

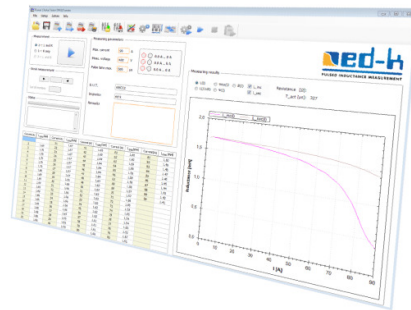
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## 3-PHASE EXTENSION UNIT

### FOR POWER CHOKES TESTER DPG10 SERIES

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#### Description & Technical Specifications



© ed-k, Dipl.-Ing. H. Kreis  
Lochhamer Straße 31 • D - 82152 Planegg • Germany  
Telephone: 0049 / 89 / 85 90 28 19 • [info@ed-k.de](mailto:info@ed-k.de)

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# Product Description

## Properties

The 3-Phase Extension Unit is an additional unit for the DPG10 Power Choke Tester series. With the help of the 3-Phase Extension Unit the inductance of 3-phase chokes can be measured simply and quickly.

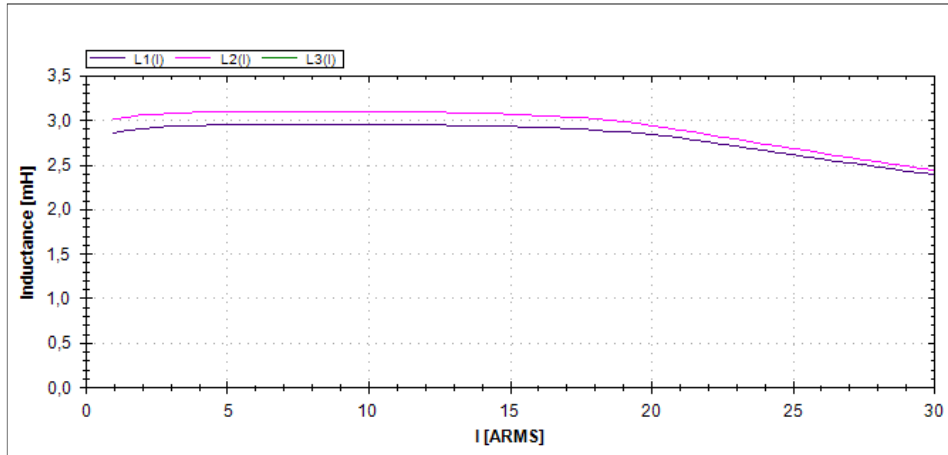


Fig. 1: Inductance curves L1(i), L2(i) and L3(i) for the three coils of a 3-phase choke

All three coils of the choke are automatically measured in succession without changing the connections of the test specimen. The software takes into account the changed flux conditions in the core compared to a 3-phase sinusoidal current feed and corrects the measurement results accordingly using a sophisticated algorithm.

In relation to the measurement with 50 Hz mains voltage, this method is much simpler, very much faster and also more accurate.

Thanks to the pulse measurement method of the DPG10 the measurement takes only 20 to 30 seconds and supplies a complete inductance curve  $L(I)$ , whose current axis is scaled with RMS values. The inductance of the three legs is illustrated in separate curves L1(i), L2(i) and L3(i).

The measurement result is equivalent to a conventional measurement with 3-phase sinusoidal voltages and currents. A correction to a reference frequency of 50 Hz or 60 Hz can be carried out.

Principle advantages over a measurement with 3-phase sinusoidal mains currents:

- \* very simple, fast and accurate measurement
- \* very large measuring currents possible (up to 2350 A<sub>rms</sub>)
- \* small, lightweight and inexpensive despite the high measuring currents
- \* correction to 50 Hz or 60 Hz possible

## **Areas of application and measurement limits**

The DPG10 series is suitable in combination with the 3-Phase Extension Unit for the development, production and use of 3-phase power inductors and transformers of all kinds, e.g.

- \* mains chokes
- \* filter chokes for UPS, inverters, etc.
- \* commutation inductors
- \* and much more

For the correct determination of inductance, the following conditions must be met for the 3-phase test specimen, which is usually the case anyway:

- \* all three legs have the same core cross-section
- \* core made of electrical sheet steel or any of the other core materials mentioned in the chapter "Frequency correction"

The maximum current up to which the 3-phase inductance measurement can take place depends on the basic unit employed. With a DPG10-4000B/F the inductance curve can be determined up to about 2350 A<sub>rms</sub>. At larger inductance values this current reduces due to the maximum available pulse energy (e.g. DPG10-4000B/F up to 7700 J).

