



## Technical Data Sheet for AvK-Alternators

FM 7.3-5

|              |                        |                |                        |
|--------------|------------------------|----------------|------------------------|
| Date:        | 02/10/13               | Customer:      | GENERIC DATASHEET only |
| Project No.: | GENERIC DATASHEET only | AvK Reference: | DSG099K1_4_50_400      |

|                                     |               |
|-------------------------------------|---------------|
| <b>Object data:</b>                 |               |
| Site:                               | Prime Mover:  |
| Application: Stationary Power Plant | Manufacturer: |

|                        |                                  |                   |   |                         |        |
|------------------------|----------------------------------|-------------------|---|-------------------------|--------|
| <b>Generator data:</b> |                                  |                   |   |                         |        |
| Generator:             | DSG 99 K1/4                      | Poles:            | 4   | Standards: IEC 60034    |        |
| Rated power:           | 3450 kVA                         | 2760 kWe          | 2872 kWm  |                         |        |
| Power factor:          | 0.80                             |                   |   |                         |        |
| Power at pf 1,0        | 2792 kVA                         | 2792 kWe          | 2872 kWm  |                         |        |
| Rated voltage:         | 0.4 kV                           |                   |   |                         |        |
| Speed:                 | 1500 1/min                       |                   |   |                         |        |
| Frequency:             | 50 Hz                            |                   | Voltage range / frequency range:                      |                         |        |
| Rated current:         | 4979.6 A                         |                   | Zone A according IEC 60034-1 (dU = +/-5%, df = +/-2%) |                         |        |
| Winding pitch:         | 2/3                              |                   |   |                         |        |
| Insulation class:      | Stator: Class H                  | Rotor: Class H    | Temperature rise:                                     | H                       |        |
| Ambient temperature:   | 40 °C                            |                   | Environment:  | Standard environment    |        |
| Site altitude:         | 1000 m                           |                   |   |                         |        |
| Enclosure:             | IP23                             |                   | Filter:   |                         |        |
| Cooling:               | IC 01 - Open-circuit ventilation |                   |   |                         |        |
| Coolant:               | Ambient Air                      | Temperature       | 40 °C   | Temperature Air inlet   | 40 °C  |
|                        |                                  | Coolant:          |   | generator:              |        |
|                        |                                  | Cooling air vol.: | 3.3 m³/s  | Cooling water quantity: | n/a    |
| Moment of inertia (I): | 130 kgm²                         | Weight:           | 6500 Kg   | Losses (environment):   | 112 KW |
|                        |                                  |                   |   | Losses (cooling):       | n/a    |

|                    |  |
|--------------------|--|
| Wires:             | 4 terminals, starpoint connected in terminal box |
| Operation mode:    | Single mode                                      |
| Regulators:        |  |
| Voltage regulator: | DECS 100   |

|                                    |       |       |      |       |      |
|------------------------------------|-------|-------|------|-------|------|
| <b>Electrical data: (acc. IEC)</b> |       |       |      |       |      |
| Efficiencies:                      | 110%  | 100%  | 75%  | 50%   | 25%  |
| Power factor 0.8                   | 95,91 | 96,1  | 95,9 | 95,5  | 93   |
| Power factor 0.9                   | 96,49 | 96,65 | 96,4 | 95,75 | 93,2 |
| Power factor 1.0                   | 97,06 | 97,2  | 96,9 | 96    | 93,4 |

|                                      |             |       |           |         |                 |             |      |           |         |            |           |
|--------------------------------------|-------------|-------|-----------|---------|-----------------|-------------|------|-----------|---------|------------|-----------|
| <b>Reactances and time constants</b> |             |       |           |         |                 |             |      |           |         |            |           |
|                                      | unsaturated |       | saturated |         |                 | unsaturated |      | saturated |         |            |           |
| $X_d$                                | 2.20        | 1.98  | p.u.      | $X_q$   | 1.10            | 1.08        | p.u. | $T_{d0'}$ | 3.87 s  | $T_{d0''}$ | 0.03959 s |
| $X_d'$                               | 0.287       | 0.287 | p.u.      | $X_q'$  | 1.10            | 1.08        | p.u. | $T_d'$    | 0.50 s  | $T_{q0'}$  | 0.4 s     |
| $X_d''$                              | 0.160       | 0.145 | p.u.      | $X_q''$ | 0.160           | 0.160       | p.u. | $T_d''$   | 0.02 s  | $T_{q0''}$ | 0.275 s   |
| $X_2$                                | 0.167       | 0.152 | p.u.      | $X_0$   | 0.048           | 0.044       | p.u. | $T_a$     | 0.055 s | $T_{q1}'$  | 0.4 s     |
| $X_{1s}$                             | n.a.        | 0.087 | p.u.      |         |                 |             |      |           |         | $T_{q1}''$ | 0.04 s    |
| Short circuit ratio saturated: 0.51  |             |       |           |         | $Z_n$ 0.046 Ohm |             |      |           |         |            |           |

