets of all EMC PARTNER AG sales products.
1	104816	Power Cord 3 pole (10/13/16A)
1	103081	EUT Power Connection 1ph, 1 set of 3 cables (2m) with banana plugs, black, blue and yellow/green

1.6.2 Standard accessories

Accessories to PFS32 (Article No. 103670)
According to OP-Variante 1, OP-Version 1

Qty	PN	Description	Weight (kg)	Length (cm)	Width (cm)	Height (cm)
3	100284	Con. MC 4mm length 19mm	0	3.8	2.8	0.8
1	102524	Spare fuse T4A	0	2	0.5	0
1	103085	MC safety cable with protected banana plug, black	0	100	0	0
1	103095	MC safety cable with protected banana plug, blue	0	100	0	0
1	103096	MC safety cable with protected banana plug, yellow/green	0	100	0	0
1	103102	MC safety cable with protected banana plug, white	0	200	0	0
1	103103	MC safety cable with protected banana plug, brown	0	200	0	0
1	103149	Connection cable 9/9 pole m/f 150cm	0	150	0	0

The standard accessories includes all necessary connections for the stand alone set-up or the insertion into the SCR32 rack.
The ZUB113, ZUB034, ZUB035, ZUB038, ZUB097 and power cords are only used with stand alone configuration.

2 Safety

The Interruption Generator PFS32 belongs to Safety class 1

2.1 Safety standard

The Interruption Generator PFS32 fulfils the requirements of the safety standards IEC 1010 for laboratory measurements equipment „Safety requirements for electrical measuring, control and laboratory equipment“. Based on EN 61010 (IEC1010) the declaration of conformity to low voltage directive (LVD 73/23/EEC O.J.N° L77, 1973-03-26) is given.

This manual is an integral part of the Interruption Generator PFS32 tester. The instructions contained in the manual regarding operation and the test set up are to be strictly observed.

2.2 Climatic Conditions

The Interruption Generator PFS32 contains high voltage circuits in integrated form. EMC PARTNER only guarantees a correct functioning of the tester Interruption Generator PFS32 and the associated accessories, if the Interruption Generator PFS32 is operated in the climatic condition specified.

Temperature	15 °C to 35 °C	
Relative humidity	45 % to 75 %	
Atmospheric pressure	86 kPa to 106 kPa	(860 to 1060 mbar)
Not influenced by:	direct solar radiation, rain or condense water, dust or larger electro magnetic fields as specified in the EMC compatibility chapter.	

The Interruption Generator PFS32 should be operated in a dry, clean room. If for any reason water condenses in the Interruption Generator PFS32, then no TRANSIEENT-2000 operation should be started before the tester is dry.

It is strictly forbidden to operate the Interruption Generator PFS32 in rooms with of gas explosion risk. The high voltage of the Interruption Generator PFS32 can generate sparks, which can ignite the gas.

People with heart pacemakers should not be in the vicinity of the test set up during operation.

2.3 Precautionary measure during use

The Interruption Generator PFS32 generate high current with associated high magnetic fields. It is wise to observe the following rules:

• Never touch the EUT when a test is in operation.
• Touch no connectors of connection cable when a EMC test is in operation.
• The power on the EUT must turned off before a manipulation on the EUT is carried out.
• For all services, e.g. check of the fuses, the power cord must first be unplugged.

The Interruption Generator PFS32 must be connected to power line with a safety ground..

2.4 Electromagnetic Compatibility

The outputs of the Interruption Generator PFS32 and the links between Interruption Generator PFS32 and the EUT can emit disturbances. Please consider the national PTT rules.

The Test System Interruption Generator PFS32 should not be operated near sensitive measuring and control systems.
The Interruption Generator PFS32 fulfils the following immunity requirements:

• Electrostatic discharge	Level 4 (8 kV)	(IEC 61000-4-2)
• Burst EFT	Level 4 (4 kV)	(IEC 61000-4-4)
• SURGE	Level 3 (2 kV)	(IEC 61000-4-5)

2.5 The manual is an integral part of the equipment. Refer to the manual.

This manual is an integral part of the Interruption Generator PFS32 System. The safety rules and precautions in the manual must be observed. EMC PARTNER and their representatives are not responsible for damage to persons and equipment by not observance the safety rules and precautions in the manual.

3 Mechanical structure

3.1 General

PFS 32 is an accessory to the TRA2000 Immunity Test System to simulate effects of power line interruptions caused by short circuit or open circuit conditions. This is an expansion of the TRA2000 Single phase capability to enable testing on **Three Phase** power lines.

PFS 32 extends the system to provide **Three Phase** testing of AC and DC Interrupts up to 480V and 32A.

Coupling Path switching and the selection of DIP levels is automatically performed from the TRA2000 control system.

BNC monitors on the PFS32 enable the voltage and current wave-shapes to be verified with an oscilloscope on all three phases.

- EUT connections are on the PFS32 front panel. An EUT is connected via 4mm safety banana plugs and cables. The maximum EUT current is $32A_{RMS}$ per phase. Inrush current is >500A per phase.

Front panels (stand alone)

Rear Panels (stand alone)

TRA2000 Version DIPS

PFS32

SRC32 includes, the DIPS source and the rack, with space in the top section, for the PFS32 and TRA2000

PFS32 inserted into SCR32

4 Control Panel

4.1 Front panel of the Interruption Generator PFS32

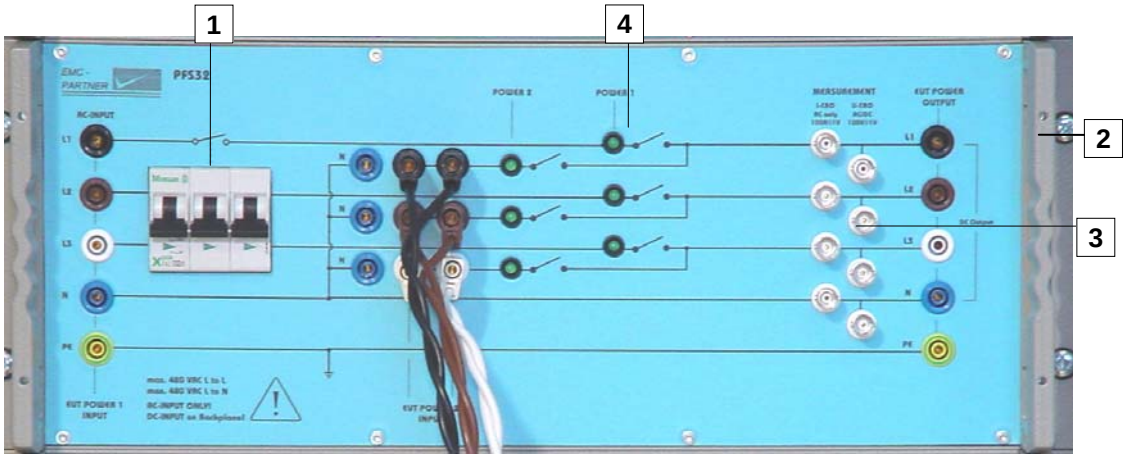


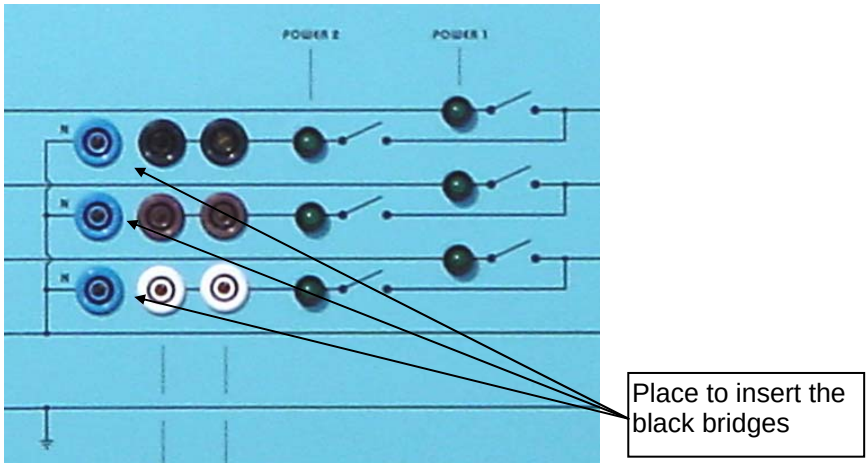
fig.4.1

The most important elements of the front panel are:

1. Over current trip out switch
2. Handles or angle bracket for the 19“ rack
3. v,i measurement BNC outputs
4. DIPS levels 0%, 40%, 70% and 80%
5. LED indicates the electronic switch status