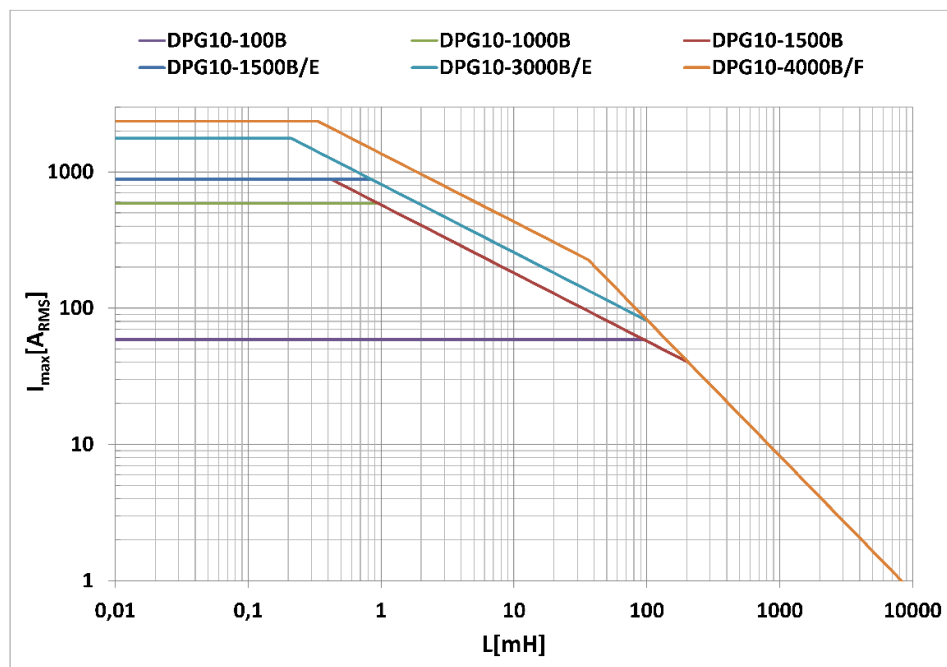


Fig. 2: Maximum measurable RMS current versus the inductance of a 3~ choke

## **Connection to the DPG10 basic unit**

The 3-Phase Extension Unit must be placed directly on top of the DPG10 basic unit. The DPG10 basic unit and the 3-Phase Extension Unit are connected to each other by three cables, which are included in the scope of delivery.

## Measurement

After choosing the measurement parameters (maximum measurement current, measurement voltage) the inductance measurement is initiated with the <Start measurement> button.

The measurement results are displayed as an L(i) diagram; i.e. the inductance L is displayed as a function of the current i. A separate inductance curve is displayed for each leg L1, L2 and L3.

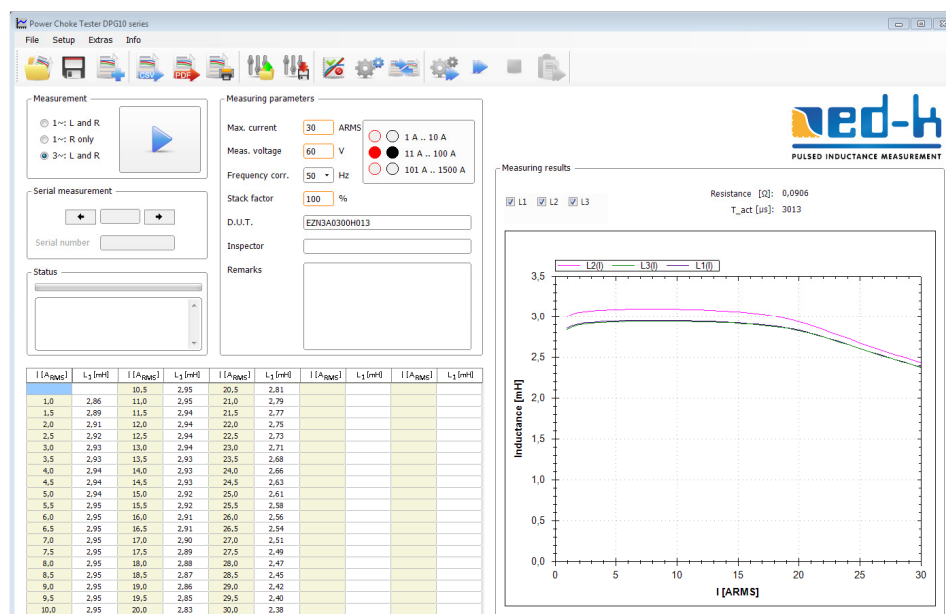


Fig. 3: Graphic user interface of the DPG10

The x-axis of the diagram is scaled with the RMS value of the current ( $I_{rms}$ ). The inductance values are calculated in such a way that the result is equivalent to a conventional measurement with 3-phase sinusoidal voltages and currents. A correction to 50 Hz or 60 Hz can be carried out.