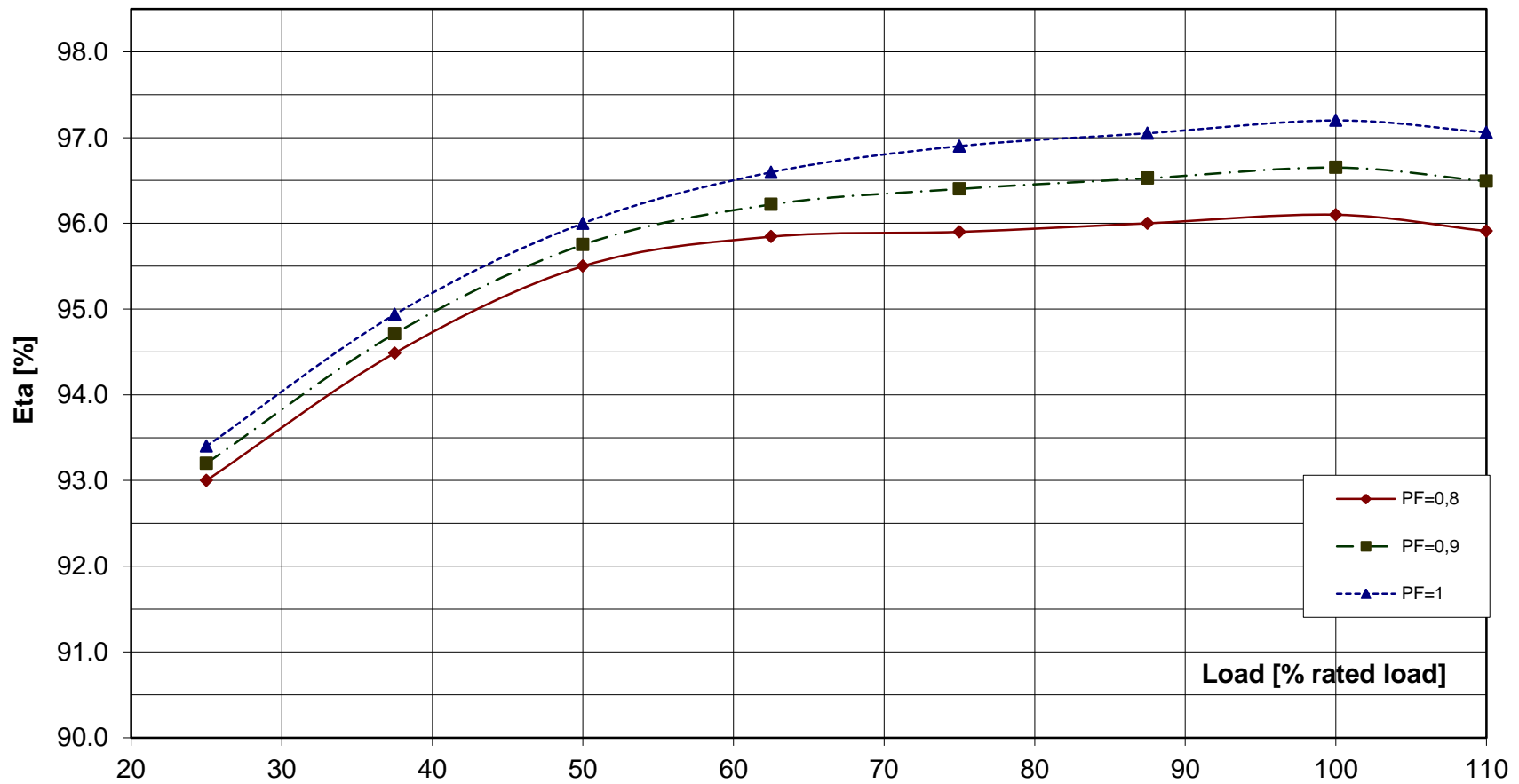
|  |          |           |
|--|----------|-----------|
| <b>Short circuit data:</b>               |          |           |
| Initial short circuit current (3-phase): | $I_k'$   | 34342 A   |
| Max. peak current (3-phase):             | $I_s$    | 87420 A   |
| Sustained short circuit current:         | $I_k$    | 14939 A   |
| Minimum 3 x rated current for max.10 s   |          |           |
| Initial short circuit torque:            | $M_{k2}$ | 196.9 kNm |
|  | $M_{k3}$ | 118.1 kNm |
| Max. faulty synchron moment:             | $M_f$    | 423.3 kNm |
| Rated kVA torque:                        | $M_{SN}$ | 21.97 kNm |
| Rated torque                             | $M_N$    | 17.58 kNm |
| Shaft torque                             | $M_{Sh}$ | 18.29 kNm |

|   |   |
|---|---|
| <b>Load application:</b>  |   |
| max. load application: 1803 kVA (corresponds to 52,26 % from 3450 kVA) for Power factor 0.4<br>15% transient voltage drop | Power: 3450 kVA<br>Power factor: 0.8<br>transient voltage drop: -22.3 % |

**Remarks:**

|                      |                    |                     |                         |
|----------------------|--------------------|---------------------|-------------------------|
| <b>Alternator :</b>  | <b>DSG 99 K1/4</b> |                     |                         |
| Rated output [kVA]   | 3450               | Rated power factor: | 0.8                     |
| Rated frequency [Hz] | 50                 | Rated speed [rpm]   | 1500                    |
|                      |                    |                     | Rated voltage [kV]: 0.4 |