4.1.1 Control part

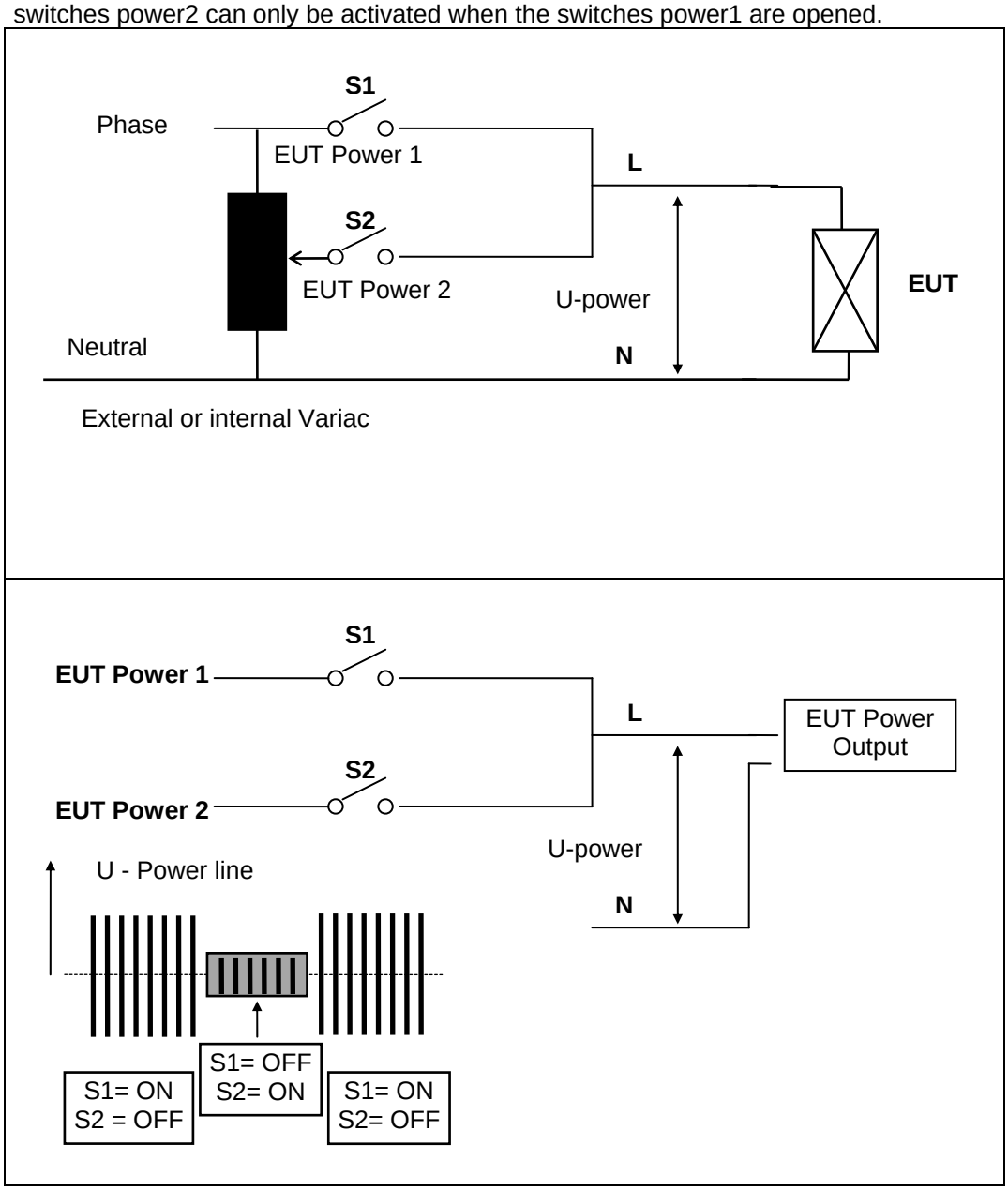
The control of the Interruption Generator PFS32 is carried out by the TRA2000 microprocessor. For more information study the TRA2000 manual. The operator communicates with the Interruption Generator PFS32 via the numeric input terminal, the display and the soft keys of the TRA2000.



The different LED signalise in which phase the switching is activated. The Power 2 switch is used to connect the (SRC32) for dips simulation. When the three black bridges are inserted between phase to neutral, the power switch 2 can be used to simulate the High-Z mode.

4.2 EUT power with High-Z Mode

In the operation mode (DIPS voltage interruption), the switches „Power 1“ turns on/off the three phases of the EUT Power. Power 2 turns on the power from SRC32 or discharges the EUT with High-Z mode „OFF“ The internal variac can be replaced by an external or with the three black brides connected to neutral. The switches power2 can only be activated when the switches power1 are opened.



At DIPS to 0 % of the power line voltage, two operating conditions can be differentiated:
A) Switch S1 is opened, the voltage of the power decreases at the EUT with the discharge constant of the EUT (High Z at 0% = ON)
B) Some µs after switch S1 has opened, switch S2 will be closed and the EUT will be discharged via the circuit EUT Power 2 (High Z at 0% = OFF).

AT High - Z Mode = OFF and large capacitive loads, the large capacitance will be discharged via the internal variac at the beginning of the interruption. A large current will result, if an interruption to 0% of the power line voltage is generated. To avoid reducing the life span of the carbon contact electrode of the variac, it is recommended to make a short circuit with an external bridge between L2 and N of EUT Power 2.

5 Preparation for Operation

5.1 Attention, Refer to Manual

This manual is an integral part of the Interruption Generator PFS32. The safety rules and precautions in the manual must be observed. EMC PARTNER and their representatives accept no responsibility not responsible for damages to persons and equipment as a results of non-observation of the safety rules and precautions in this manual.

Before connecting the Interruption Generator PFS32 to a public power line, Chapter 3 „Safety must be carefully studied.

5.2 Operators and Service Personnel

Only trained personnel should carry out EMC tests. For small groups of maximum 10 persons EMC PARTNER AG offers the following in-house seminars in English or German at the customer's location:

1. EMV Introduction
2. EMV Standardisation
3. EMC „ESD" immunity test
4. EMC „EFT" immunity test
5. EMC „SURGE" immunity test
6. EMC „DIPS" immunity test
7. EMC „HARMONICS" immunity test
8. EMC „MAGNETIC FIELD" immunity test
9. EMC „CW CURRENT INJECTION" immunity test
10. EMC „CE-MARK" transient immunity tests
11. „NEMP" immunity test
12. „AC, DC, IMPULSE" insulation test

5.3 Checks before operation

5.3.1 Optical verification of the Interruption Generator PFS32

Before you unpack the Interruption Generator PFS32, please check whether the packing is deformed or damaged. When the DIPS SRC32 is unpacked, also check whether the tester is damaged. If you detect a damage, please inform EMC PARTNER and the shipping organisation immediately.

5.3.2 Power source check

On the rear panel, you will find a type plate. Please check whether the tester has been prepared for the correct power line voltage of your public power. If the power supply voltage is different please inform EMC PARTNER AG in Switzerland, or your EMC PARTNER AG representatives.

5.3.3 Connecting the Interruption Generator PFS32 rack to the power line

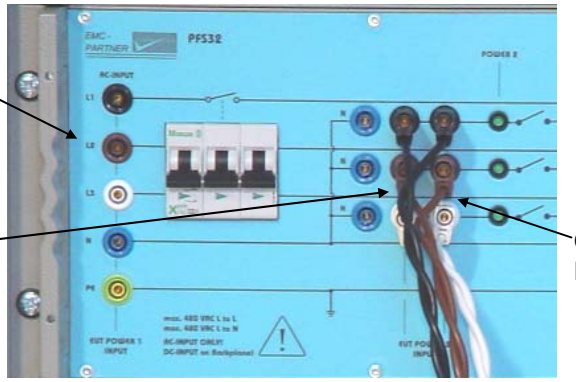
Please use the supplied power cord for connecting the Interruption Generator PFS32 to your public power supply. As stated on the rear, the power supply must have an earth safety wire. Please check the earth connection on your power outlet before you turn on the Interruption Generator PFS32 with the main the main switch on the front.

5.3.4 EUT Power, Power source for the EUT

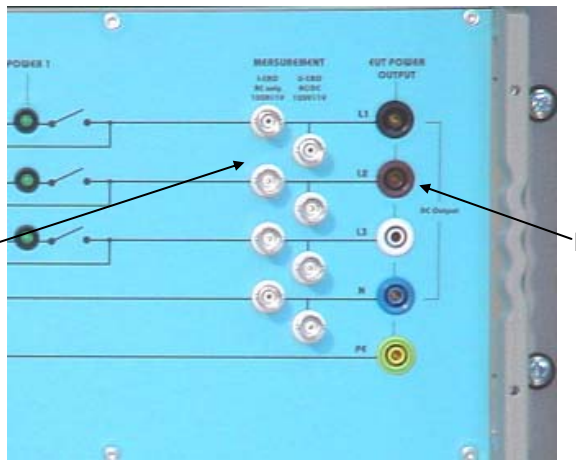
The EUT power must be connected via the PFS32 interruption generator. Please cut the black, brown, white, blue and green/yellow cables supplied into two halves of the same length. One half can be used for the Three Phase inputs and the other half for the for supplying the EUT from the front panel. The high inrush current during the DIPS test can only be reached, when the public power supply can deliver 500 A peak current. The public power supply must be protected by 32 A fuses.

Public power input

Public power input to SRC32



Output of SRC32 to PFS32



BNC outputs for current and voltage measurement line to ground for all lines and neutral

EUT connection

The sequence of the connected phases L1, L2, L3 must be correct. When the sequence is not correct the synchronisation of the interruptions / dips will not be correct. The sequence must be either measured with an three channel oscilloscope or with a phase sequence indicator.

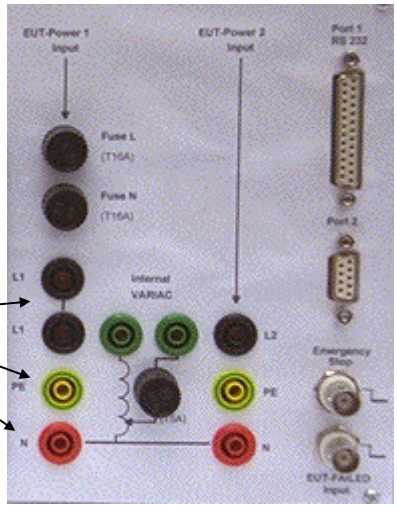
5.3.5 Supply of the EUT with dc

It is not allowed to connect d.c. power on the front panel a.c. inputs. For d.c. interruption the input on the rear side must be used.

