

	chap.	kind of type test		kind of document	number of document
d)	6.101	Verification of making and breaking capacities	contactor fuse combination	Test report	1174.2080772.751
			make-proof earthing switch	Test report	1174.2080772.750
e)	6.102	Mechanical operation tests	disconnecter	Test report	U4471/006
			make-proof earthing switch	Test report	U4471/006
			withdrawable part	Test report	U4471/007
			interlocks	Test report	U4471/007
f)	6.7	Verification of the protection (IP coding)		Test report	U4462/033
g)	6.104	Tests on non-metallic partitions and shutters		—	n.a.
h)	6.103	Pressure withstand test of gas-filled compartments		—	n.a.
i)	6.8	Tightness tests		—	n.a.
j)	6.106	Internal arcing tests (classification IAC)	busbar compartment	Test report	1174.2080772.497
			switching device compartment	Test report	U4467/028
			connection compartment	Test report	1174.2080772.726
k)	6.9	Electromagnetic compatibility tests (EMC)		Test report	NX/ET/001, 08-E002305-BM-A01

The above mentioned switchgear complies with the standards that are quoted in the particular test documents.

This summary may contain test documents that refer to switchgear with different technical ratings. These test documents are also valid for the above mentioned object.

This summary represents the current status of the NXAIR type test documentation.

Frankfurt am Main, 10 November 2011

Siemens Aktiengesellschaft



Thomas Lange



Dieter Zweng

Siemens AG
Infrastructure and Cities Sector; Management: Roland Busch
Low and Medium Voltage Division; Management: Ralf Christian
Medium Voltage; Management: Wolfgang Heuring

Mozartstr. 31c
91052 Erlangen
Germany

Tel: +49 (9131) 7 0

Siemens Aktiengesellschaft; Chairman of the Supervisory Board: Gerhard Cromme
Managing Board: Peter Loescher, Chairman, President and Chief Executive Officer; Roland Busch, Brigitte Ederer, Klaus Helmrich, Joe Kaeser
Barbara Kux, Hermann Requardt, Siegfried Russwurm, Peter Y. Solmssen, Michael Suess
Registered offices: Berlin and Munich, Germany; Commercial registries: Berlin Charlottenburg, HRB 12300, Munich, HRB 6684
WEEE-Reg.-No. DE 23891322



MANAGEMENT SYSTEM CERTIFICATE

Certificate No.:
134372-2013-AMSO-GER-DAKKS

Initial date:
1995 (ISO 14001)
1997 (ISO 14001)
2008 (BS OHSAS 18001)

Valid:
01.10.2014 - 06.01.2017

This is to certify that the management system of

Siemens AG
Division Energy Management
Medium Voltage & Systems EM MS

Mozartstr. 31c, 91052 Erlangen - Germany

and the sites as mentioned in the Appendix accompanying this Certificate

has been found to conform to management system standard:

ISO 9001:2008
ISO 14001:2004
BS OHSAS 18001:2007

This certificate is valid for the following scope:

Development, Production and Sales of
Medium Voltage Switchgear, Circuit Breakers and Components up to 52 kV,
Low Voltage Switchboards and Busbar Systems; Planning and Execution of
Turnkey Power Supply Systems

Place and date:
Essen, 01.10.2014



Deutsche
Akkreditierungsstelle
D-20419 Hamburg

For the Accredited Unit:
DNV GL Business Assurance Zertifizierung
und Unternehmensaudit GmbH

75 702

Thomas Beck
Technical Manager

This certificate replaces the issue of 07.01.2014.

For the Accredited Unit:
DNV GL Business Assurance Zertifizierung
und Unternehmensaudit GmbH, Schwanengraben 14, 43129 Essen, Germany.
Tel.: +49 201 7246 222, www.dnv-gl.de

Loss of effectiveness of certification is not an indication of any failure of the Certificate holder.
ACCREDITED UNIT: DNV GL Business Assurance Zertifizierung und Unternehmensaudit GmbH, Schwanengraben 14, 43129 Essen, Germany.
Tel.: +49 201 7246 222, www.dnv-gl.de

Certificate No.: 134372-2013-AMSO-GER-DAKKS
Place and date: Essen, 01.10.2014

Appendix to Certificate

Locations included in the certification are as follows:

Site Name	Site Address	Site Scope
Siemens AG Division Energy Management Medium Voltage & Systems EM MS	Mozartstr. 31c D-91052 Erlangen	Sales of Medium Voltage Switchgear, Circuit Breakers and Components up to 52 kV, Low Voltage Switchboards and Busbar Systems; Planning and Execution of Turnkey Power Supply Systems
Siemens AG Division Energy Management Medium Voltage & Systems EM MS	Carl-Benz-Str. 22 D-60386 Frankfurt	Development of Gas and Air Insulated Medium Voltage Switchgear up to 52 kV, Production of Gas Insulated Medium Voltage Switchgear up to 52 kV
Siemens AG Division Energy Management Medium Voltage & Systems EM MS	Nonnendammallee 104 D-13629 Berlin	Development and Production of Medium Voltage Switchgear, Circuit Breakers and Components up to 52 kV
Siemens AG Division Energy Management Medium Voltage & Systems EM MS	Südstr. 74 D-04178 Leipzig	Sales, Development, Production and Service of Low Voltage Switchboards
Siemens AG Division Energy Management Medium Voltage & Systems EM MS	Frohnhoferstr. 103-107 D-50827 Köln	Sales, Development and Production of Busbar Systems
Siemens, s.r.o. o.z. Busbar Trunking Systems	Nádražní 30 CZ-78965 Mohelnice	Development and Production of Busbar Systems

Loss of effectiveness of certification is not an indication of any failure of the Certificate holder.
ACCREDITED UNIT: DNV GL Business Assurance Zertifizierung und Unternehmensaudit GmbH, Schwanengraben 14, 43129 Essen, Germany.
Tel.: +49 201 7246 222, www.dnv-gl.de

Превод от английски език

DNV-GL

СЕРТИФИКАТ ЗА СИСТЕМА ЗА УПРАВЛЕНИЕ

Сертификат №: 134373-2013-AHSO-GER-DMS
Начална дата: 1995 (ISO 9001)
1997 (ISO 14001)
2008 (BS OHSAS 18001)
Валиден до: 01.10.2014 г. - 01.01.2017 г.

С настоящото се удостоверява, че за системата за управление на Сименс АД "Енергийно управление" Средно напрежение и системи EM MS ул. Моцарт 31с, 91052 Ерланген - Германия и обектите, споменати в Приложениято, придружаващо този Сертификат е установено, че съответстват на стандарта за системи за управление: ISO 9001:2008 ISO 14001:2004 BS OHSAS 18001:2007

Този сертификат е валиден за следния обхват: Разработка, производство и продажби на разпределителни уреди, преключачи и компоненти средно напрежение до 52 kV, разпределителни табла и шинни системи ниско напрежение; планиране и изпълнение на системи за електрозахранване "до ключ"

Място и дата: Бонн, 01.10.2014 г.
За Акредитираното лице: DNV GL Business Assurance Zertifizierung und Umweltgütesicher GmbH
Адрес: - не се чете!
Томас Бек
Телемачен директор

Този сертификат замества издаването от 07.01.2014 г.

Настоящият документ, използван в Споразумението за сертификация, може да направи този Сертификат невалиден. АНОДИРАНО ЗЕЛНО DNV GL Business Assurance Zertifizierung und Umweltgütesicher GmbH, Шверинсдорф 14, 43329 Бонн, Германия. Тел.: +49 201 7296 222. www.dnvgl.de/3535353535

ВЯРНО
РИГИНАЛА



Handwritten signature

DNV-GL

Сертификат №: 134373-2013-AHSO-GER-DMS
Място и дата: Бонн, 01.10.2014 г.

Приложение към Сертификат

Местата, включени в сертификацията, са следните:

Име на обекта	Адрес на обекта	Обхват на обекта
Сименс АД Отделение "Енергийно управление" Средно напрежение и системи EM MS	ул. Моцарт 31с 91052 Ерланген Германия	Продажби на разпределителни уреди, преключачи и компоненти средно напрежение до 52 kV, разпределителни табла и шинни системи ниско напрежение; планиране и изпълнение на системи за електрозахранване "до ключ"
Сименс АД Отделение "Енергийно управление" Средно напрежение и системи EM MS	ул. Карл Бенц 22 80386 Франкфурт Германия	Разработка на газово и въздушно изолирани разпределителни уреди средно напрежение до 52 kV, производство на газово изолирани разпределителни уреди средно напрежение до 52 kV
Сименс АД Отделение "Енергийно управление" Средно напрежение и системи EM MS	Нонендамалее 104 13629 Берлин Германия	Разработка и производство на разпределителни уреди, преключачи и компоненти средно напрежение до 52 kV
Сименс АД Отделение "Енергийно управление" Средно напрежение и системи EM MS	Зоденрасе 74 04178 Тайплиц Германия	Продажби, разработка, производство и обслужване на разпределителни табла ниско напрежение
Сименс АД Отделение "Енергийно управление" Средно напрежение и системи EM MS	Фронхофенсра 103-107 50827 Кюлн Германия	Продажби, разработка и производство на шинни системи
Сименс ООД Завод за шинни магистрални системи	Надрасни 30 78985 Мохелнзе Чехия	Разработка и производство на шинни системи

Настоящият документ, използван в Споразумението за сертификация, може да направи този Сертификат невалиден. АНОДИРАНО ЗЕЛНО DNV GL Business Assurance Zertifizierung und Umweltgütesicher GmbH, Шверинсдорф 14, 43329 Бонн, Германия. Тел.: +49 201 7296 222. www.dnvgl.de/3535353535

Подписаният Теодор Пламенов Иванов удостоверява верността на извършения от мен превод от английски на български език на приложените документи - Сертификат за система за управление. Преводът се състои от 2 (две) страници.