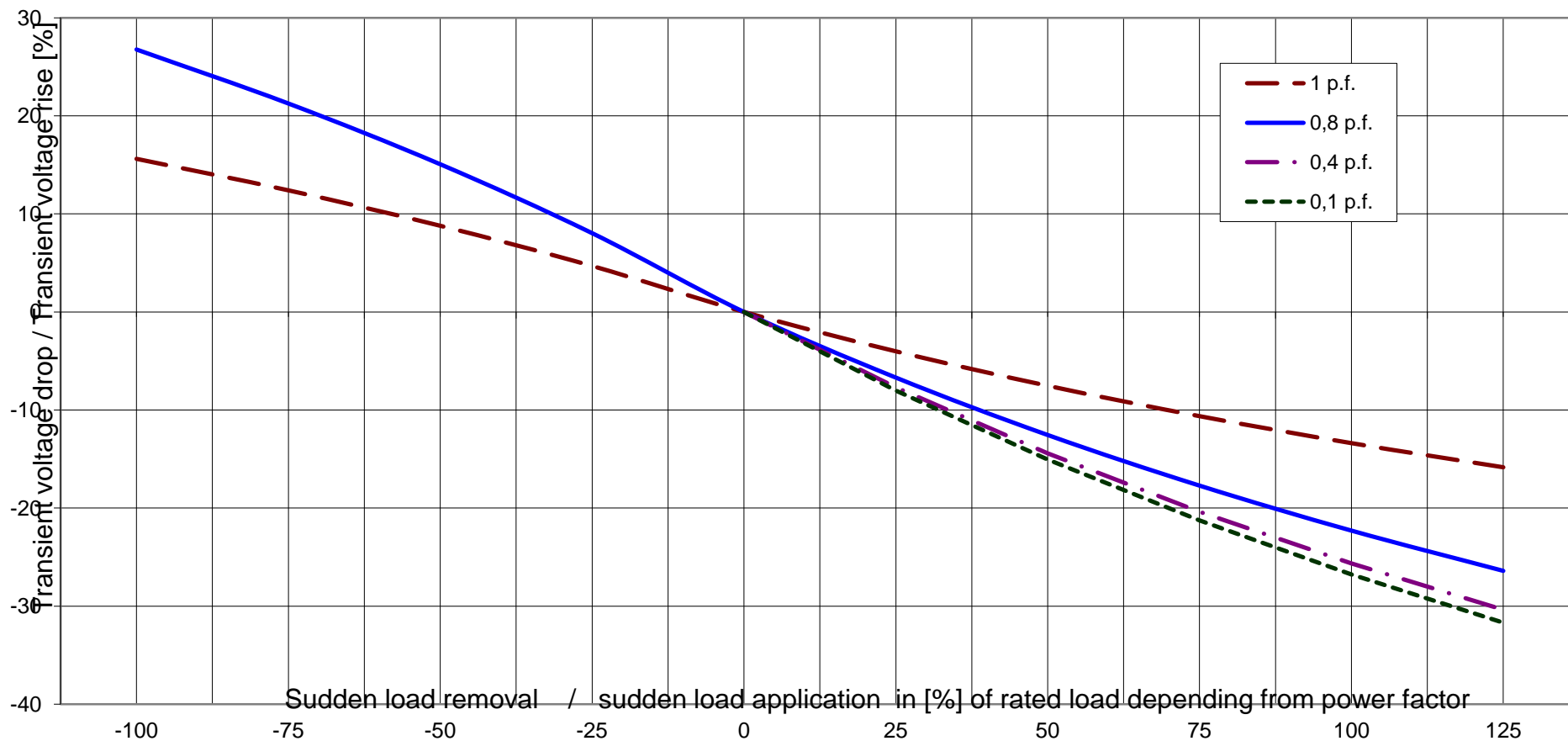
### Wirkungsgrad-Kennlinie - Efficiency Curve



**Alternator : DSG 99 K1/4**

|                      |      |                     |      |                     |     |
|----------------------|------|---------------------|------|---------------------|-----|
| Rated output [kVA]   | 3450 | Rated power factor: | 0.8  | Rated voltage [kV]: | 0.4 |
| Rated frequency [Hz] | 50   | Rated speed [rpm]   | 1500 |                     |     |