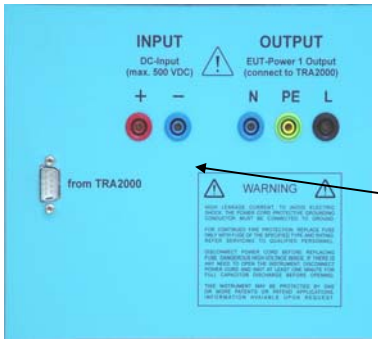
The d.c. can be connected to the EUT from L1 to N output on the front.

Before a d.c. source is connected to the rear of the PFS32 the synchronisation cables to the TRA2000 must be removed. If the cables are not removed and the d.c. is connected to the PFS32, the TRA2000 will be damaged.

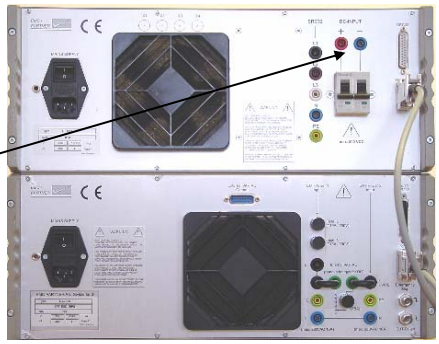
No cables connected to EUT power 1 Input L1, N, PE



For both set-ups: „stand alone or inserted into the SRC32 rack. The cables to EUT Power 1 of the TRA2000 must be removed.



Connect the d.c. supply after you have removed the EUT Power1 cable on the rear side of the



Preparations:
Activate "Main" DIPS test and select the d.c. interruption mode.

Remarks:
- The green LED „Synchro on EUT Power“ has no indication.
- The voltage and current measurement EUT Power is out of order. The measurement circuit is designed for ac.

5.4 Hints for the test set up according to IEC standards

We list below those experiences of EMC PARTNER which are important for the success of the various tests. This information is only partly given in the standards.
Before a test is started, it is important to define which ports (inputs, outputs) must be tested. For the most important transient tests the ports are given as follow in the European generic standard:

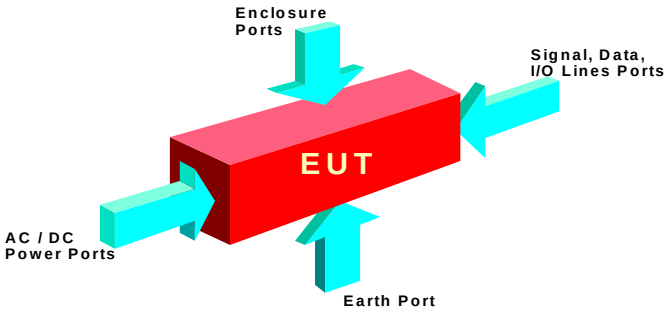
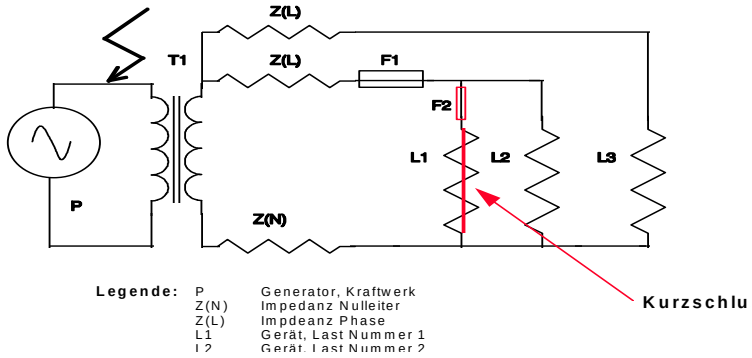


figure 5.4

5.4.1 Test set up DIPS, Interruption

Ports which must be tested:
AC / DC power supply
Hints for the test set-up

Coupling path:
This disturbances appear on the power lines. Disturbance sources are short circuits between power lines, power line switching actions and heavy load changes etc.



Legend:

P	Power generator
Z(N)	Impedance neutral
Z(L)	Impedance Phase
L1	Load 1
L2	Load 2
L3	Load 3
F1	Power line fuse
F2	Equipment fuse

Short circuit at load 1 ure 5.4.4.1

Test set-up:

- During DI h current are possible during the turn on phase of the DIPS.
- With switc :an increase linearly with the voltage reduction e.g. I= 1A at U 230V, and with reduced voltage of U = 40%, the current increase to 2,5 A.
- For a realistic DIPS and interruption test, the test object must be discharged using the power line impedance

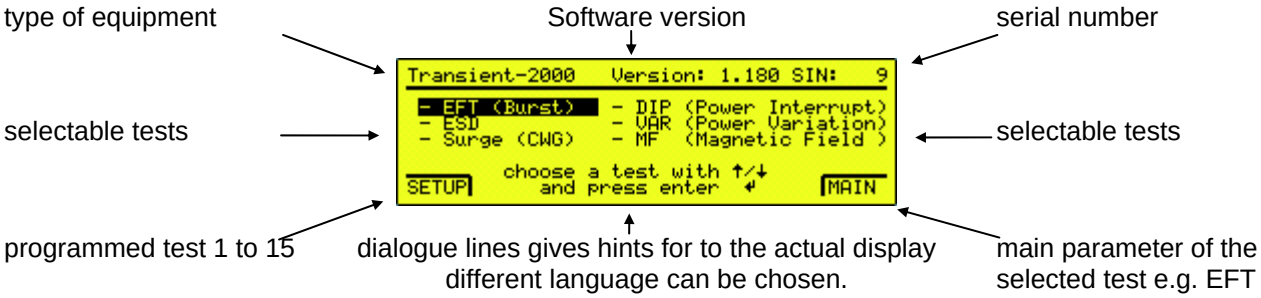
6 Testing with the Interruption Generator PFS32, PFS32 and TRA2000

6.1 Quick start of a DIPS test

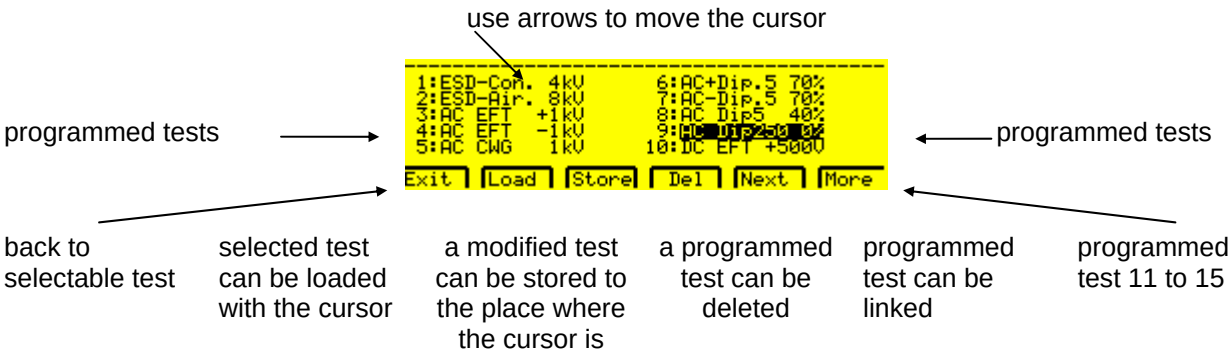
When you have studied Chapter 2 „Safety“ and Chapter 5 „Preparation for operation“ and all instructions have been followed you have green light for a quick start. The quick start includes the most important tests using the Interruption Generator PFS32, RFS32 and the TRA2000.

To start a set-up, the follow steps must carried out:

- Turn the main power switch on the front side to position I
- Operate the ON/STBY button on the front panel of TRA2000 the display turns to:

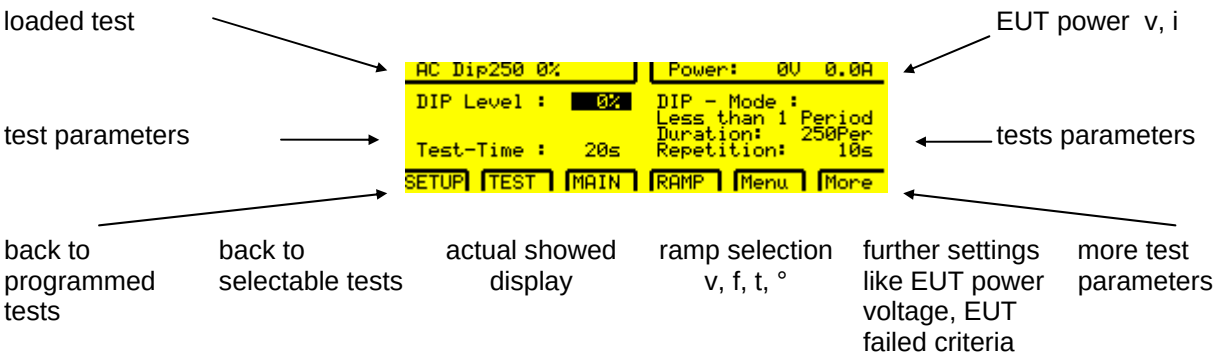


Press "SETUP"

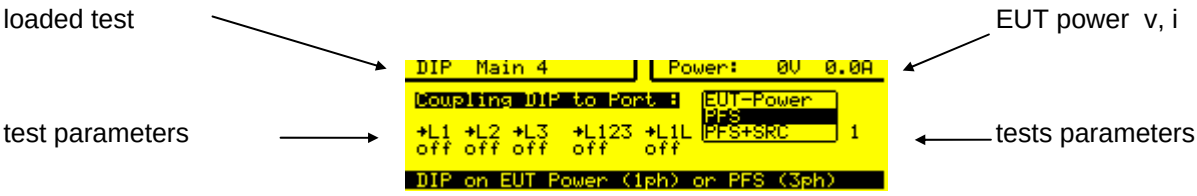


Quick test example AC Dips5 40%:

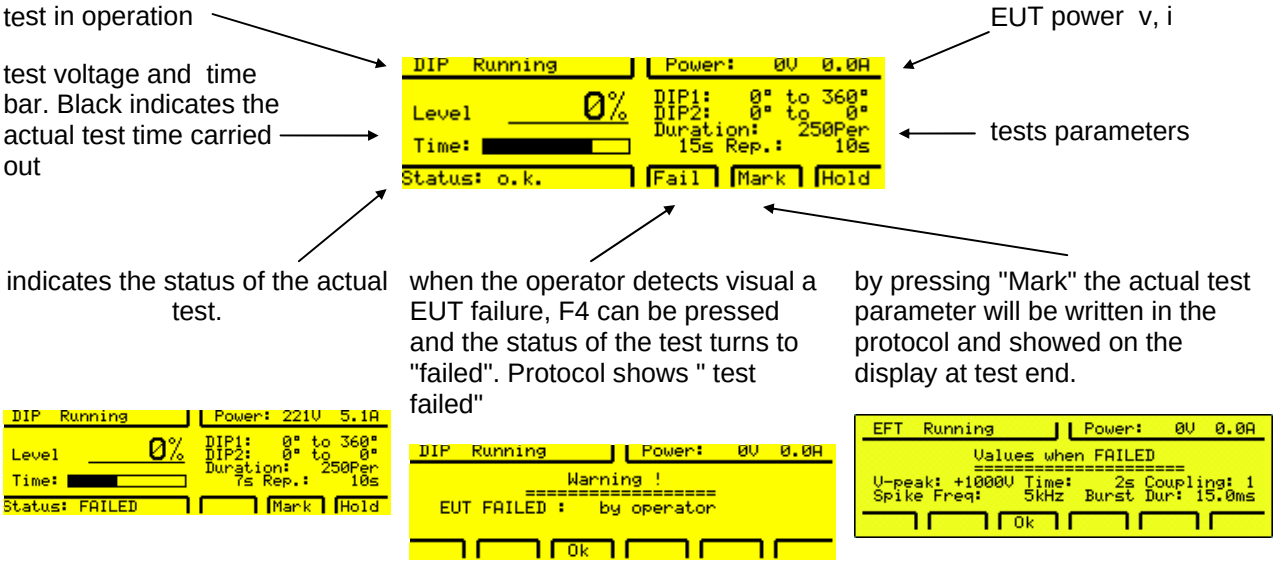
- move the cursor with the arrow to number 8
- press F2 Load



- press twice „More“
- Activate the PFS and SRC control



- press "RUN" button



When the TRA2000 is controlled from a PC with GENECS the following protocol will be printed or showed on the monitor:

```
EMC-Partner AG
--------------------------------------------------------------------------------

TRANSIENT-2000-555   Version: 3.23    Test :  AC Dip250 0%

                                      Date :  20.09.05    Time :  12:42:57

Test Kind:  DIP (Power Interrupt)

EUT :                                 Operator :
Comment   :

--------------------------------------------------------------------------------

  PowerON Syncro:   0Deg   PowerOFF Syncro:   0Deg   Current Limiter: 20A

--------------------------------------------------------------------------------


  DIP Level       :    0%       Repetition  :   10s     Trigger :  auto
  Number of interrupted Periods :   250          High-Z at 0%  :  off
  DIP1:   0 to 360 Deg    DIP2:   0 to   0 Deg     Syncro Freq. :    50Hz
--------------------------------------------------------------------------------


       Test-Time :                        20s
       ================================================================


          DIP (Power Interrupt)              Result :  Test completed
          Test End ...................   21s



       Test Result :  Test completed
```

Well that's easy isn't it ?

All other 14 programmed tests can be started and carried out on the same way. All test can be started or stopped with the "RUN" button.

The quickstart tests contain only a small part of the testing possibilities of the TRA2000 with Interruption Generator PFS32 and PFS32.

Further information can be found in the TRA2000 Manual.

7 Maintenance and Servicing

7.1 Maintenance

To avoid electrical shock, be sure that the power cord is disconnected before starting maintenance work.

No further maintenance is necessary on the Interruption Generator PFS32.

7.2 Verification of the Interruption Generator PFS32 by the user

7.2.1 Interruption

1. Select PFS32 in the menu „select coupling to port“
2. Verification as specified in the Basic Standard 61000-4-11

Trigger the measuring equipment via the external trigger input. Different trigger level, see Chapter 1.2.7 of the TRA2000 Manual

7.2.2 DIPS

1. Setting DIPS Source PFS+SRC32 in the menu „select coupling to port“

1. Measuring point:
   BNC output EUT Power V.

2. Setting measuring equipment
   Time base 10 to 50 ms,
   Vertical deflection 2 V / division
   Trigger the measuring equipment via the external trigger input. Different trigger level, see Chapter 1.2.7 of the TRA2000 Manual

7.3 Verification of the Interruption Generator PFS32, PFS32 and TRA2000 by EMC PARTNER AG

EMC PARTNER verify the Interruption Generator PFS32 System in accordance with the verification chapter in the Basic Standards.

Interruption and DIPS 61000-4-11 Ed.2

EMC PARTNER recommend a full verification of the Interruption Generator PFS32 once every two years. A test report with all oscillograms is included in the verification price. A full verification without a repair takes approximately 1 week.

Before a Interruption Generator PFS32 is delivered, all verifications are carried out in accordance with the basic documents.

All data are within the tolerable tolerances.

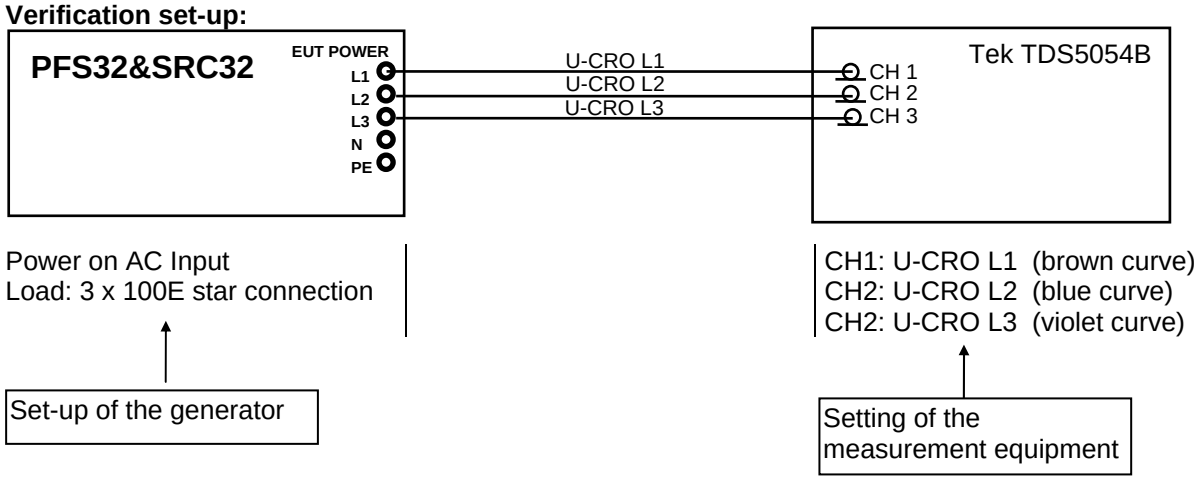
See verification report Interruption Generator PFS32 and PFS at the end of the Manual binder.

On the following pages some explanation can be found to the EMCP calibration report.

The head of the calibration report informs about the set-up of the generator and the measurement equipment used for the calibration:

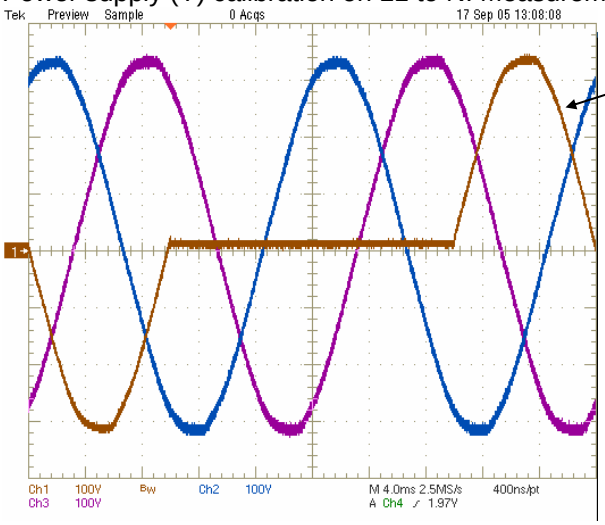
3-Phase DIP with PFS32 & SRC32

Verification set-up:

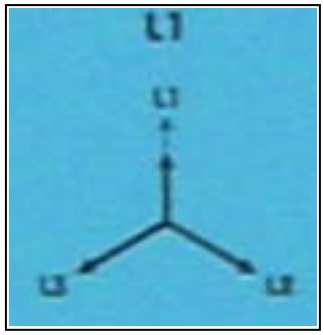


On the next pages some oscillograms are shown, which explain the dips and interruptions on a three phase system.