Преводчик: Теодор Пламенов Иванов

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THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

IQNet and
TSE

hereby certify that the organization
SIEMENS SAN. VE TIC. A.Ş.

MERKEZ: KARTAL YERLEŞKESİ YAKAKIÇ CADDESİ NO:111
34870 KARTAL-İSTANBUL

ŞUBE: GEBZE YERLEŞKESİ GEBZE ORGANİZE SANAYİ BÖLGESİ 1000.CAD. NO:1004
41480 GEBZE- İSTANBUL / TÜRKİYE

has implemented and maintains an
ENVIRONMENTAL MANAGEMENT SYSTEM
which fulfills the requirements of the following standard

TS EN ISO 14001:2004

Scope of the certificate is given in annex.

Date of Revision: 09-10-2014

Date of Certificate: 09-10-2014

Valid Until: 09-10-2017

Registration Number : TR-ÇY-027-05/98



Michael Drechsel
President of IQNet

Hakan DENİZ
Istanbul Certification Director

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*

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Annex to IQNET Certificate Number :TR-ÇY-027-05/98

Name and Address of the certified organization

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34870 KARTAL-İSTANBUL

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İSTANBUL / TÜRKİYE

Scope of the Certificate

DESIGN, PRODUCTION, SALES AND AFTER SALES
SERVICES OF

ELECTRICAL AND ELECTRONICAL PRODUCTS AND SOLUTIONS

4

341410231410092577

TSE TURKISH STANDARDS INSTITUTION TSE

This annex is only valid in connection with the above-mentioned certificate



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34870 KARTAL-İSTANBUL

ŞUBE: GEBZE YERLEŞKESİ GEBZE ORGANİZE SANAYİ BÖLGESİ 1000.CAD. NO:1004
41480 GEBZE- KOCAELİ / TÜRKİYE

has implemented and maintains an
OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM

which fulfills the requirements of the following standard

TS 18001:2008



Scope of the certificate is given in annex.

Date of Revision: 21-11-2012

Date of Certificate: 21-11-2012

Valid Until: 21-11-2015

Registration Number : TR-OY-096-09/05



Michael Drechsel

Michael Drechsel
President of IQNet

Mesut DÖRÜ

Mesut DÖRÜ
Vice System Certification Center

IQNet Türkiye:
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NSAI Ireland, PCBC Poland, Quality Austria, BQ Russia, SII Israel, BQ Slovakia, SHAK UAS International Malaysia,
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Name and Address of the certified organization

SIEMENS SAN. VE TİC. A.Ş.

MERKEZ: KARTAL YERLEŞKESİ YAKACIK CADDESİ NO:111
34870 KARTAL-İSTANBUL

ŞUBE: GEBZE YERLEŞKESİ GEBZE ORGANİZE SANAYİ BÖLGESİ 1000.CAD.
NO:1004 41480 GEBZE- KOCAELİ / TÜRKİYE

Scope of the Certificate

DESIGN, PRODUCTION, SALES AND AFTER SALES SERVICES OF
- ELECTRICAL AND ELECTRICAL PRODUCTS AND SOLUTIONS

af 12

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TURKISH STANDARDS INSTITUTION



ВЯРНО С
РИГИНАЛА

TSE

İŞ SAĞLIĞI ve GÜVENLİĞİ YÖNETİM SİSTEMİ BELGESİ

OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM CERTIFICATE



TÜRK STANDARDLARI ENSTİTÜSÜ
bu belge ile

SIEMENS SAN. VE TİC. A.Ş.
MERKEZ: KARTAL YERLEŞKESİ YAKACIK CADDESİ NO:111
34870 KARTAL-İSTANBUL
ŞUBE: GEBZE YERLEŞKESİ GEBZE ORGANİZE SANAYİ BÖLGESİ
1000.CAD. NO:1004 41480 GEBZE-
KOCAELİ / TÜRKİYE

kuruluşunun TS 18001:2008 şartlarına uygun bir İŞ SAĞLIĞI ve
GÜVENLİĞİ YÖNETİM SİSTEMİNE sahip olduğunu onaylar.

Belge kapsamı Ek'te verilmiştir



TÜRK STANDARDLARI ENSTİTÜSÜ
TURKISH STANDARDS INSTITUTION

Sistem Belgelendirme ve Komiteler Müdürü
System Certification and Committees Director

[Signature]
Mustafa ÖLÇER

Sistem Belgelendirme Merkezi Başkanı V.
Vice System Certification Center

[Signature]
Metin DURU

Bu belge, Türk Standardları Enstitüsü'nün kuruluşu hakkındaki 132 sayılı kanun uyarınca verilmiştir.
This certificate is issued in accordance with the Law No. 132 establishing Turkish Standards Institution.

TURKISH STANDARDS INSTITUTION
hereby certifies that the organization

SIEMENS SAN. VE TİC. A.Ş.
MERKEZ: KARTAL YERLEŞKESİ YAKACIK CADDESİ NO:111
34870 KARTAL-İSTANBUL
ŞUBE: GEBZE YERLEŞKESİ GEBZE ORGANİZE SANAYİ BÖLGESİ
1000.CAD. NO:1004 41480 GEBZE-
KOCAELİ/TÜRKİYE

has an OCCUPATIONAL HEALTH and SAFETY
MANAGEMENT SYSTEM which fulfills the requirements
of the TS 18001:2008

Scope of the certificate is given in annex

Belge No / Certificate No OY-096-09/05
Belge Tarihi / Date of Certificate 21.11.2012
Geçerlilik Tarihi / Valid Until 21.11.2015
Revizyon Tarihi / Date of Revision 21.11.2012

Bu belge belgelendirme şartlarına uygunluk sağlandığı
sürece geçerlidir. This certificate is valid provided that
compliance with the certification requirement is maintained.

TSE

İŞ SAĞLIĞI ve GÜVENLİĞİ YÖNETİM SİSTEMİ BELGESİ

OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM CERTIFICATE



EK / ANNEX

Belge No / Certificate No: OY-096-09/05

Belgeli Kuruluş Adı, Adresi

Name and Address of the certified organization

Belge Kapsamı:

TS 18001:2008

- ELEKTRİK VE ELEKTRONİK ÜRÜN VE ÇÖZÜMLERİNİN

TASARIM, ÜRETİM, SATIŞ VE SATIŞ SONRASI HİZMETLERİ
SUNUMU



Belge Tarihi / Date of Certificate: 21/11/2012

SIEMENS SAN. VE TİC. A.Ş.
MERKEZ: KARTAL YERLEŞKESİ YAKACIK CADDESİ NO:111
34870 KARTAL-İSTANBUL
ŞUBE: GEBZE YERLEŞKESİ GEBZE ORGANİZE SANAYİ BÖLGESİ
1000.CAD. NO:1004 41480 GEBZE-
KOCAELİ / TÜRKİYE

Scope of the Certificate:

TS 18001:2008

DESIGN, PRODUCTION, SALES AND AFTER SALES
SERVICES OF

- ELECTRICAL AND ELECTRONICAL PRODUCTS AND
SOLUTIONS

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BRPHO C

ALFAN İNHAJIA

[Handwritten signature]



KALİTE YÖNETİM SİSTEMİ BELGESİ

QUALITY MANAGEMENT SYSTEM CERTIFICATE

Partner of



TÜRK STANDARDLARI ENSTİTÜSÜ
bu belge ile

SIEMENS SAN. VE TİC. A.Ş.
MERKEZ: KARTAL YERLEŞKESİ YAKACIK CADDESİ NO:111
34870 KARTAL-İSTANBUL
ŞUBE: GEBZE YERLEŞKESİ GEBZE ORGANİZE SANAYİ BÖLGESİ
1000.CAD. NO:1004 41480 GEBZE-
KOCAELİ / TÜRKİYE

Kuruluşunun TS EN ISO 9001:2008 şartlarına uygun bir KALİTE
YÖNETİM SİSTEMİNE sahip olduğunu onaylar.

Belge kapsamı Ek'te verilmiştir



TURKISH STANDARDS INSTITUTION
hereby certifies that the organization

SIEMENS SAN. VE TİC. A.Ş.
MERKEZ: KARTAL YERLEŞKESİ YAKACIK CADDESİ NO:111
34870 KARTAL-İSTANBUL
ŞUBE: GEBZE YERLEŞKESİ GEBZE ORGANİZE SANAYİ BÖLGESİ
1000.CAD. NO:1004 41480 GEBZE-
KOCAELİ/TÜRKİYE

has a **QUALITY MANAGEMENT SYSTEM** which fulfills
the requirements of the **TS EN ISO 9001:2008**

Scope of the certificate is given in annex

TÜRK STANDARDLARI ENSTİTÜSÜ

TURKISH STANDARDS INSTITUTION

Sistem Belgelendirme Müdürü
System Certification Director

Mustafa Ölçer
Mustafa ÖLÇER

Personel ve Sistem Belgelendirme Merkezi Başkanı
Head of Personnel and System Certification Center

Aykut Kırbaş
AYKUT KIRBAŞ

Belge No /Certificate No
KY-001-03/KG-91/09-R
Belge Tarihi / Date of Certificate
01.06.2012
Geçerlilik Tarihi / Valid Until
01.06.2015
Revizyon Tarihi / Date of Revision
01.06.2012

Türk Standardları Enstitüsü Türk Akreditasyon Kurumu TÜRKAK tarafından akredite edilmiştir.
Turkish Standards Institution, has been accredited by the Turkish Accreditation Agency TÜRKAK.