**Transient Voltage rise or drop for sudden load removal or application**





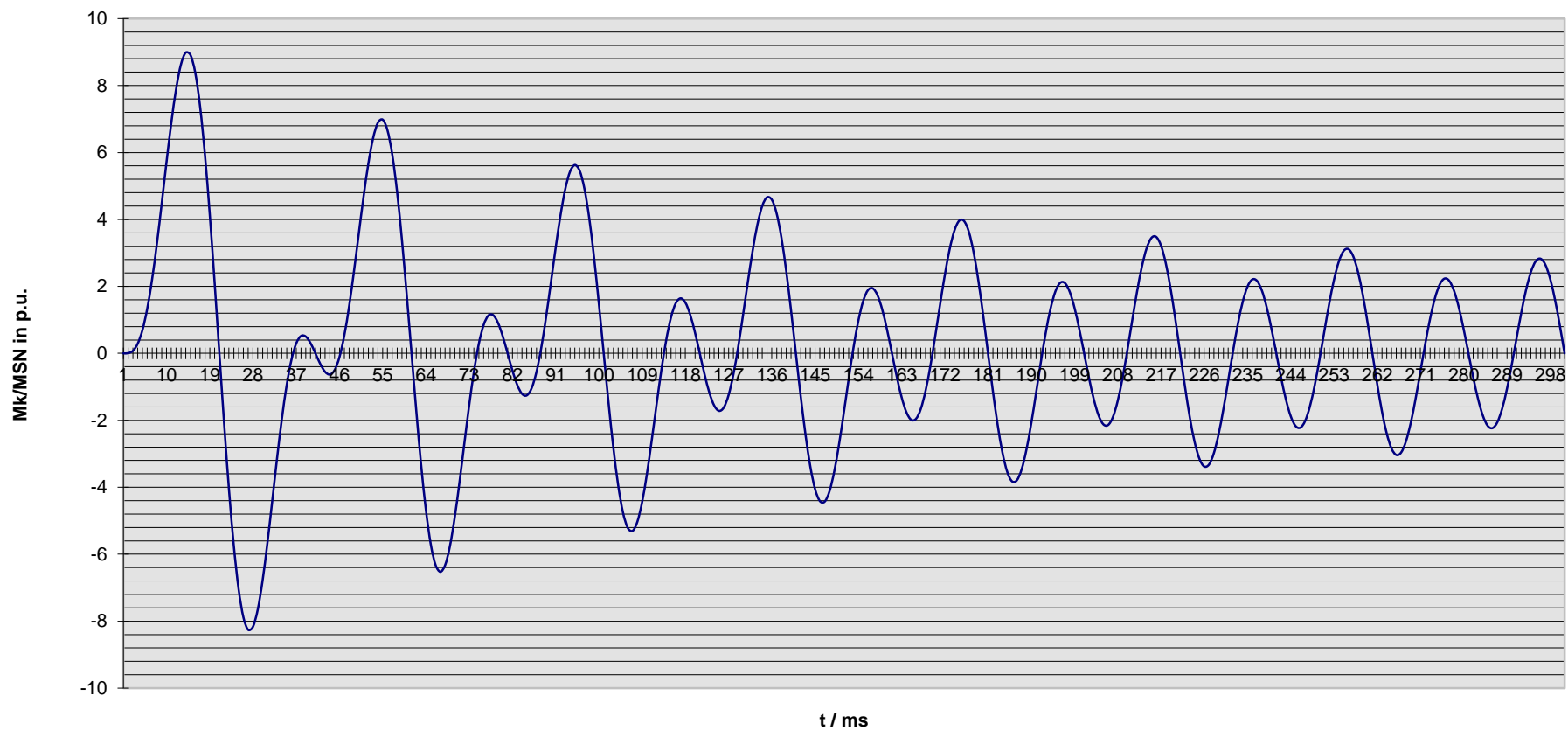
Technisches Datenblatt - Diagramme  
Technical data sheet - Diagrams

**ING-FCD-0112**

**Alternator : DSG 99 K1/4**

|                      |      |                     |      |                     |           |
|----------------------|------|---------------------|------|---------------------|-----------|
| Rated output [kVA]   | 3450 | Rated power factor: | 0.8  | Rated voltage [kV]: | 0.4       |
| Rated frequency [Hz] | 50   | Rated speed [rpm]   | 1500 | MSN related to kVA: | 21.96 KNm |