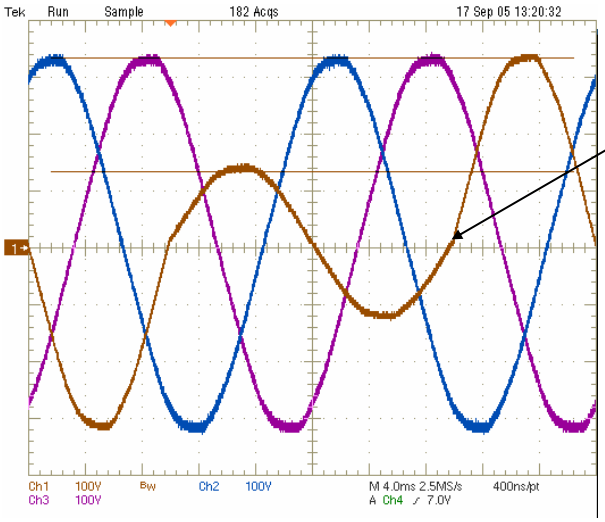
Power supply (Y) calibration on L1 to N. Measurement has been taken between L1 and PE



Phase L1 with 20ms interruption, voltage 0%

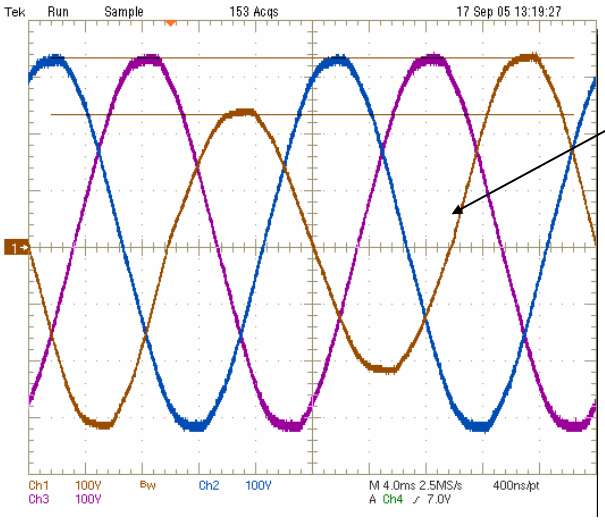


Long DIP: 20ms, begin 0°, end 0°
DIP on L1 (Y connection)



Phase L1 with 20ms dips, voltage 40%
The phase L1 has no phase shifting, 120°.
Only possible with

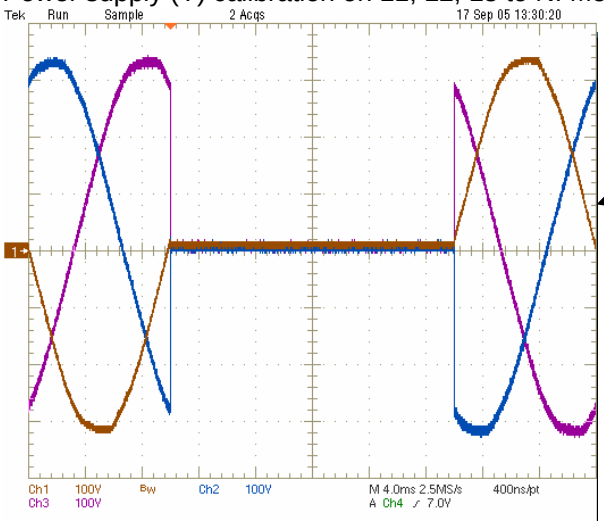
Long DIP:
DIP on L1 (Y connection)



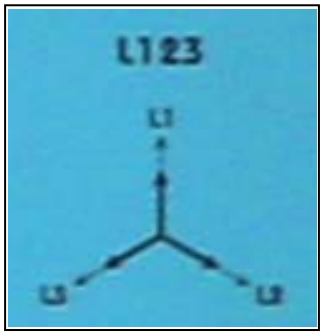
Phase L1 with 20ms dips, voltage 70%
The phase L1 has no phase shifting, 120°. Only possible with SRC32

Long DIP:
DIP on L1 (Y connection)

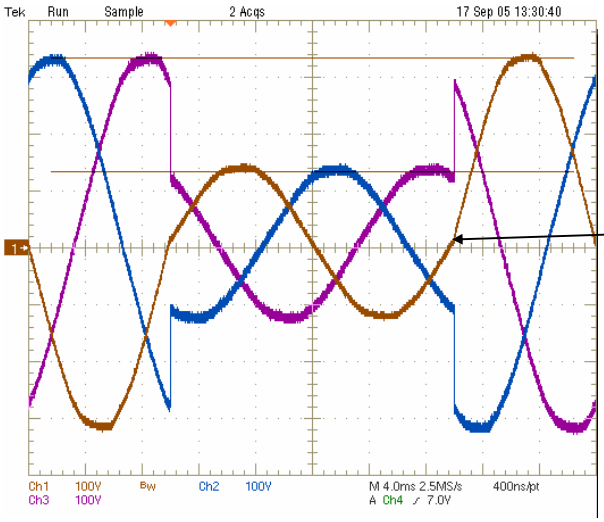
Power supply (Y) calibration on L1, L2, L3 to N. Measurement has been taken between Lx to PE



All three phases with 20ms interruption, voltage 0%

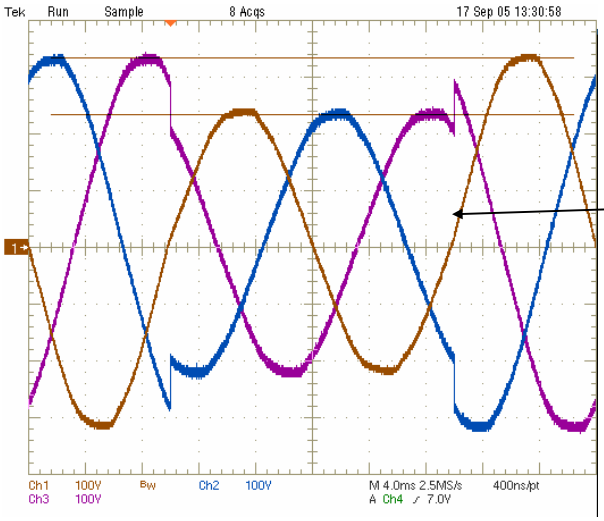


Long DIP: 20ms, begin 0°, end 0°
DIP on L1 (Y connection)



All three phases with 20ms dips, voltage 40% All lines have no phase shifting, 120°. Only possible with SRC32

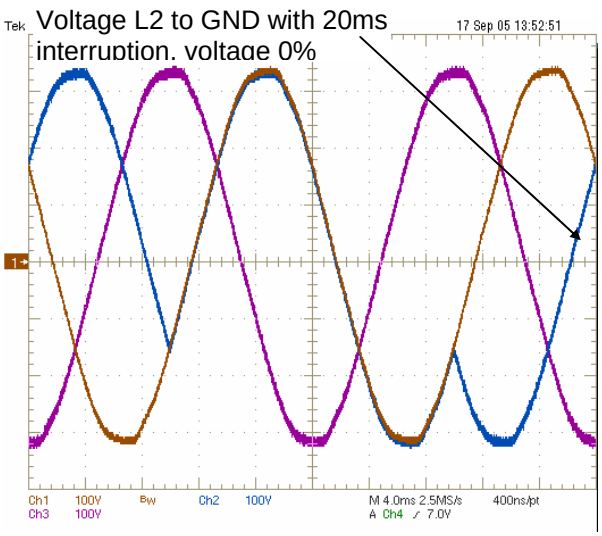
Long DIP:
DIP on L1 (Y connection)



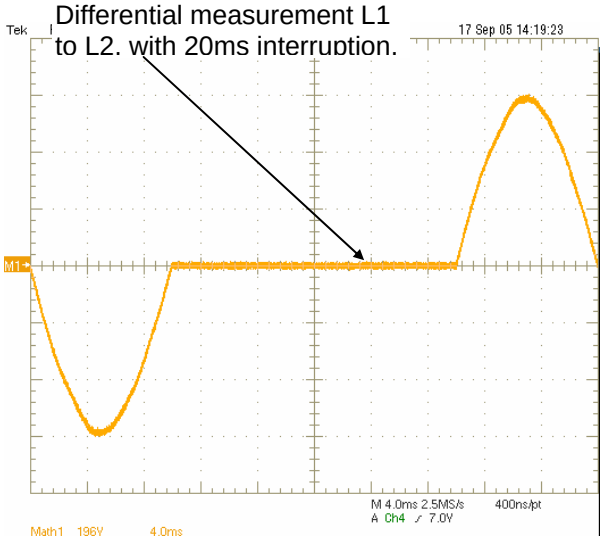
All three phases with 20ms dips, voltage 70% All lines have no phase shifting, 120°. Only possible with SRC32

Long DIP:
DIP on L1 (Y connection)

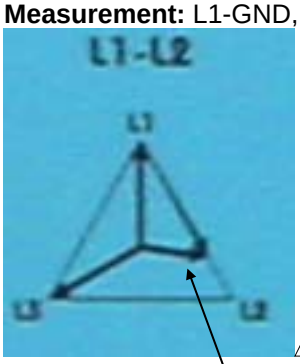
Power supply (Δ) calibration on L1 to L2. Measurement set-up see below the oscillograms



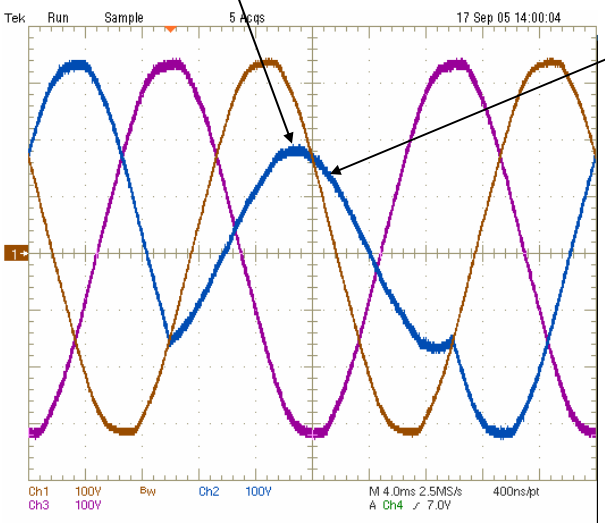
Long DIP:
DIP on L1-L2 (delta connection)
Level: 0%
Measurement: L1-GND, L2-GND, L3-GND