Bu belge belgelendirme şartlarına uygunluk sağlandığı
sürecede geçerlidir. This certificate is valid provided that
compliance with the certification requirement is maintained.

KALİTE YÖNETİM SİSTEMİ BELGESİ

QUALITY MANAGEMENT SYSTEM CERTIFICATE

EK / ANNEX

Partner of



Türk Akademi
TS EN ISO/IEC 17021
AB-0002.YS

Belge No / Certificate No: KY-001-03/K.G-91/09-R

Selgeli Kuruluş Adı, Adresi

Name and Address of the certified organization

Belge Kapsamı:

TS EN ISO 9001:2008

- ENDÜSTRİYEL OTOMASYON, BİNA TEKNOLOJİLERİ, MOTOR VE SÜRÜCÜ TEKNOLOJİLERİ
- ENERJİ ÜRETİMİ, İLETİMİ VE DAĞITIMI
- ENERJİ, SU, GAZ SİSTEMLERİ "SCADA" VE OTOMASYON UYGULAMARI İÇİN ORÜN ÇÖZÜM VE SİSTEMLERİNİN

TASARIMI, ÜRETİMİ, MÜHENDİSLİK, PROJE YÖNETİMİ, DEĞEREYELME, SATIŞ VE SATIŞ SONRASI SERVİS HİZMETLERİ

SİDÜMU

Belge Tarihi / Date of Certificate: 01/06/2012

SIEMENS SAN. VE TİC. A.Ş.
MERKEZ: KARTAL YERLEŞKESİ YAKACIK CADDESİ NO:111
34870 KARTAL-İSTANBUL
ŞUBE: GEBZE YERLEŞKESİ GEBZE ORGANİZE SANAYİ BÖLGESİ
1000.CAD. NO:1004 41480 GEBZE-
KOCAELİ /TÜRKİYE

Scope of the Certificate:

TS EN ISO 9001:2008

DELIVERY OF

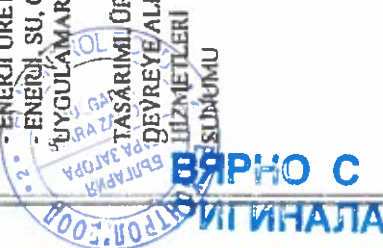
DESIGN, PRODUCTION, ENGINEERING, PROJECT
MANAGEMENT COMMISSIONING SALES AND AFTER
SALES SERVICES OF

PRODUCTS, SOLUTIONS AND SYSTEMS FOR

- INDUSTRIAL AUTOMATION BUILDING
TECHNOLOGIES AND DRIVES TECHNOLOGIES

- POWER GENERATION, TRANSMISSION AND
DISTRIBUTION

"SCADA" AND AUTOMATION APPLICATIONS FOR
ENERGY, WATER AND GAS SYSTEMS



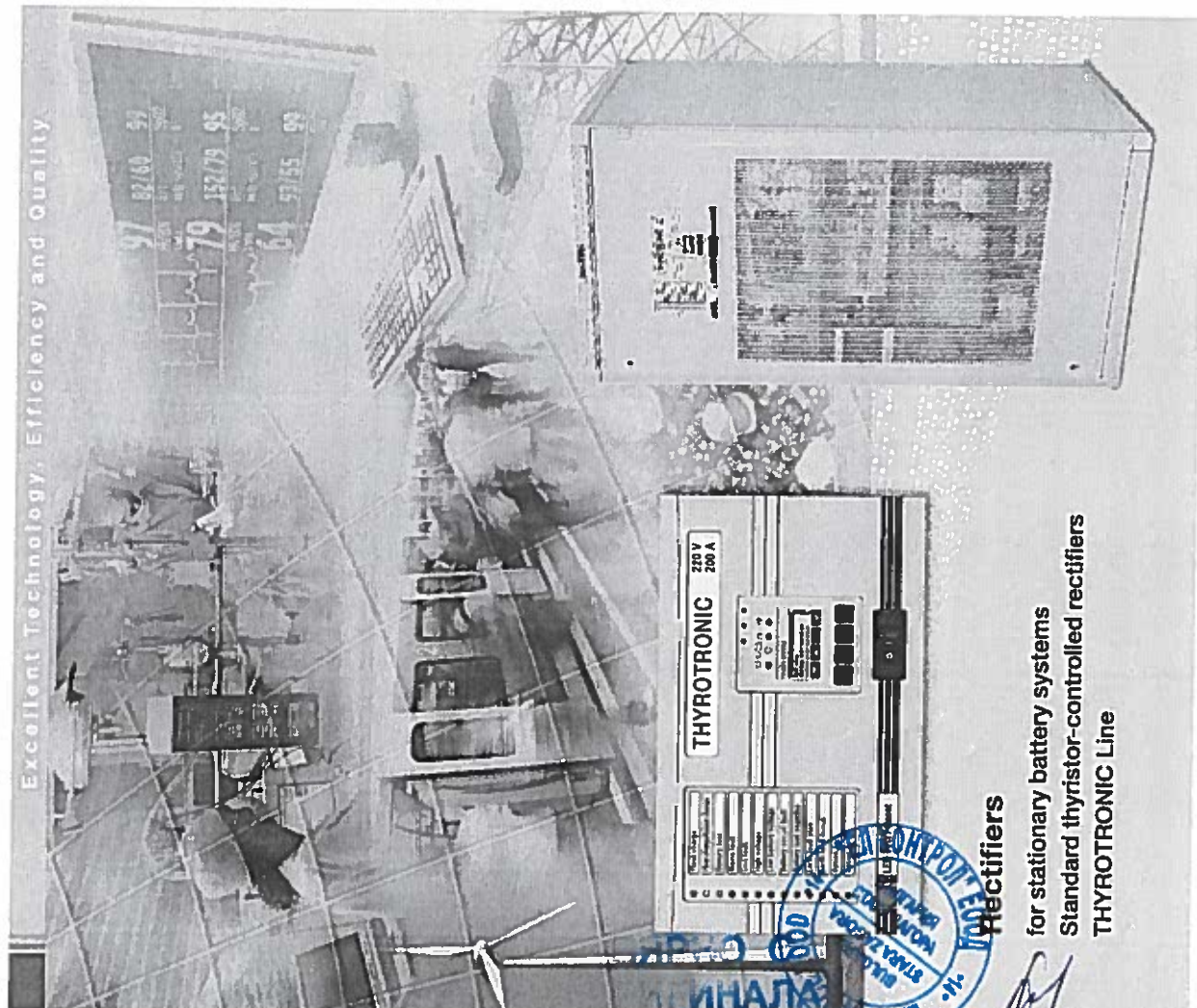
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BENNING

World Class Power Solutions

Excellent Technology, Efficiency and Quality



Rectifiers

for stationary battery systems
Standard thyristor-controlled rectifiers
THYROTRONIC Line

THYROTRONIC rectifier range for stationary back up power supply

General

The protection of electrical load against power failure is often carried out by battery backed up DC power supplies, providing electrical energy to important loads during mains supply, as well as during mains failure.

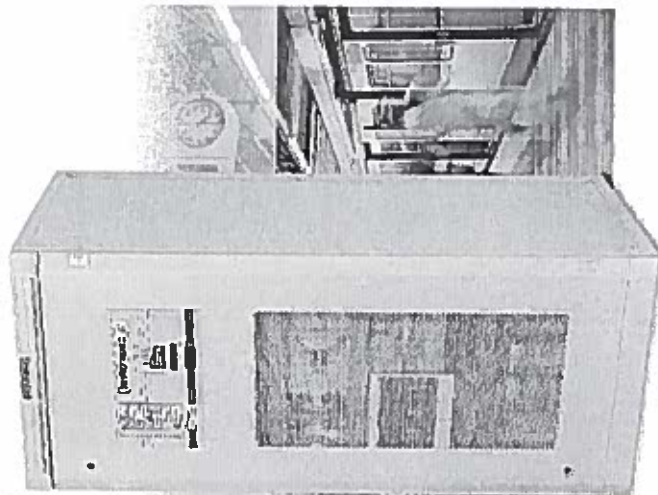


Fig. 1: Thyrotronic

Battery backed up DC power supplies have, over several decades proved extremely reliable and very economical power supplies.

The reliability of a battery backed up DC power supply is defined by the quality of the battery used, as well as the reliable operation of the rectifier.

Range of applications

- Power plants
- substations
- Railway equipment
- Offshore projects
- Oil and gas pipeline systems
- hospitals

The Thyrotronic rectifier range (see picture 1) developed by BENNING is especially qualified for use as battery backed up power supplies and feature very high reliability and a comprehensive monitoring concept.

Thyrotronic rectifiers are operating with a controlled output characteristic (U-I-characteristic line in accordance with DIN 41773).

The output voltage is kept constant to the set value with a permissible deviation of $\pm 0.5\%$ within a load range between 0% and 100% of the unit current.

Mains voltage fluctuations of $\pm 10\%$ and mains frequency fluctuations of $\pm 5\%$ will be controlled automatically.

As an energy storage mainly closed or vented lead acid batteries are used. Nickel-cadmium batteries are used in extreme ambient conditions.