**Kurzschlußmomenten-Verlauf 2-poliger KS**  
**Short circuit torque at 2-phase SC**



#### Nennwerten / nominal data

DSG 99 K1/4

Leistung  $S_N$ : **3450** kVA

$\cos \varphi$ : **0.80**

*Rating*

*p.f.*

Spannung  $U_N$ : **0.40** kV

Strom  $I_N$ : **4980** A

*Voltage*

*Current*

Frequenz  $f$ : **50** Hz

Drehzahl  $n$ : **1,500** min<sup>-1</sup>

*Frequency*

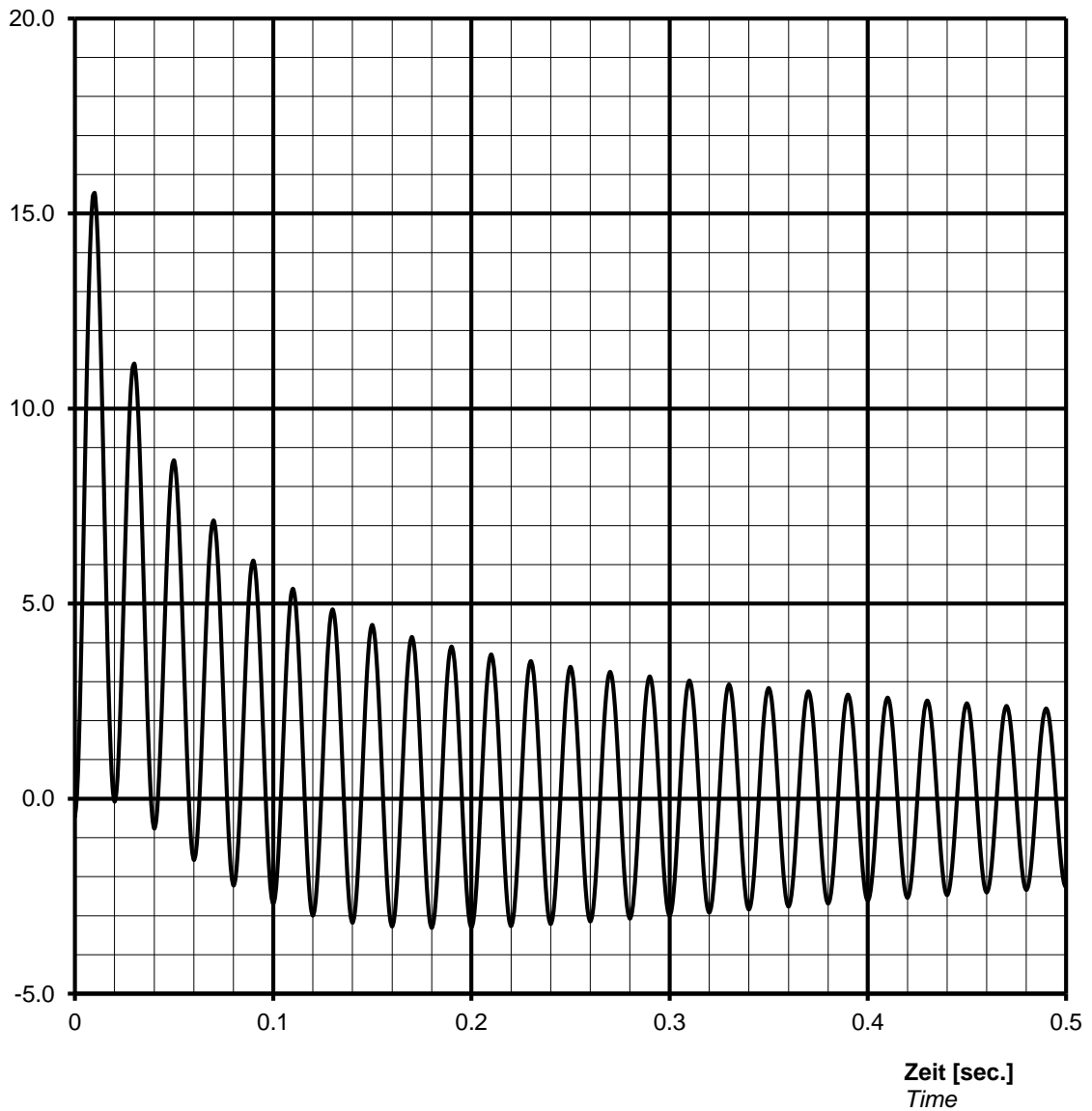
*Speed*

Schutzart **IP23**

*Protection*

Kurzschlussstrom  $I_{k3\text{phasig}} / I_N$  [p.u.]  
Short-circuit current  $I_{k3\text{phase}} / I_N$  [p.u.]

**Stosskurzschluss-Strom, 3-phasig, asymmetrisch /**  
*Sudden short circuit current, 3-phase, asymmetrical*



#### Notizen / remarks:

Maximum asymmetric peak value

$I_{\text{speak}} =$  **77296** A or **15.52** p.u.