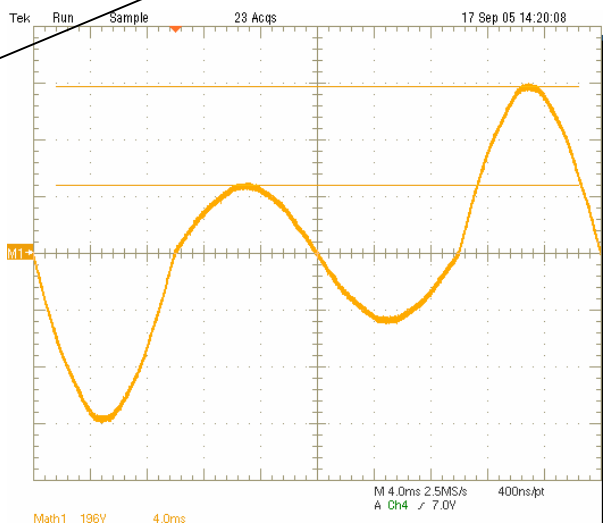
Long DIP:
DIP on L1-L2 (delta connection)
Level: 0%
Measurement: L1-GND, L2-GND, L3-GND



Differential measurement must be made, to see the interruptions or dips. Measurement between L2 to GND shows the phase shifting at DIPS.



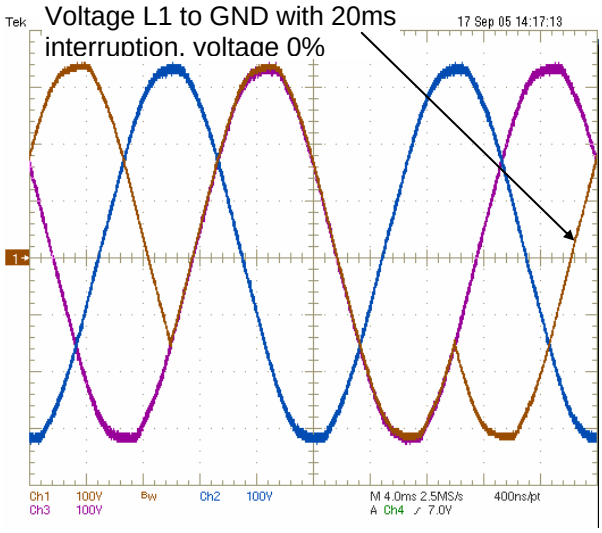
Long DIP:
DIP on L1-L2 (delta connection)
Level: 40%
Measurement: L1-GND, L2-GND, L3-GND



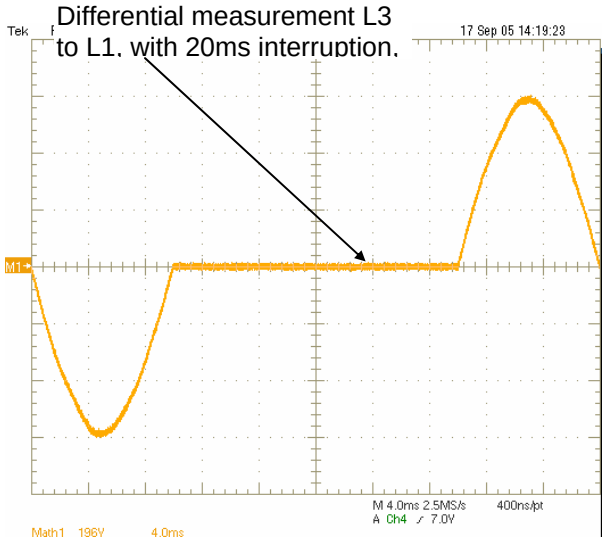
Long DIP:
DIP on L1-L2 (delta connection)
Level: 40%
Measurement: L1-L2 (phase to phase voltage)

Only possible together with SRC32

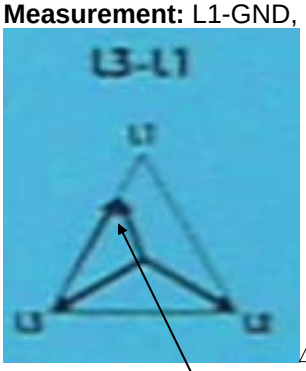
Power supply (Δ) calibration on L3 to L1. Measurement set-up see below the oscillograms



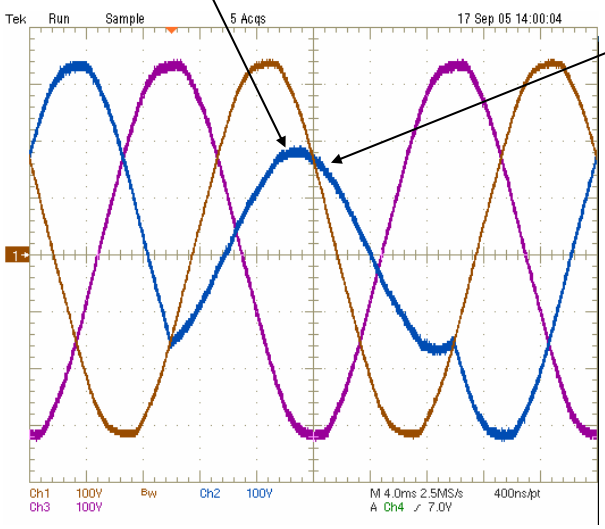
Long DIP:
DIP on L3-L1 (delta connection)
Level: 0%
Measurement: L1-GND, L2-GND, L3-GND



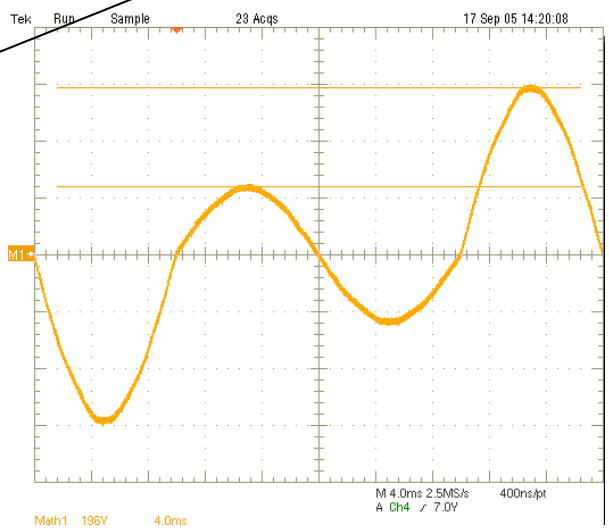
Long DIP:
DIP on L3-L1 (delta connection)
Level: 0%
Measurement: L1-L2 (phase to phase voltage)



Differential measurement must be made, to see the interruptions or dips. Measurement between L1 to GND shows the phase shifting at DIPS.



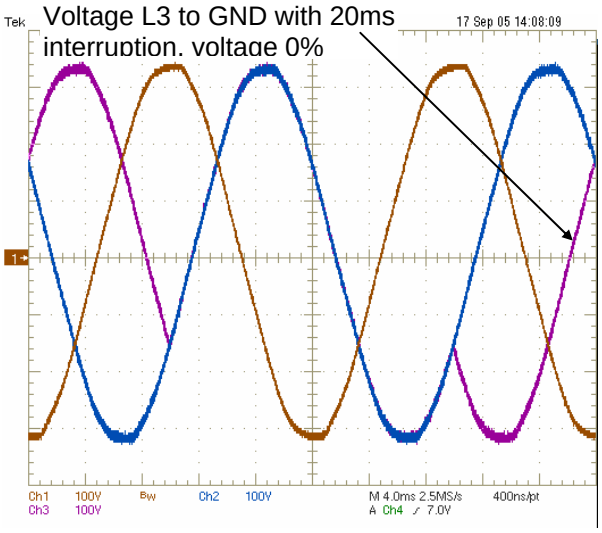
Long DIP:
DIP on L3-L1 (delta connection)
Level: 40%
Measurement: L1-GND, L2-GND, L3-GND



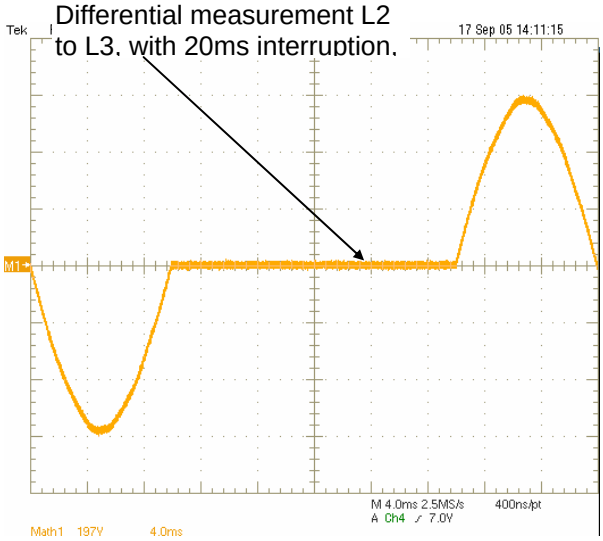
Long DIP:
DIP on L3-L1 (delta connection)
Level: 40%
Measurement: L1-L2 (phase to phase voltage)