Type table THYROTRONIC rectifier range for multi-purpose use

Nom. voltage [V]	No. of cells P ₀	No. of cells MCA	Output current [A]	Type	Max. voltage [V]	Current constancy [%]	Cabinet type	Weight [kg]
24	12	20	20	E 230 G 24 / 20	230	4,6	WZ 755	30
24	12	20	40	E 230 G 24 / 40	230	9,2	WZ 755	40
24	12	20	60	E 230 G 24 / 60	230	13,8	UC 1566	60
24	12	20	80	E 230 G 24 / 80	230	17,8	UC 1566	75
24	12	20	100	D 400 G 24 / 100	3 x 400	5,5	UC 1566	150
24	12	20	125	D 400 G 24 / 125	3 x 400	6,9	UC 1566	200
24	12	20	160	D 400 G 24 / 160	3 x 400	8,7	UC 1566	240
24	12	20	200	D 400 G 24 / 200	3 x 400	10,8	UC 1566	280
24	12	20	300	D 400 G 24 / 300	3 x 400	19,0	UC 1866	400
24	12	20	400	D 400 G 24 / 400	3 x 400	24,3	PSJ 1596	510
48	24	40	10	E 230 G 48 / 10	230	4,6	WZ 755	30
48	24	40	20	E 230 G 48 / 20	230	9,1	WZ 755	40
48	24	40	30	E 230 G 48 / 30	230	12,3	UC 1566	60
48	24	40	40	E 230 G 48 / 40	230	16,3	UC 1566	75
48	24	40	50	D 400 G 48 / 50	3 x 400	5,9	UC 1566	145
48	24	40	60	D 400 G 48 / 60	3 x 400	6,7	UC 1566	190
48	24	40	80	D 400 G 48 / 80	3 x 400	8,9	UC 1566	230
48	24	40	100	D 400 G 48 / 100	3 x 400	10,8	UC 1566	270
48	24	40	125	D 400 G 48 / 125	3 x 400	11,8	UC 1566	280
48	24	40	160	D 400 G 48 / 160	3 x 400	17,8	UC 1566	340
48	24	40	200	D 400 G 48 / 200	3 x 400	21,9	UC 1866	400
48	24	40	300	D 400 G 48 / 300	3 x 400	32,0	UC 1866	500
48	24	40	400	D 400 G 48 / 400	3 x 400	48,0	PSJ 1896	600
60	30	50	10	E 230 G 60 / 10	230	5,1	WZ 755	30
60	30	50	20	E 230 G 60 / 20	230	10,3	WZ 755	40
60	30	50	30	E 230 G 60 / 30	230	15,3	UC 1566	60
60	30	50	40	E 230 G 60 / 40	230	20,4	UC 1566	75
60	30	50	50	D 400 G 60 / 50	3 x 400	6,8	UC 1566	150
60	30	50	60	D 400 G 60 / 60	3 x 400	8,1	UC 1566	230
60	30	50	80	D 400 G 60 / 80	3 x 400	10,8	UC 1566	280
60	30	50	100	D 400 G 60 / 100	3 x 400	13,5	UC 1566	290
60	30	50	125	D 400 G 60 / 125	3 x 400	17,1	UC 1566	300
60	30	50	160	D 400 G 60 / 160	3 x 400	21,7	UC 1566	350
60	30	50	200	D 400 G 60 / 200	3 x 400	26,5	UC 1866	420
60	30	50	300	D 400 G 60 / 300	3 x 400	40,5	UC 1866	520
60	30	50	400	D 400 G 60 / 400	3 x 400	53,0	PSJ 1896	620
108	54	90	5	E 230 G 108 / 5	230	4,0	WZ 755	30
108	54	90	10	E 230 G 108 / 10	230	8,0	UC 1566	40
108	54	90	15	E 230 G 108 / 15	230	13,2	UC 1566	60
108	54	90	25	D 400 G 108 / 25	3 x 400	6,5	UC 1566	75
108	54	90	30	D 400 G 108 / 30	3 x 400	7,5	UC 1566	95
108	54	90	40	D 400 G 108 / 40	3 x 400	10,0	UC 1566	160
108	54	90	50	D 400 G 108 / 50	3 x 400	12,9	UC 1566	220
108	54	90	60	D 400 G 108 / 60	3 x 400	14,7	UC 1566	260
108	54	90	80	D 400 G 108 / 80	3 x 400	20,0	UC 1566	330
108	54	90	90	D 400 G 108 / 90	3 x 400	21,7	UC 1566	400
108	54	90	125	D 400 G 108 / 125	3 x 400	31,5	UC 1566	450
108	54	90	160	D 400 G 108 / 160	3 x 400	40,0	UC 1866	500
108	54	90	200	D 400 G 108 / 200	3 x 400	50,0	PSJ 1896	520
108	54	90	300	D 400 G 108 / 300	3 x 400	70,0	PSJ 1896	650
108	54	90	400	D 400 G 108 / 400	3 x 400	100,0	PSJ 2288	1100
216	108	180	5	E 230 G 216 / 5	230	9,4	WZ 755	40
216	108	180	10	D 400 G 216 / 10	3 x 400	5,1	UC 1566	60
216	108	180	15	D 400 G 216 / 15	3 x 400	8,0	UC 1566	90
216	108	180	20	D 400 G 216 / 20	3 x 400	9,8	UC 1566	120
216	108	180	25	D 400 G 216 / 25	3 x 400	12,4	UC 1566	220
216	108	180	30	D 400 G 216 / 30	3 x 400	15,2	UC 1566	260
216	108	180	40	D 400 G 216 / 40	3 x 400	21,0	UC 1566	330
216	108	180	50	D 400 G 216 / 50	3 x 400	25,2	UC 1566	400
216	108	180	60	D 400 G 216 / 60	3 x 400	30,5	UC 1566	450
216	108	180	80	D 400 G 216 / 80	3 x 400	40,0	UC 1566	500
216	108	180	100	D 400 G 216 / 100	3 x 400	50,0	UC 1566	620
216	108	180	125	D 400 G 216 / 125	3 x 400	63,0	PSJ 1896	720
216	108	180	160	D 400 G 216 / 160	3 x 400	81,0	PSJ 1896	800
216	108	180	200	D 400 G 216 / 200	3 x 400	100,0	PSJ 2288	1050
216	108	180	300	D 400 G 216 / 300	3 x 400	152,0	PSJ 2288	1300
216	108	180	400	D 400 G 216 / 400	3 x 400	203,0	PSJ 2288	1600

For further charge without notice, other types on request.

THYROTRONIC rectifier range for multi-purpose use

Operation

Lead-acid and nickel-cadmium batteries achieve optimum service life when remaining on float, in a charged condition. The charger floats the battery in a charged state and also supplies the load with power. In the event of mains power failure the battery will then supply the load its required power. This is called "parallel operation" (see fig. 2).

With substantially discharged batteries, the rectifier unit at first operated in the 1-branch of the U-characteristic line, whereby the charging current for the batteries results from the difference between the nominal current of the rectifier unit and the load current.

When the set output voltage of the rectifier unit (U-branch) has been reached, the unit is changed to constant voltage charging (see fig. 3).

Switching the charge characteristic, from float charging (e.g. 2.23 V/cell with lead-acid batteries) to boost charging (2.4 V/cell with lead-acid batteries) gives an accelerated recharge which can be manual, dependent on voltage or dependent on voltage and time.

After the battery has been fully charged, a small charge current flows (approx. 0.3 mA to 1 mA per 1 Ah) to balance the internal losses of the battery.

The required autonomy is taken into consideration for calculating the battery size. The standby times vary depending on type of load and mains conditions.



Fig. 2: Standby parallel operation

Typical values: Depending on type of load and mains conditions

- 10 – 30 minutes
- for EDP-systems
- 1 – 3 hours
- energy supply
- process control
- rail way
- air ports
- hospitals
- 2 – 10 hours
- telecommunication systems
- oil and gas industry

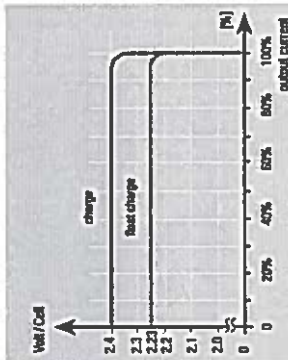


Fig. 3: Charging characteristic for lead-acid batteries in accordance with DIN 41773

Rectifier series Thyrotronic

The Thyrotronic series consists mainly of a thyristor-controlled power unit and a microprocessor-controlled monitoring and control unit.