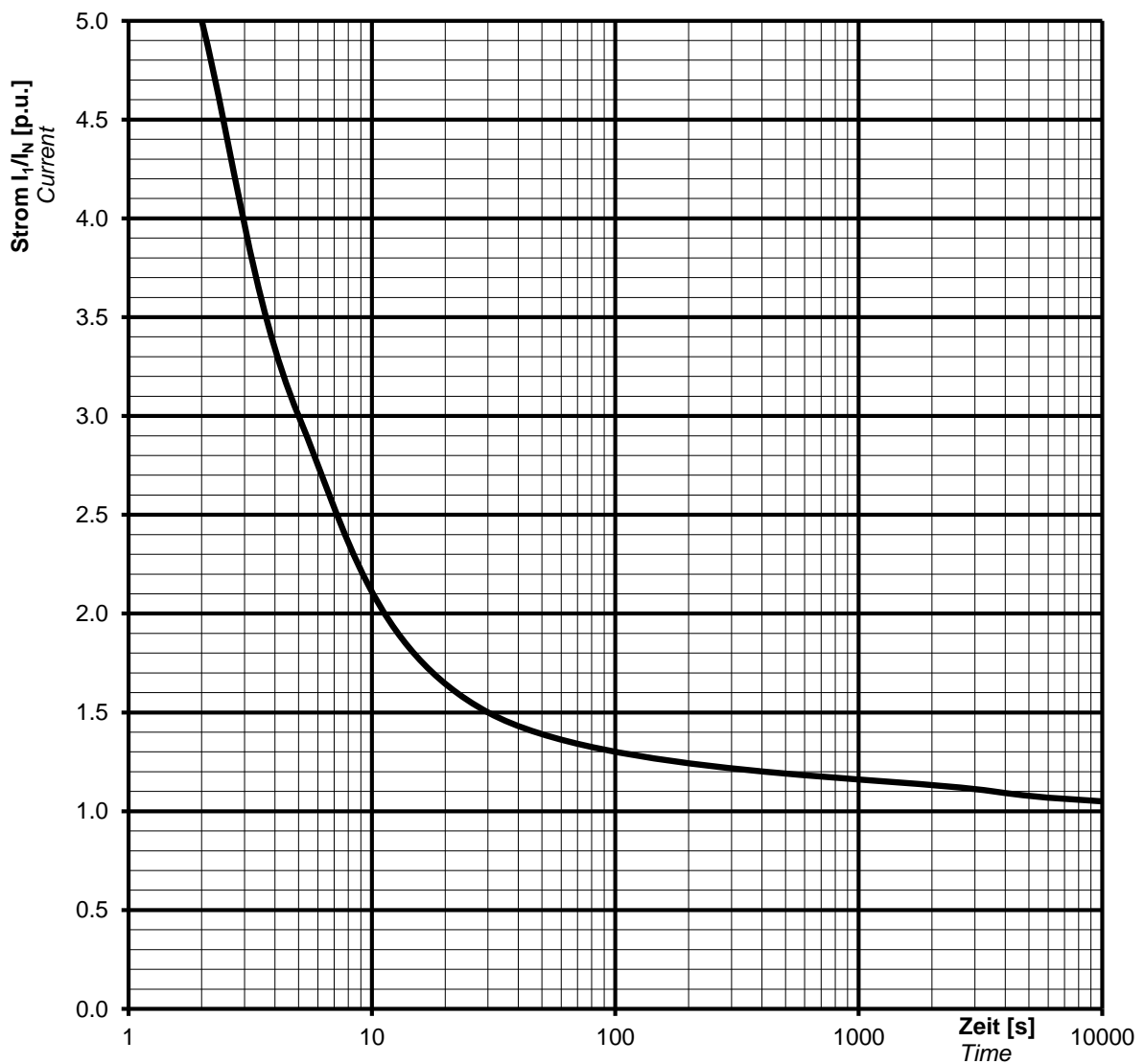
**Nenndaten / nominal data**

**DSG 99 K1/4**

Leistung  $S_N$ : **3450** kVA  
*Rating*  
 Spannung  $U_N$ : **0.40** kV  
*Voltage*  
 Frequenz  $f$ : **50** Hz  
*Frequency*  
 Schutzart **IP23**  
*Protection*

$\cos \varphi$ : **0.80**  
*p.f.*  
 Strom  $I_N$ : **4980** A  
*Current*  
 Drehzahl  $n$ : **1500** min<sup>-1</sup>  
*Speed*

**Überlast Kennlinie**  
*Overload capability*



**Notizen / remarks:**

**Strom / Zeit Kriterien:**  $(I / I_N)^2 \cdot t = 45s$   
**Current/time characteristics:** 1,5 \*  $I_N$  for 30 s  
 1,1 \*  $I_N$  for 1 h in 6h

#### Neurdaten / nominal data

**DSG 99 K1/4**

Rating  $S_N$ : **3450 kVA**

Bemessungsleistung

Nominal voltage  $U_N$ : **0.40 kV**

Bemessungsspannung

Frequency  $f_N$ : **50 Hz**

Frequenz

Protection: **IP23**

Schutzart

*p.f.* **0.80**

Leistungsfaktor  $\cos \varphi$ :