An ohmic resistance measurement is always carried out first. Due to the principle employed, only the resistance of the series connection of two legs can be measured directly. Nevertheless the ohmic resistance displayed is related to the resistance of one leg of the test specimen.

## Frequency correction

If the chosen measurement voltage leads to a pulse length that doesn't correspond to the reference frequency of 50 Hz or 60 Hz (i. e. 10 ms or 8.3 ms respectively) then the measured inductance curve of electrical sheets can be corrected to these reference frequencies.

For less frequency dependent core materials the frequency correction has to be deactivated. That includes amongst others the material groups FeSi, Sendust, High Flux, MPP und hybrid grades.

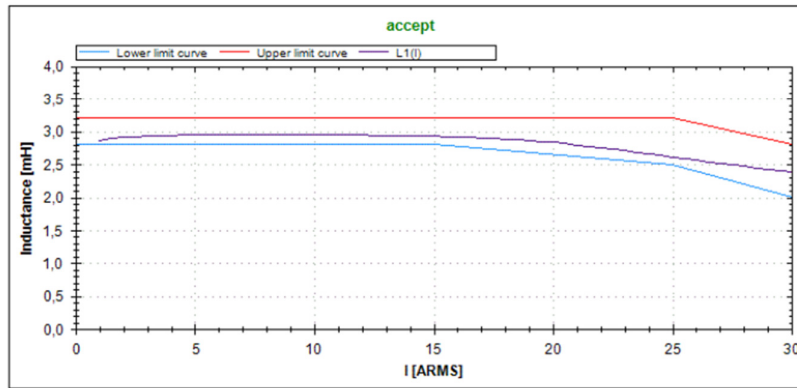
In table 1 some well-known trade marks corresponding to the mentioned material groups from different core manufacturers are listed. However this list is not exhaustive.

|                       | FeSi<br>(Fe-(Ni)-Si) | SENDUST<br>(Al-Si-Fe) | HIGH FLUX<br>(Ni-Fe) | MPP<br>(Mo-Ni-Fe) | HYBRID<br>GRADES     |
|-----------------------|----------------------|-----------------------|----------------------|-------------------|----------------------|
| CSC                   | Megaflux             |                       |                      |                   | KH, KS, HS           |
| DMEGC                 | DF, DFF              | DS                    | DH                   | DM                |                      |
| FERROXCUBE            | 3P1                  |                       |                      |                   |                      |
| KDM                   | Si-Fe                | KS-HF                 |                      |                   | NeuFlux,<br>KAM, KAH |
| MAGNETICS             | XFlux                | Kool Mμ               |                      |                   | Amoflux              |
| MICROMETALS<br>ARNOLD | Fluxsan              | Super-MSS             | Hi-Flux              |                   | Optilloy             |
| POCO                  | NPF, PPI             | NPS                   |                      |                   |                      |
| SAMWHA                | Super Flux           |                       |                      |                   |                      |

Table 1: Material groups without frequency correction with some manufacturer specific trade marks

## DPG10 Power Choke Tester

D.U.T.: EZN3A0300H013  
 Inspector:  
 Date: 2015-09-23  
 Parameters: 30 A / 60 V / 50 Hz / 100 %  
 Resistance [Ohm]: 0,0906