Only possible together with SRC32

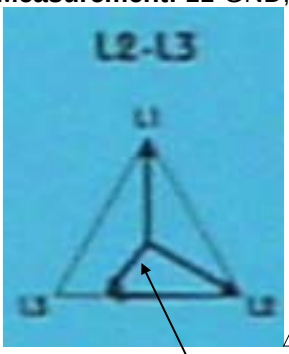
Power supply (Δ) calibration on L2 to L3. Measurement set-up see below the oscillograms



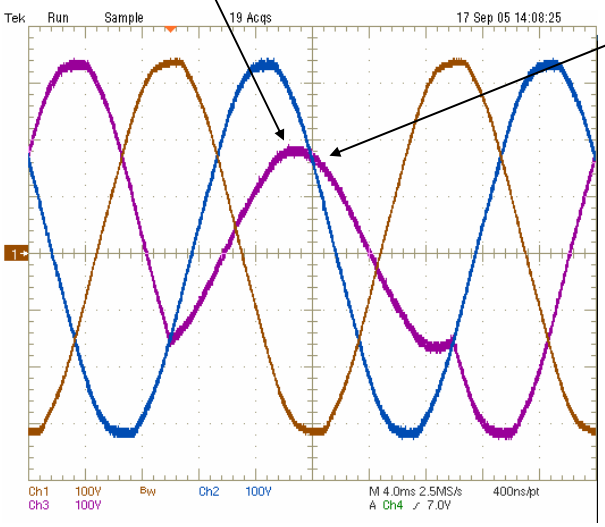
Long DIP:
DIP on L2-L3 (delta connection)
Level: 0%
Measurement: L1-GND, L2-GND, L3-GND



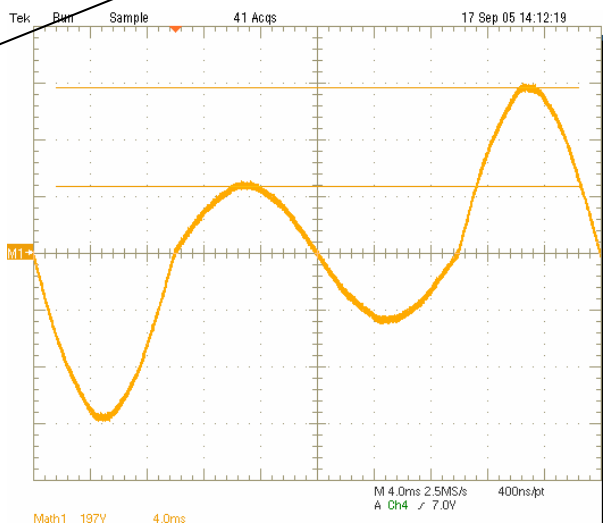
Long DIP:
DIP on L2-L3 (delta connection)
Level: 0%
Measurement: L1-L2 (phase to phase voltage)



Differential measurement must be made, to see the interruptions or dips. Measurement between L3 to GND shows the phase shifting at DIPS.



Long DIP:
DIP on L2-L3 (delta connection)
Level: 40%
Measurement: L1-GND, L2-GND, L3-GND



Long DIP:
DIP on L2-L3 (delta connection)
Level: 40%
Measurement: L1-L2 (phase to phase voltage)

Only possible together with SRC32

8 What must be done following failed operation

The TRANSIENT generators have many of different messages to assist the operator to solve possible problems, give information regarding incorrect operation of the TRANSIENT-generator, or to correct an incorrect system configuration. Basically, three different messages can be differentiated:

- Error message based on incorrect inputs
- Error based on incorrect operation of the generator
- Warning messages

8.1.1 Error caused by incorrect inputs „Generator not ready for run“

Error code. E?	Message	Description
ECAS10E	Emergency stop active	An emergency stop has been operated via the BNC outlet „Emergency Stop“ on the rear of the Interruption Generator PFS32.
ECAS11E	no nominal defined	voltage or current
ECAS12E	V-start > V-nominal	At EFT : The test was selected with a voltage at „Voltage Ramp“ V-Start set lower than V-nominal. The start voltage in the „ Ramp“ menu must be decreased.
ECAS13E	Spike rate > xxxxx pulses/rep. reduce spacing, length or repetition	AT EFT: The spike rate is too high. For information about spike repetition limits of the Interruption Generator PFS32, see Chapter 6.2.2.1 EFT. „Main“ Menu
ECAS14E	No coupling path defined	In the „Main“ menu no coupling path for superimposing SURGE and EFT onto the power line has been defined.
ECAS15E	Contact discharge max. 10’000	During ESD contact-discharge mode, a maximum voltage of 10000 V is allowed. Set the equal or lower than 10 kV voltage in the „ Main“ menu.
ECAS16E	Repetition < 100ms	At EFT: When synch mode = On, the Burst repetition must be greater than 100 ms.
ECAS17E	to high nominal	Reduce nominal value
ECAS18E	Repetition too low (<xxsec)	During SURGE test, the minimum repetition depends on the charging voltage. See Chapter 6.2.2.3 for repetition limits. Increase the repetition rate in „Main“ menu .
ECAS19E	DIP-end < DIP-begin	At DIPS: The End-angle of a DIPS must always be greater than the Begin-angle of a ramp. Chose the correct angle in „ RAMP“ menu.

ECAS25E	High-Z mode at level 0% only	The high-Z mode is only practical for an interruption to 0%. Turn off the High-Z Mode in „Main“ menu.
ECAS26E	Duration < 1 period	During Long Dip mode, the interruption cannot be shorter than one period. Increase the

		duration in „Main“ menu Long Dip, or choose short Dip .
ECAS27E	No ESD-Relay circuit found	Connect the ESD2000 to Interruption Generator PFS32
ECAS28E	DIP2 begin < DIP1 begin	AT DIPS: The start of the DIP2 must always be greater than the start of the DIP1. Choose the correct angle in „ RAMP“ menu.
ECAS29E	No DIP test while PWR2 is on	Turn off the PWR2 (power supply form variac
ECAS50E	Switch on power first	Press PWR1

8.1.2 Failure based on error at the generator „Generator malfunction“

ERR5L3E	Generator malfunctioning	Tittle of the message followed by the information below
ERR5L31E	no high-voltage	The voltage of the high voltage source of the Interruption Generator PFS32 cannot be increased. Press any of the front panel buttons. Repeat the test. If there is no change contact EMC PARTNER.
ERR5L33E	High-voltage overshoot	The high voltage has exceeded a voltage limit. Press any of the front panel buttons. Repeat the test. If there is no change contact EMC PARTNER.
ERR5L34E	self firing	The pulse release has been before the trigger released. Press any of the front panel buttons. Repeat the test. If there is no change contact EMC PARTNER
ERR5L35E	no firing	The pulse release has not functioned. Press any of the front panel buttons. Repeat the test. If there is no change contact EMC PARTNER
ERR5L37E	Variac fault	The variac could not be set to the correct value. Please check: -Is voltage on EUT Power 1? -variac bracket inserted on the rear panel? -variac fuse o.k.?
ERR5L38E	earth switch fault	The earth switch worked not correctly. Press any of the front panel buttons. Repeat the test. If there is no change contact EMC PARTNER.
ERR5L398E	High voltage regulation fault	The high voltage regulation of the source is not functioning correctly. Press any of the front panel buttons. Repeat the test If there is no change contact EMC PARTNER

8.2 Service; Repairs

The Interruption Generator PFS32 is a compact equipment and servicing or repairing the tester can only be carried out by EMC PARTNER authorised service companies.

8.3 Spare parts list

No spare parts are necessary for the Interruption Generator PFS32.

8.4 Check before you contact the service of EMCP

8.4.1 Fuses

Always check first the fuses of the unit before you contact EMCP service. A set of fuses has been delivered with the tester.

8.4.2 System Reset (Software) on TRA2000

On three different ways a system reset can be done:

1. **Reset without deleting the stored 1 to 15 programs**
- Press the following softkey
- Main - Menu - Menu - Reset - quit with Yes

2. **Reset via the display**
- Press the following softkey:
- Main - Menu - Menu - Util - General Reset

3. **Reset with keyboard buttons**
- Press „Power ON“ and „1“ buttons simultaneously
- Wait until beep sounds
- Press button „2“ immediately

8.5 Service department of EMC PARTNER AG

EMC PARTNER AG
Baselstrasse 160
CH - 4242 Laufen
Switzerland
☎ ++41 61 775 20 50
🖷 ++41 61 775 20 59
✉ service@emc-partner.ch
💻 www.emc-partner.com

9 Putting out of operation

Whenever the Interruption Generator PFS32 is not needed remove the power cord.

Reasons for putting the TRANSIENT out of operation:

1. Maintenance work
2. Service, repair
3. Verification by EMC PARTNER
4. Shipment for outdoor tests

The Interruption Generator PFS32 is a laboratory test equipment. When the tester is not used, store it in a dry, clean dark place.

10 Packaging and Transport

10.1 Packaging

If you transport the Interruption Generator PFS32, pack it in the original shipping box and packing material.

10.2 Transport

If you are transporting the Interruption Generator PFS32 to an EMC PARTNER field office for repair, attach a tag to the equipment showing the instrument owner and address, the name of the person to contact about the instrument, the instrument type and the serial number.

11 Recycling / Disposal

11.1 RoHS directive 2002/95/EG

The PFS32 complies with the directive 2002/95/EG (RoHS - Restriction of certain Hazardous Substances).

From December 2005, all EMC Partner products either hand soldered or by machine are produced using lead-free solder.

11.2 WEEE directive 2002/96/EG

The EMC Partner PFS32, is exempted from the directive 2002/96/EG (WEEE) under category 9.

The product should be recycled through a professional organisation with appropriate experience for the disposal and recycling of electronic products. EMC Partner are also available to help with questions relating to the recycling of this product.

11.3 Information for dismantling

 Remove always power cord fist.