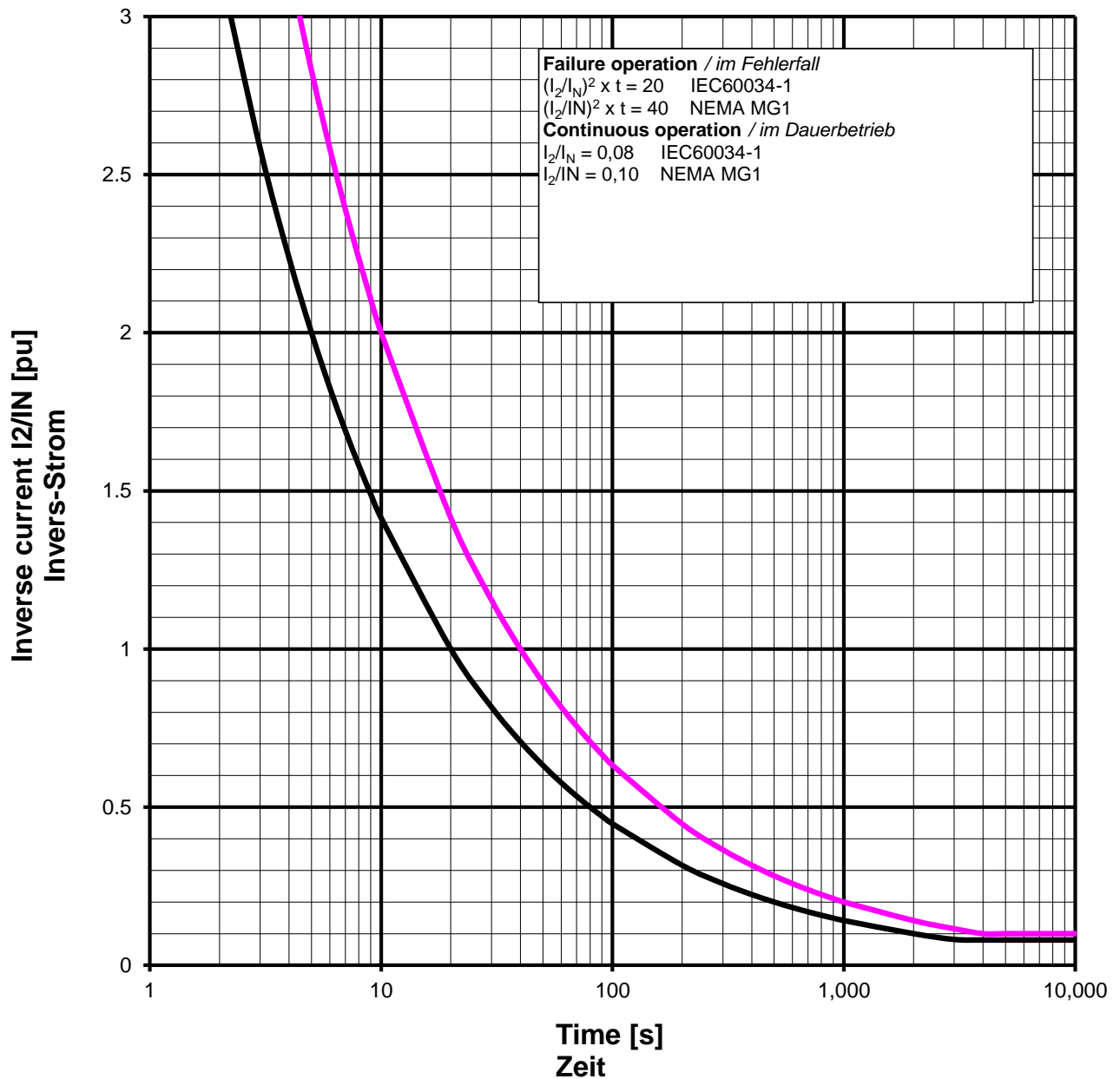
Nominal current  $I_N$ : **4980 A**

Bemessungsstrom

Speed  $n$ : **1500 min<sup>-1</sup>**

Drehzahl

#### Inverse current or unbalanced negative sequence current



Remarks / Notizen:

All data according IEC 60034-1, NEMA MG1



Technische Daten selbstregelnden Drehstrom-Synchrongenerator  
technical data for self regulating three phase alternator