The following main components are included:

- mains input with contactor
- mains transformer with separate windings
- fully controlled 6 pulse three phase bridge with semi conductor protection fuse (working primarily as battery inverse polarity protection)
- smoothing chokes and capacitor bank to reduce ripple
- control unit with digital setpoint setting
- digital monitoring
- display and operation unit with graphical LCD display on the front door (see picture 5)
- MFI fuses loaded battery circuit breaker
- 2 pol MFI load circuit breaker to be populated with fuses or links for load circuit

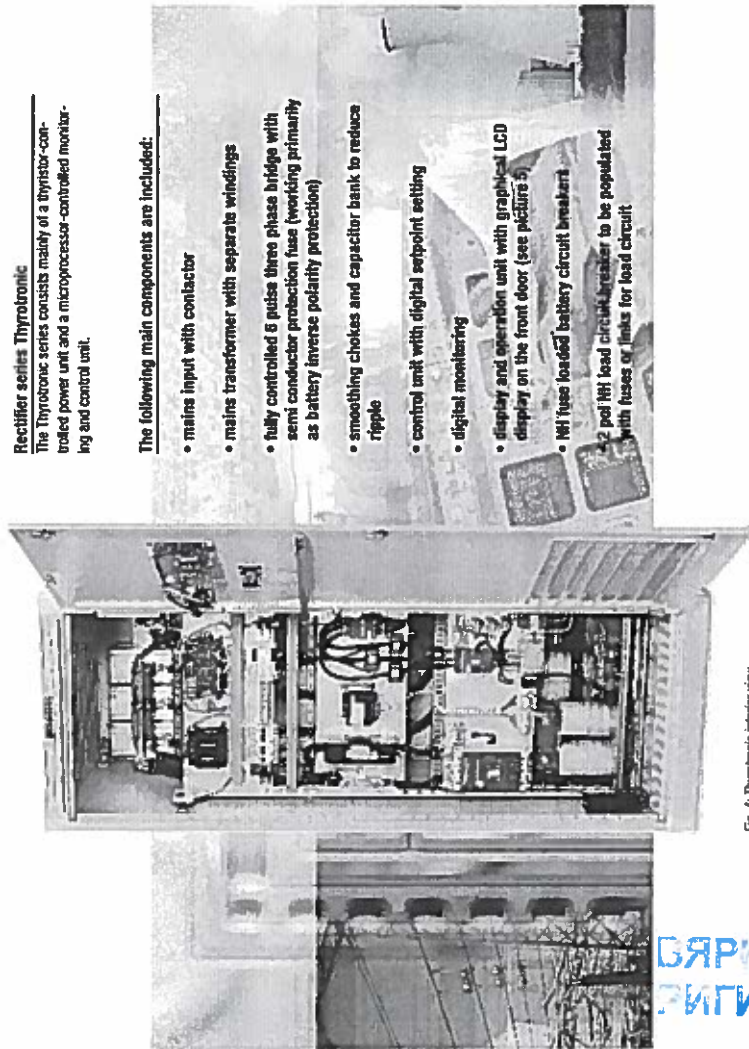
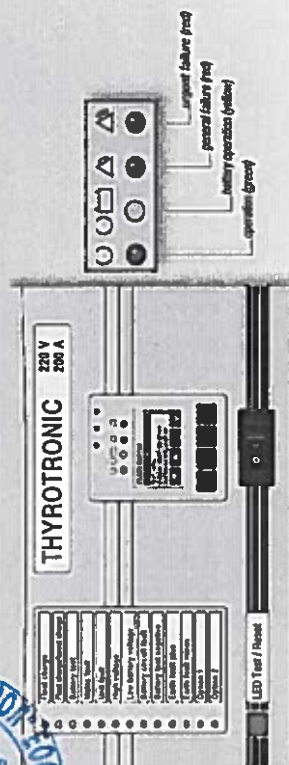


Fig. 4: Thyrotronic interior view

Display and operation unit (see picture 5)

The display and operation unit mounted on the front door of the Thyrotronic features a graphical LCD display to indicate the status and the measurements in plain text, as well as 17 LEDs controlled by the monitoring and control unit.



The 4 LEDs integrated in the display above the push buttons are linked to fixed functions. Two spare LEDs can be linked to any external monitoring units.

THYROTRONIC

comprehensive alarm and monitoring concept

Functions of the signalling and monitoring unit:

In the rectifiers of the Thyrotronic range a very large monitoring concept with the following functions is included as standard:

Mains monitoring

In case of a mains failure, an electronic regulator block is initiated and the LED and the "mains failure relay" will be activated. If the mains voltage returns the unit is automatically switched on after a set time.

Charger output monitoring

The charger output monitoring is a current-dependent low voltage monitoring and monitors the U-characteristic of the rectifier unit.

If the charger output falls below a set value of 2.1 V/cell and the output current falls below 90% of the rated current the alarm will activate and indicate "unit fault". The corresponding LED and the common relay will be activated.

High voltage monitoring

If the output voltage rises too high (value is adjustable due to internal or external interference, over 20 mV), the impulses blocking will be activated and the output voltage will be set to zero.

This high voltage monitoring works as dynamic monitoring with an automatic reset. The monitoring activates 4 times within a period of 30 seconds. The pulse indicator will be disconnected, the LED "high voltage" and common relay will be activated.

Low battery voltage

If the battery voltage falls below a set value, e.g. 1.8 V/cell (value adjustable) during discharge in a case of mains failure, the alarm "low battery voltage" will appear. LED and common alarm will be activated.

Battery circuit test

The battery circuit of the power supply system is tested cyclically every 24 hours. For this, the rectifier output voltage is dropped down to 1.9 V/cell for a period of 5 sec. and, as a result, the battery is discharged. At the same time, the battery voltage is checked. If the battery voltage drops above 1.9 V/cell, the battery circuit has no fault. If it falls below the limiting value, a "battery circuit fault" will be indicated and the LED as well as the common fault signalling relay will be activated. - Caution! - It is not intended that this test should replace battery circuit monitoring!

Battery availability test

During the battery availability test the rectifier output voltage will be dropped and the battery will be discharged as is the case during the battery circuit test. The battery will be discharged down to an adjustable minimum voltage limit during an adjustable time. These limits depend on the proportional battery capacity withdrawn during the discharge and can be taken from the discharging curves of the connected battery.

If, during the availability test, the values fall below the adjusted limits, the message "battery test negative" will be indicated by the corresponding LED and the common fault signalling relay.

After the test the rectifier automatically switches back to boost charge or floating charge.

Earth fault monitoring

The earth fault monitoring function monitors the impedance resistance of the DC-output to earth. Plus and minus are measured and monitored alternately. If the insulation resistance falls below the adjusted value (adjustable from 100 kOhm to 1 MOhm), this will be indicated by the LED and the common alarm.

PM Compensation

With PM Compensation it is possible to compensate for the voltage drop on the cable between rectifier and battery. The length of cable length and cross-sections are taken into account.

Programmable float/boost/charge change over
If the battery voltage (measured by means of an internal reference) falls below a set value and the output current is above a set value, the rectifier will automatically switch to boost charge. After the boost charge voltage (current) has been reached and after decreasing to < 90%, a time delay will be activated. Upon expiry of the set time (0 to 45 min) the rectifier will automatically be switched back to float charge.

The automatic charging can be switched off so that only a manual switch-over via the plastic key board on the front panel is possible. Switching back to float charge can be done manually as well. If this is not done, the controller will switch back as in the case of automatic charging.

The switch-over to boost charge can be blocked by an external contact or a fused bridge on the controller.

Equalise charge stage

It is possible to switch to an equalise charge stage via a switch on the front panel. Here the voltage limitation will be abolished and the nominal unit current will be reduced to 20% (adjustable from 20-30). An equalise and commissioning charge follows with an I-characteristic up to the final charge voltage of the battery.

After switching to equalise charge, a timer automatically switches back to the float charge on expiry of the set time (16 hours to 72 hours).

Using an external contact or a fused bridge at the regulator, the equalise charge can be blocked and a switch over to the I-characteristic can be prevented.

Load sharing in parallel operation

Due to an internal bus connection between several rectifiers an active load sharing of $\pm 10\%$ is possible.

THYROTRONIC technical data

Technical data

Mains input	
Input voltage	(VAC) 230 ± 10 % 1-phase 3x400 ± 10 % 3-phase
Input current	(A) see type table
Frequency	(Hz) 50 ± 5 %
Power factor	-0.83 at nominal mains voltage and float charging

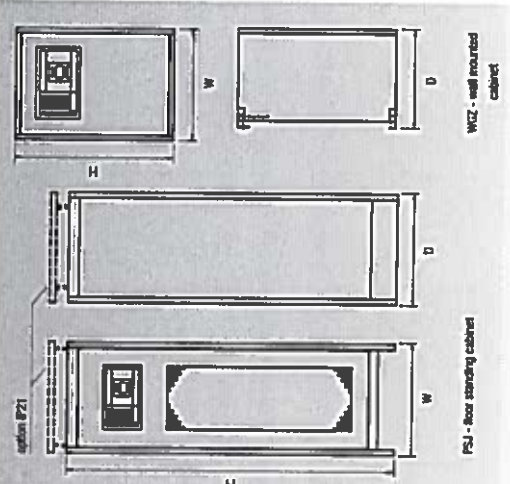
Rectifier output	
Output voltage	(VDC) 24, 48, 60, 110, 125, 220
Output current	(A) see type table
Output current adjustment range	(%) 50 - 100
Rectifier current limit	(%) 0 - 50 battery charging
Current limit	(%) 0 - 50 battery charging
Current accuracy	(%) ± 2

Characteristics	
Charging current	(A) 0.1 and 0.2
Float voltage	(VDC) 2.4 lead acid battery 1.55 NiCd battery
Float voltage	(VDC) 2.23 lead acid battery 1.40 NiCd battery
Equalize voltage	(VDC) 2.7 lead acid battery 1.7 NiCd battery
Output voltage adjustment range	(%) ± 5

Options	
Interface	M000 Bus Profibus additional relay contacts
Higher IP protection	
Counteracts	
Analogue measuring instruments	
Additional monitoring components	

Cabinet type	Dimensions (mm)		
	H	W	D
WZ2	755	758	534
PSJ	1564	1500	600
UC/PSJ	1566	1500	600
UC/PSJ	1866	1800	600
PSJ	1896	1800	900
PSJ	2268	2200	800
PSJ	221208	2200	1200

WZ2 - wall mounted cabinet
PSJ - floor standing cabinet
UC/PSJ - floor standing cabinet



Cabinet type	Dimensions (mm)		
	H	W	D
WZ2	755	758	534
PSJ	1564	1500	600
UC/PSJ	1566	1500	600
UC/PSJ	1866	1800	600
PSJ	1896	1800	900
PSJ	2268	2200	800
PSJ	221208	2200	1200

WZ2 - wall mounted cabinet
PSJ - floor standing cabinet
UC/PSJ - floor standing cabinet

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MCU 2500 Monitoring and Control System for Telecoms and Industry

Monitoring and Control System MCU 2500

The quantity of IT and telecommunication equipment with related AC and DC power systems has increased dramatically during recent decades.