| Current [A] | L <sub>1</sub> [mH] | Current [A] | L <sub>1</sub> [mH] | Current [A] | L <sub>1</sub> [mH] | Current [A] | L <sub>1</sub> [mH] | Current [A] | L <sub>1</sub> [mH] |
|-------------|---------------------|-------------|---------------------|-------------|---------------------|-------------|---------------------|-------------|---------------------|
|             |                     | 10,5        | 2,95                | 20,5        | 2,81                |             |                     |             |                     |
| 1,0         | 2,86                | 11,0        | 2,95                | 21,0        | 2,79                |             |                     |             |                     |
| 1,5         | 2,89                | 11,5        | 2,94                | 21,5        | 2,77                |             |                     |             |                     |
| 2,0         | 2,91                | 12,0        | 2,94                | 22,0        | 2,75                |             |                     |             |                     |
| 2,5         | 2,92                | 12,5        | 2,94                | 22,5        | 2,73                |             |                     |             |                     |
| 3,0         | 2,93                | 13,0        | 2,94                | 23,0        | 2,71                |             |                     |             |                     |
| 3,5         | 2,93                | 13,5        | 2,93                | 23,5        | 2,68                |             |                     |             |                     |
| 4,0         | 2,94                | 14,0        | 2,93                | 24,0        | 2,66                |             |                     |             |                     |
| 4,5         | 2,94                | 14,5        | 2,93                | 24,5        | 2,63                |             |                     |             |                     |
| 5,0         | 2,94                | 15,0        | 2,92                | 25,0        | 2,61                |             |                     |             |                     |
| 5,5         | 2,95                | 15,5        | 2,92                | 25,5        | 2,58                |             |                     |             |                     |
| 6,0         | 2,95                | 16,0        | 2,91                | 26,0        | 2,56                |             |                     |             |                     |
| 6,5         | 2,95                | 16,5        | 2,91                | 26,5        | 2,54                |             |                     |             |                     |
| 7,0         | 2,95                | 17,0        | 2,90                | 27,0        | 2,51                |             |                     |             |                     |
| 7,5         | 2,95                | 17,5        | 2,89                | 27,5        | 2,49                |             |                     |             |                     |
| 8,0         | 2,95                | 18,0        | 2,88                | 28,0        | 2,47                |             |                     |             |                     |
| 8,5         | 2,95                | 18,5        | 2,87                | 28,5        | 2,45                |             |                     |             |                     |
| 9,0         | 2,95                | 19,0        | 2,86                | 29,0        | 2,42                |             |                     |             |                     |
| 9,5         | 2,95                | 19,5        | 2,85                | 29,5        | 2,40                |             |                     |             |                     |
| 10,0        | 2,95                | 20,0        | 2,83                | 30,0        | 2,38                |             |                     |             |                     |

Remarks:

Fig. 4: Measurement report of a 3~ mains choke with limit curves

# Technical Specifications

## **Scope of delivery**

- \* 3-Phase Extension Unit EXT1 or EXT2
- \* Cable set consisting of
  - Test leads Force + Sense, triple, 1m each
  - Star point cable, triple, 1 m
  - 9 alligator clips
  - Force and sense connecting cables between DPG10 and 3-Phase Extension Unit
  - Control cable between DPG10 and 3-Phase Extension Unit
- \* Instruction manual, German and English

The DPG10 basic device is not included in the scope of delivery!

The 3-Phase Extension Unit is available in two different versions (part no. EXT1 and part no. EXT2). Table 2 shows which version is suitable for which DPG10 basic unit.

|              | EXT1                                                                       | EXT2          |
|--------------|----------------------------------------------------------------------------|---------------|
| Width        | 370 mm                                                                     | 470 mm        |
| suitable for | DPG10-100B<br>DPG10-1000B<br>DPG10-1500B<br>DPG10-1500B/E<br>DPG10-3000B/E | DPG10-4000B/F |

Table 2: Versions EXT1 and EXT2

## **Optional accessories**

- \* Kelvin test leads for 3-Phase Extension Unit (KK31-4)
  - Length: approx. 1m; connector: 4mm
  - Clampable wire diameter: approx. 1 to 25mm
  - Max. measuring current: up to 250A
  - Avoid use when inductance is <10µH (uncertainty will increase)
- \* Kelvin test leads for 3-Phase Extension Unit (KK31-6)
  - Length: approx. 1.5m; connector: 6mm
  - Clampable wire diameter: approx. 1 to 35mm
  - Max. measuring current: up to 5000A
  - Avoid use when inductance is <30µH (uncertainty will increase)
- \* Hard-top case
  - robust hard-top case of aluminium profiles, with compartments for accessories
  - 2 automatic locks, 3 hinges, 8 corner protections of steel
  - Internal dimensions: 650 x 410 x 230 mm<sup>3</sup>

**Power inputs and outputs:**

see technical data of the basic unit

**Safety lock interface:**

Connector

D-Sub-9pole male

Connector pin assignment

Pin 5 (-) and Pin 6 (+); Enabling by linking together with an external floating safety switch (5VDC/50mA)

**Power supply:**

Mains voltage

90...264 VAC / 50...60 Hz

Power consumption

80 VA max.

**Environmental conditions:**

Operation

0 ... 50°C, no moisture condensation

Storage, transport

-20 ... 75°C, no moisture condensation

Permissible installation height

≤ 2000 m amsl

**Weight, dimensions:**

EXT1:

Weight

7.2 kg

Dimensions

365 (W) x 325 (L) x 167 (H) mm<sup>3</sup>

EXT2:

Weight

14 kg

Dimensions

470 (W) x 500 (L) x 167 (H) mm<sup>3</sup>