ING-FCD-0112

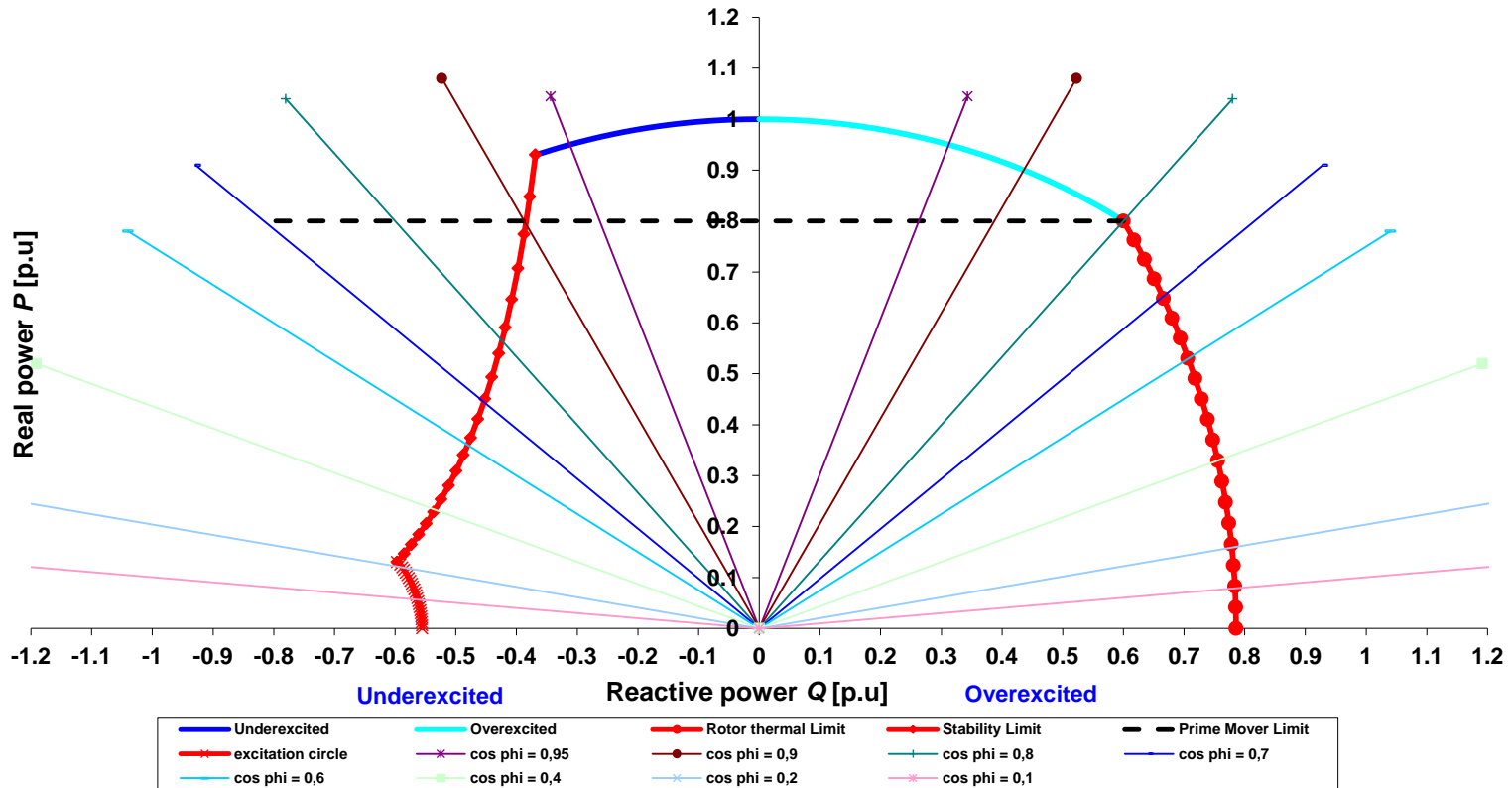
TYPE

DSG 99 K1/4

Projekt:

Order Nr.:

### Capability (P-Q) Diagram



Cummins Generator Technologies

Datum / date:

03/10/2013





Technische Daten selbstregelnden Drehstrom-Synchrongenerator  
 technical data for self regulating three phase alternator

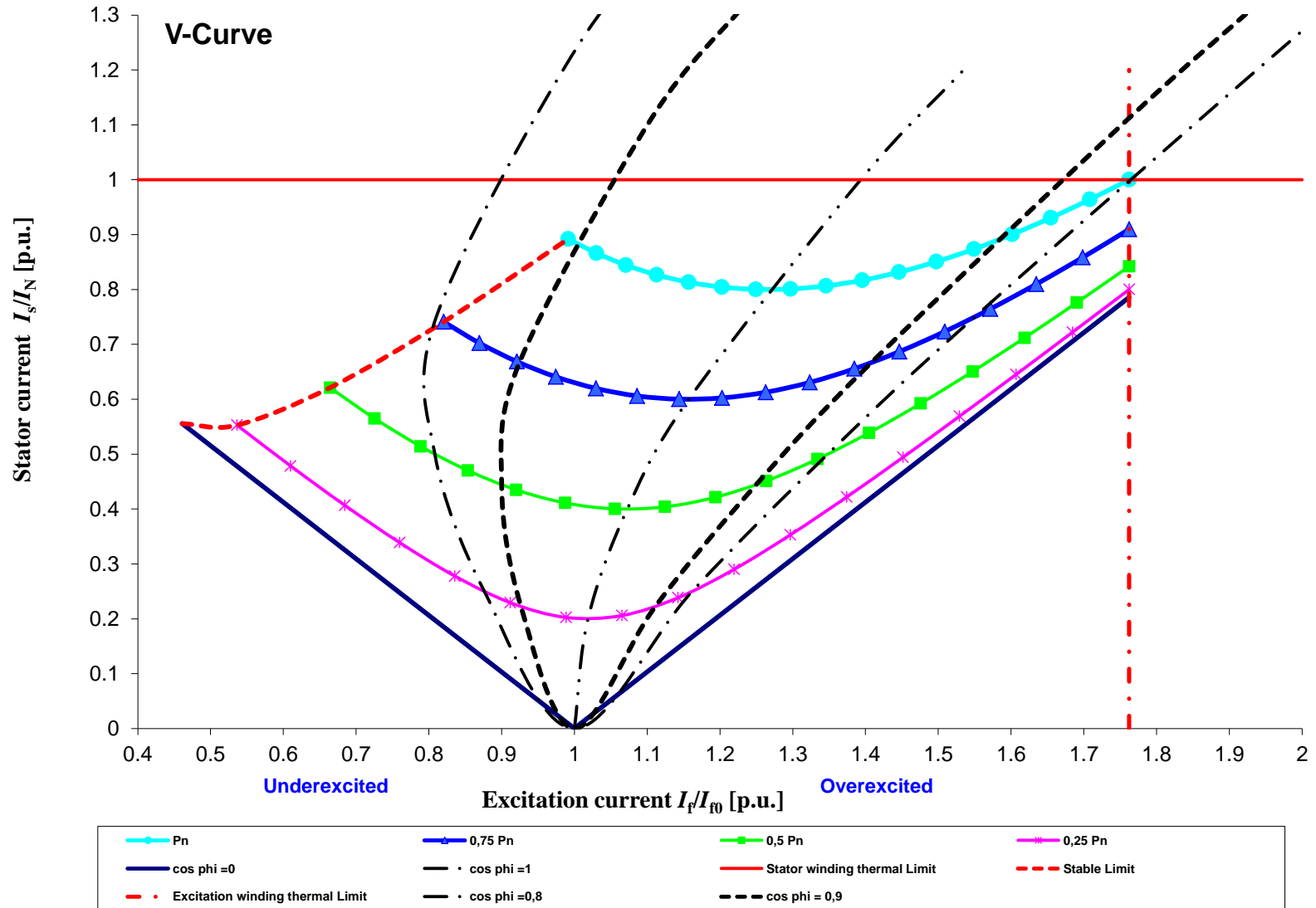
ING-FCD-0112

TYPE

DSG 99 K1/4

Projekt:

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