To handle this rapid growth whilst maintaining system reliability in the face of operation and service cost cutting, power monitoring and control solutions are required.

BENNING's microprocessor based monitoring and control system MCU 2500 offers a user friendly and flexible solution for the integration of AC and DC power systems into a network management system. A great number of MCU 2500 systems are already operating in telecommunication and industrial power systems all over the world.

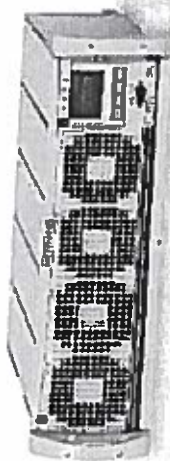


Fig. 1. modular rectifier with MCU 2500



MCU 2500 Features

- Flexible and modular monitoring and control system for AC and DC power solutions
- Front panel with graphic display and keypad for local operation, RS 232 interface for PC connection
- Remote monitoring and control via modem, Ethernet, WEB or SNMP
- The analysis of critical system parameters and alarm events allows quick and efficient service and maintenance activities
- Local and remote battery management optimises the availability and service life of system batteries
- Free configuration of alarm relays
- Digital inputs for monitoring of external site equipment (air-conditioning etc.)
- Integrated data logger stores up to 131070 events
- Messages are date and time stamped

The MCU 2500 provides local monitoring and control of power systems via a keypad and LCD or remote operation via modem, Ethernet or TCP/IP—WEB-adaptor.

Local operation of the MCU 2500 is available via the front door mounted monitoring and operation panel with LCD and push buttons. Local operation is also possible from a standard PC using the Windows-based BENNING monitor/service software.

Password protection guards against unauthorized access.

The capabilities of the MCU 2500 with remote monitoring and control and real-time feedback of critical system parameters and alarm events, helps to cut service and maintenance costs as service engineers can resolve problems on site quicker and more efficiently.

BENNING

World Class Power Solutions

Efficient Technology, Efficiency and Quality



Remote Monitoring System

Modular Design allows flexible Solutions and easy Maintenance

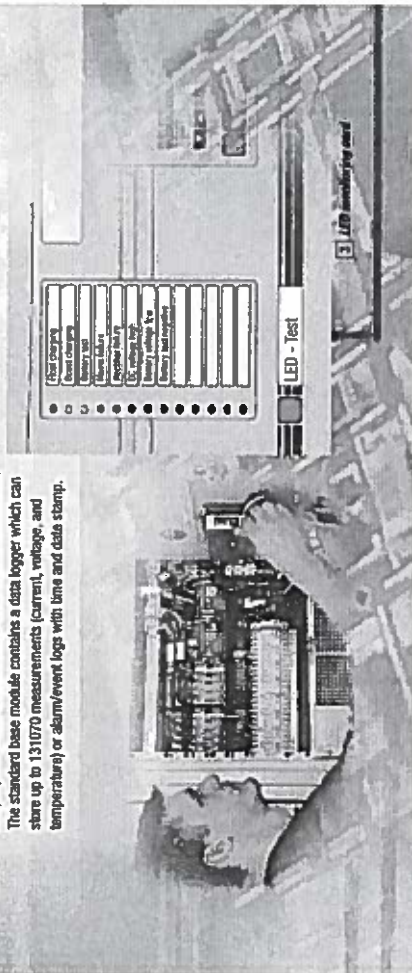
The modular design of the MCU 2500

The MCU 2500 consists of the following modules:

1 Base module

The base module (the heart of the complete MCU system) is connected to the power modules (rectifiers, inverters or DC converters), the measurement and monitoring modules, the operation and monitoring panel and the LED monitoring card.

Interface components for remote operation such as TCP/IP, Adapter, modem or PC are also connected to the base module. The standard base module contains a data logger which can store up to 131070 measurements (current, voltage, and temperature) or alarm/event logs with time and date stamp.



2 Monitoring and operation panel with

LCD display, 4 push buttons and 4 LED's. The front door mounted monitoring and operation panel enables local operation of the power system via either the keypad and LCD or from a standard PC equipped with the BENNING service software.

An RS 232 C cable connects the PC to the RS 232 interface of the MCU 2500 base module.

Measurement and monitoring modules

The following DIN rail mountable modules extend the functionality of the base module.

To optimise the length of measurement cables the mounting position of the measurement modules should be near the measurement points.

4 RELIO-module

The RELIO-module is available in two versions:

- Version 1 with 4 volt-free relay contacts and 8 digital inputs
- Version 2 with 2 volt-free relay contacts, 8 digital inputs and 2 powered outputs

The powered outputs are designed to operate low power contactors (maximum 80 W).

5 TUII-module

The TUII-module incorporates 4 analogue inputs to measure: 1 DC voltage (0 up to 320 V DC), 2 DC current (0 up to 110 mA), 1 Temperature (-30°C up to 80°C). Accuracy of all measurements: ±1%.

Extended Functionality with external Monitoring and Measurement Modules

6 BATTIS module

The BATTIS module provides battery symmetry testing. With five measurement inputs the BATTIS module can test 5 x 12 V battery blocks (60 V battery) or 4 x 12 V battery blocks (48 V battery). Mid point measurement of single 48 V or 60 V batteries is also possible. A special BATTIS module is available for 110V or 220V batteries. (see page 7, fig. A and B)

7 MAC module

The MAC module measures the AC phase voltages of a single phase, two phase or three phase AC mains.

8 SAT-relay module

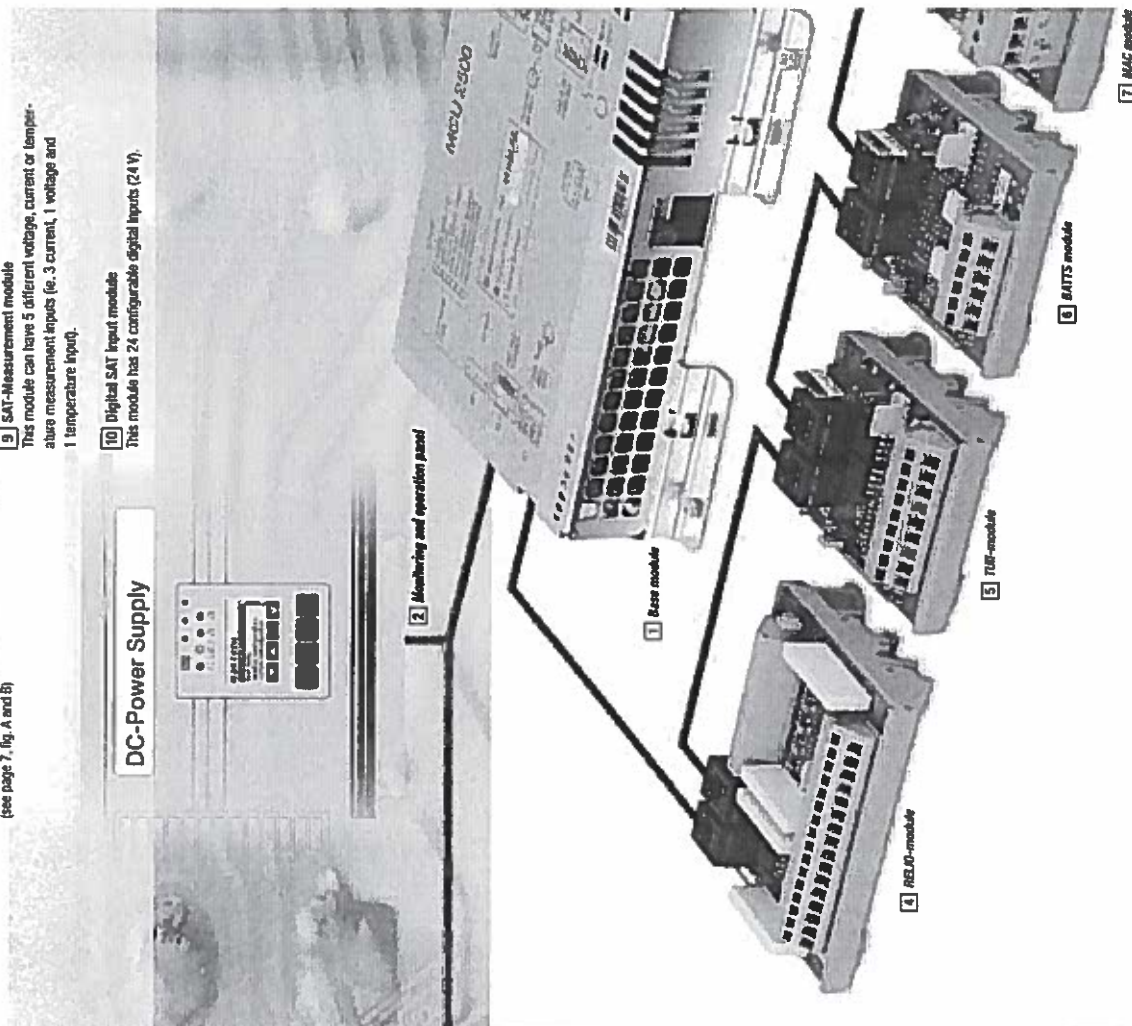
The SAT-relay module contains 8 volt-free relay contacts.