There is no special danger involved in dismantling the PFS32.

11.4 Parts which can be recycled

The PFS32 contains parts made from steel, aluminium, PVC, two-component sealing compound. The impulse capacitors are filled with non-poisonous mineral oil. The various parts can be separated and recycled.

11.5 Parts which can not be recycled

All parts in the PFS32 can be recycled.

12 Accessories

12.1 Interruption Generator PFS32 Options

Software

Pos.	Product No.	Type	Short Description
27	TRA1Z225N	TEMA	Test Manager (TEMA). Comfortable control of Interruption Generator PFS32, MIG2000 or ESD3000 systems: EUT control, test report, test library. Each serial number requires one "ENTRY CODE". Incl. connection cable 25/9 pole to PC.
28	TRA1Z252A	TEMA OPTION DSO CONTROL	Option to TEMA Software: module for DSO (digital storage oscilloscope) control. "Extended" and "Option" codes neccessary.

12.1.1.1 DIPS Accessories

Pos.	Product No.	Type	Short Description
52	TRA1Z19B	VERI-DIPS	Measuring set for calibration / verification of the inrush current TRA1000, Interruption Generator PFS32xx, PFS32 and PFS63.
56	TRA1Z409	PFS32	Extension of Interruption Generator PFS32 DIPS. The PFS32 can generate interruptions on three phase power supply up to 480V/ 32A. For DIPS and supply configuration the PFS32 can be inserted in the SRC32 rack.
59	TRA1Z421	DIPS100E	100 Ohm resistor for switching time calibration / verification. Can be used with TRA1000, Interruption Generator PFS32xx, PFS32, PFS63. 100 Ohm +/- 5%, 1kW.

13 Serial Remote Port

13.1 General

The different commands can be found in the TRA2000 Manual.

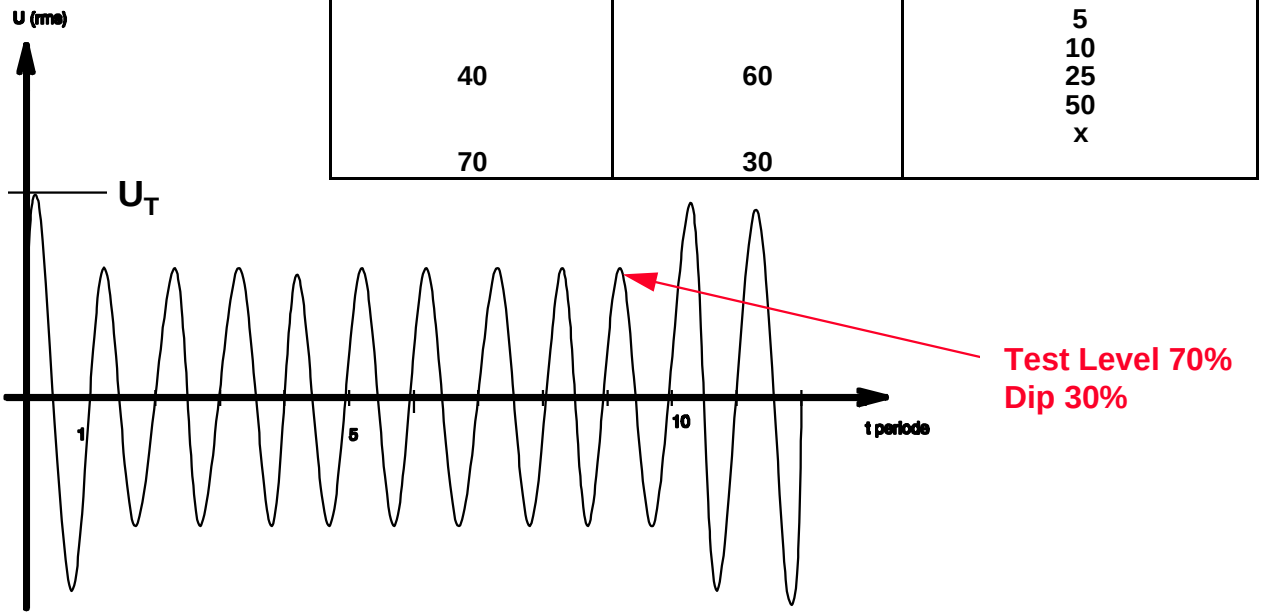
14 Appendix and Corrections

14.1 Appendix

14.1.1 DIPS Interruption Specification

Test levels DIPS

Test Level % U_T	Voltage Dip/int % U_T	Duration (in period)
0	100	0.5* 5 10
40	60	25 50 x
70	30	



In addition to the data showed in the figure, such as test levels, duration of the interruption, transition time, etc., the inrush current must be tested. Electronic equipment very often contain inrush current limitation circuits. These inrush limiting circuits are often bypassed during interrupts at the turn on part. Consequences are defective power switching modules, or the equipment can not be turned on after the test because the software has not made a restart etc.

So that the test will cover this aspect, the inrush current capability of the generator must be at least 500 A peak. The verification of the generator inrush current is defined as follow:

Turn on the generator at a phase angle of 90 degrees. Using a current sensor, measure the current in a capacitor of several µF. The measured amplitude must be equal to/or greater than 500 A. When the tester can generate a current amplitude of 500 A, all equipment with current consuming up to 16 A can then be tested.

If the current amplitude of 500 A is not reached, then the inrush current of the EUT must be measured. The inrush current of the tester must be a minimum of 30 % higher than the inrush current of the EUT.

14.2 Correction

14.2.1 Declaration of conformity to the EMC directive 89/336/EEC

see appendix at the end of this documents.

14.2.2 Declaration of conformity to the LV directive 93/68/EEC

see appendix at the end of this documents.

14.2.3 Declaration of conformity to the Basic Standards

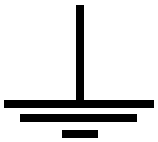
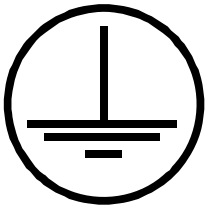
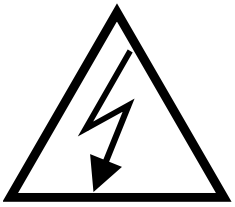
see appendix at the end of this documents.

15 Glossary

Wherever possible, definitions in accordance with IEC 50 (IEV 161) are used.

EUT EST	Equipment under Test French abbreviation of EUT
EMV = EMC = CEM	Electro Magnetic Compatibility German:Elektromagnetische Verträglichkeit French: compatibilité elctromagnetique
Hybrid pulse	Voltage at no load 1.2 / 50 µs and current at short circuit 8 / 20µs.
CWG	Definition in IEC 1000-4-5 used for Surge Tester Combination wave generator.
Coupling network	Electric circuit for transferring energy with low losses from one circuit into another circuit.
Decoupling network	Electric circuit to prevent transmitting energy from one circuit into another circuit.
CDN coupling decoupling network (single or three phase unit)	Consist of a coupling and a de-coupling network.
EFT	Electric Fast Transient (switched inductance)
ESD	Electric Static Discharge
SURGE	Transients with high energy content with relatively low frequency content as produced by lightning and switching of power lines.
DIP	Short voltage interruption or short voltage drop
IEC	International standardisation organisation for electronic technology
VARIAC	Voltage variable transformer
SPIKE	One pulse of the burst
CRO	oscilloscope
HV	High Voltage
rms.	root mean square; effective value

Used symbols:

	Direct current
	Alternating current
	Three phase alternating current
	Earth (ground) terminal
	Protective conductor terminal IEC 417, No. 5019
	Caution, risk of electric shock ISO 3864, No. B.3.6
	Caution (refer to accompanying documents) ISO 3864, No. B.3.1

16 Index

Declaration of Conformity to Standards

The EMC Tester

Type: Interruption Generator PFS32

complies with the following standards:

Interruption on a.c. power supply up to 16A, 3P	**IEC/EN 61000-4-11 Ed.2**
Interruption on a.c. power supply >16A, 3P	**IEC/EN 61000-4-34 Ed.1**
INTERRUPTION on d.c.	**IEC/EN 61000-4-29**

Laufen, 02. February 2004

EMC PARTNER AG

M. Lutz
Managing Director

EMC PARTNER AG

R. Casanova
Manager Development

Appendix to 14.2.3 Conformity declaration with basic standards

CE

EMC - PARTNER

Manufacturer Declaration Of Conformity LV

Directive 73/23/EWG; with table VI 2006/95/EG

The EMC Tester

Type: Interruption Generator
PFS32; S/N > 10

is designed and manufactured complying with the following harmonised standards:

Harmonised:
EN 61010-1: 2001

international
IEC 61010-1

in accordance with the regulation of LV - directive of the members states 73/23/EWG and with table VI 2006/95/EG

EMC PARTNER authorised representative established within the EC Community

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Technology GmbH
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DE - 58640 Iserlohn

Laufen, 05.August 2009

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Managing Director

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R. Casanova
Manager Quality Department

Appendix to 14.2.2 Conformity declaration with Low Voltage Directive 93/68/EEC and with table VI 2006/95/EG

CE

EMC - PARTNER

Manufacturer Declaration Of Conformity EMC

Directive 89/336/EWG with table VII 2004/108/EG

The EMC Tester

Type: Interruption Generator
PFS32, S/N > 10

has been tested in accordance with the following standards:

harmonised:
EN 61000-6-3: 2007
EN 61326: 2006

international
IEC 61000-6-3
IEC 61326-1

Fulfilling the directions of the EMC - Directive 89/336/EWG and with table VII 2004/108/EG

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Laufen: 04. August 2009

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Appendix to 14.2.2 K Conformity declaration with the EMC directive