9 SAT-Measurement module

This module can have 5 different voltage, current or temperature measurement inputs (e.g. 3 current, 1 voltage and 1 temperature input).

10 Digital SAT Input module

This module has 24 configurable digital inputs (24 V).



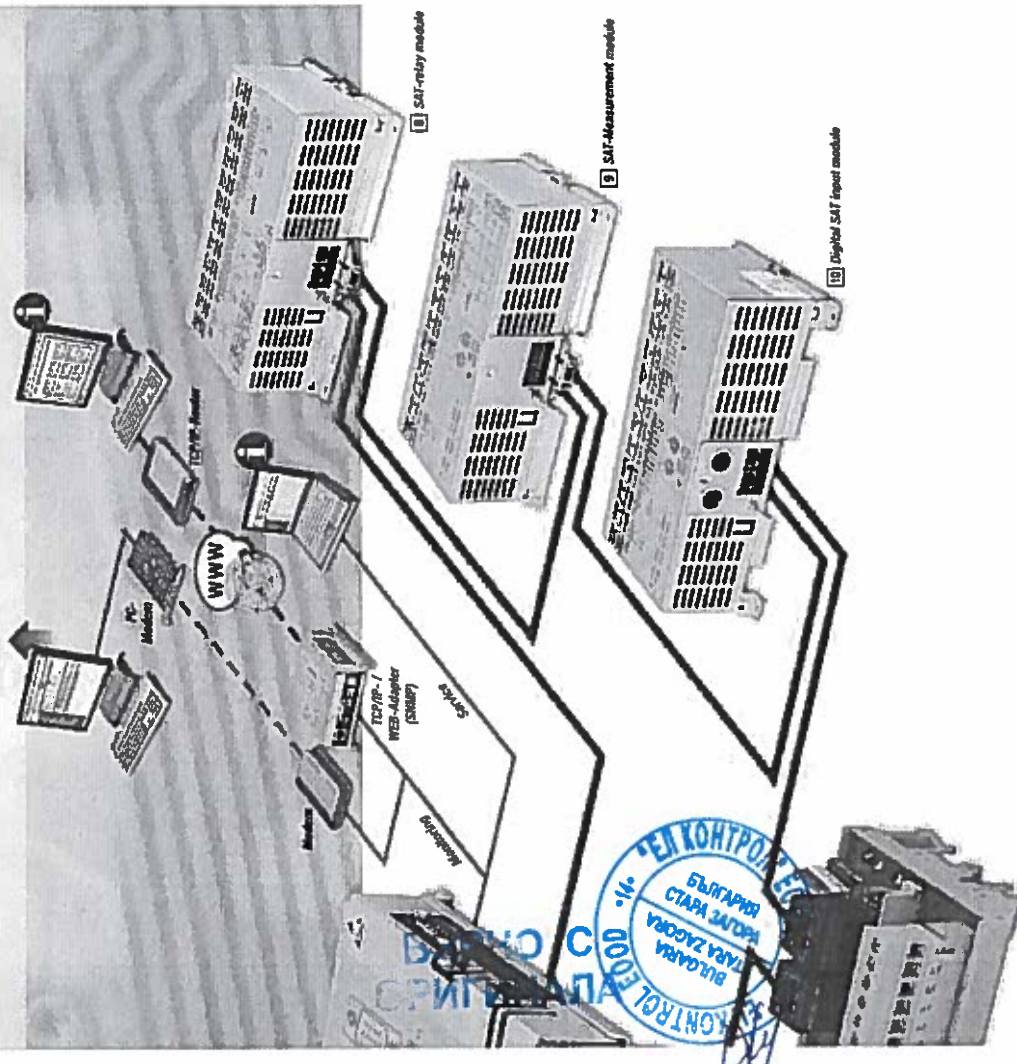
MCU 2500 features Comprehensive and Clear Monitoring Functions

Remote operation and monitoring of power systems

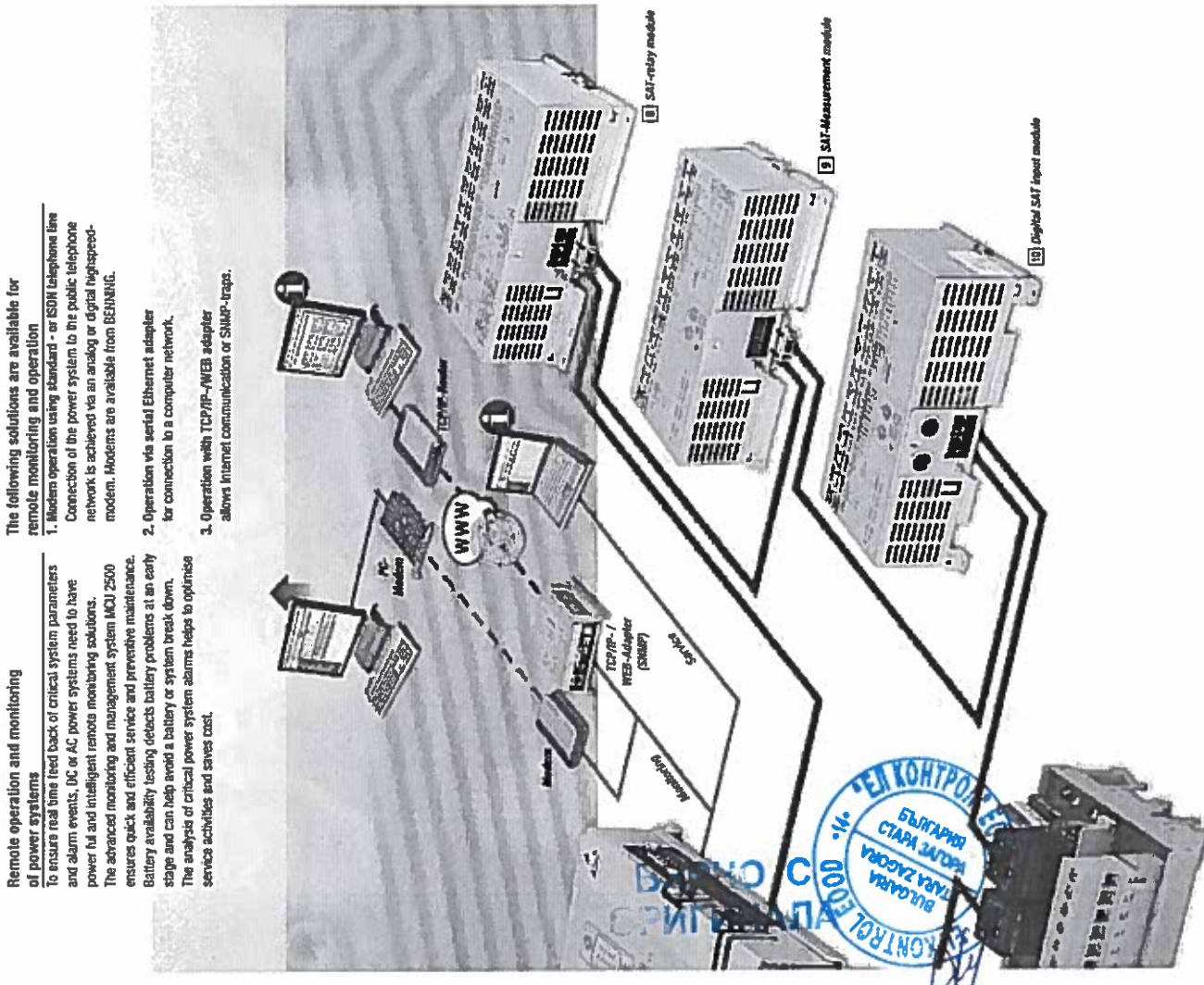
To ensure real time feed back of critical system parameters and alarm events, DC or AC power systems need to have power full and intelligent remote monitoring solutions. The advanced monitoring and management system MCU 2500 ensures quick and efficient service and preventive maintenance. Battery availability testing detects battery problems at an early stage and can help avoid a battery or system break down. The analysis of critical power system alarms helps to optimise service activities and saves cost.

The following solutions are available for remote monitoring and operation

1. Modem operation using standard - or ISDN telephone line
Connection of the power system to the public telephone network is achieved via an analog or digital high-speed-modem. Modems are available from BENNING.
2. Operation via serial Ethernet adapter
for connection to a computer network.
3. Operation with TCP/IP-Web adapter
allows Internet communication or SNMP-traps.



Global Remote Monitoring via HTTP and TCP/IP Server



Remote monitoring and control center

The universal remote communication capabilities of the MCU 2500 are the basis for the operation of the technical monitoring and control center at BENNING.

The control center monitors customer locations 24h a day and 365 days a year. Beside BENNING power systems the MCU 2500 allows the remote monitoring of customer products like air conditioning equipment or fire alarm systems.

The engineering staff at BENNING's remote monitoring center analyse all incoming messages and alarms regarding relevant customer locations and manage all necessary service activities. Repair times depend on the fault status-system critical or non-critical. System critical problems should be resolved as quickly as possible, typically 4 to 6 hours after the critical alarm was identified by the control center.

Comprehensive Battery Management Maximises Service Life and System Availability

The most important measurement, operation and alarm events of the MCU 2500
When used with a battery assisted power supply system, the MCU 2500 provides the following measurement, status and alarm information.

Measurements:

- System output voltage
- System output current
- System temperature
- Load current
- Max load power

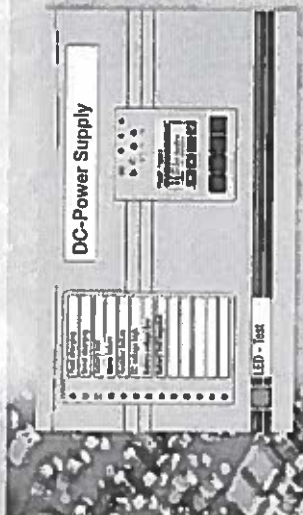
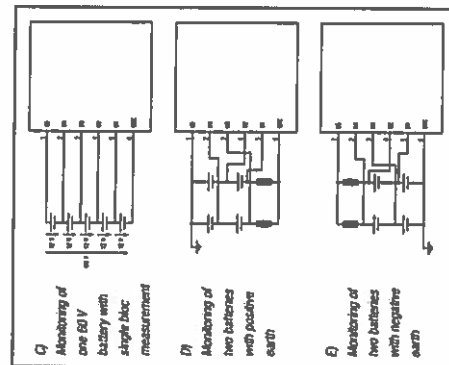
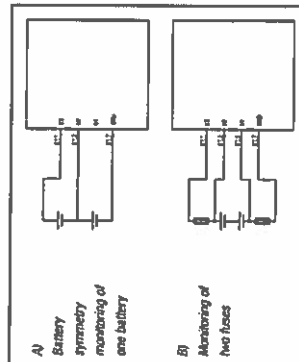


Fig. 2: Monitoring and control unit

Battery monitoring 110 V - 220 V:
This battery monitor incorporates 3 inputs. Two of them are used to enable a battery mid point measurement. This battery monitoring module can also operate as fuse monitoring. (Fig. A and B)



BENNING worldwide

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www.benning.de





THYROTRONIC - СЕРИЯ ВЫПРЯМИТЕЛЕЙ для систем гарантированного электроснабжения со стационарными аккумуляторными батареями

Общие

Защита потребителей электроэнергии от аварий электроснабжения часто осуществляется переходом на питание от резервной аккумуляторной батареи, при этом ответственные потребители снабжаются электрической энергией постоянного напряжения как при наличии напряжения сети так и при его аварии.

Excellent Technology, Efficiency and Quality



Выпрямители

серии THYROTRONIC для систем
гарантированного электроснабжения
со стационарными аккумуляторными
батареями

Рис.1 Внешний вид выпрямителя Thyrotronic

Системы гарантированного электроснабжения постоянного тока с параллельными резервированием стационарными аккумуляторными батареями используются на протяжении последних десятилетий и зарекомендовали себя как высоко надежное и оправданное по экономическим затратам резервное электроснабжение.

Надежность систем гарантированного электроснабжения постоянного тока с использованием параллельного резервирования стационарными аккумуляторными батареями определяется как качеством аккумуляторной батареи так и безопасной работой выпрямителя.

Область применения систем

- электрические станции
- трансформаторные подстанции
- железнодорожный транспорт
- транспортирование, переработка нефти и газа
- аэропорты
- больницы и лечебные заведения

Серия выпрямителей Thyrotronic, разработанная компанией Benning (см. Рис. 1), предназначена для построения систем гарантированного электроснабжения постоянного тока с параллельным резервированием стационарными аккумуляторными батареями и предлагает, наряду с высокой надежностью, всестороннюю концепцию мониторинга и контроля.

Выпрямители серии Thyrotronic работают в соответствии с регулирующей электронной образной характеристикой выходного постоянного напряжения (ИУ-характеристика в соответствии с DIN41773). (см. Рис. 3).

Нестабильность выходного напряжения составляет $\pm 0,5\%$ при изменении потребляемого тока нагрузки от 0% до 100%.

Допустимый диапазон отклонений напряжения сети $\pm 10\%$, частоты $\pm 5\%$. Как резервный источник электроэнергии используются преимущественно стационарные первичные или маломощные свинцово-кислотные батареи. Ни в коем случае щелочные батареи не рекомендуется использовать при экстремальных условиях окружающей среды.

ТИПОВАЯ ТАБЛИЦА СЕРИИ TNUOTRONIC
Выпрямители для многоцелевого применения

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Итак, остается рассмотреть возможность изменения без предварительного извещения другого типа устройств по отдельному запросу.

THYROTRONIC
Серия выпрямителей для многоцелевого применения

Функционирование

Самостоятельные и неавтономные шатеры достигают оптимального срока службы только в зарекомендовавшемся при длительной эксплуатации в процессе работы с подключенной в параллель аккумуляторной батарее выпрямителе одновременно с осуществлением питания потребителей и зарядом батареи. Электронная мерная аккумуляторная батарея используется только при аварийном напряжении или в случае пиковых нагрузок при аварийном резервном источнике питания.

21.

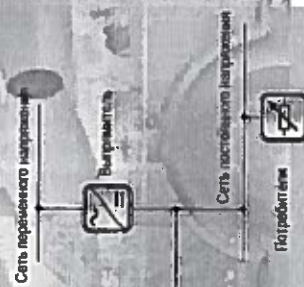


Рис. 2 Режим дежурной парализующей работы

III, при этом зарядный ток определяется как разница между номинальным током выработки и током потребления (при достижении установленного высокого напряжения (напряжение дуплексного подзаряда) происходит перевод на зарядку постоянным напряжением — область II (см. рис. 3).

Для уменьшения времени заряда аккумуляторов батареи либо для трансферных зарядов, в выходные дни предусмотрена услуга (вызывающей) заряд. Переключение с режима длительного подзарядки (содержание, 2,2В) для самонагрева батарей) в режим ускоренного заряда (2,4В) для самонагрева батарей) происходит в ручном режиме либо автоматически в зависимости от температуры.

в режиме «параллельной работы» потребляет ток непрерывного содержания примерно от 0,3 мА до 1 мА на 1 Ач емкости для компенсации внутренних потерь. Емкость аккумуляторной батареи определяется временем разряда при заданном токе потребления. На время разряда аккумулятора электропитания, на время резервного электропитания также влияют величина нагрузки и качество цепи электрооборудования.

Типовые периоды времени для резервного электроснабжения в зависимости от вида нагрузки и качества сетей электроснабжения

- 10 – 30 минут
 - электронный обработка данных
- 1 – 3 часа
 - аварийное освещение
 - технологические процессы
 - железнодорожный транспорт
 - аэропорты
 - больницы
- 2 – 8 часов
 - связь
 - транспортирование, переработка нефти и газа

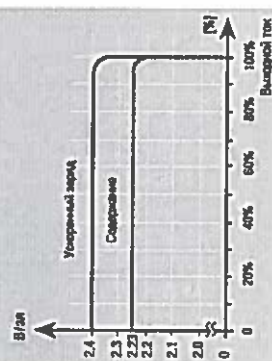


Рис.3. Характеристики ИУ согласно DIN 41 773 для
самонесущих батарей

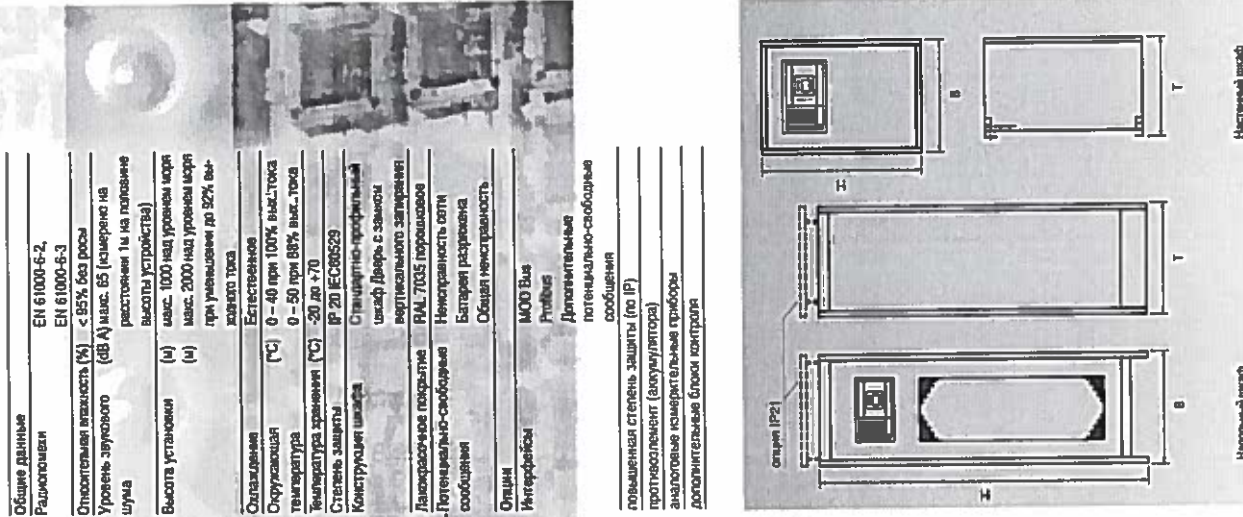
THYROTRONIC
Технические данные

Технические данные

Сетевой ввод	
Видные напряжения (В)	230 ± 10%, 1-фазное 3/400 ± 10%, 3-фазное
Входной ток	3х, типичную таблицу серии
Частота	(Гц) 50 ±5%
Коэффициент мощности	0,83 в режиме сохранения при номинальном напряжении сети
Выход постоянного тока	
Выходное напряжение (В)	24, 48, 60, 110, 125, 220
Выходной ток (А)	3х, типичную таблицу серии
Диапазон установок (%)	50 – 100
Выходной ток	ограничение тока устройства
(%)	0 – 50
	ограничение зарядного тока батареи
Ток/на неустойчивость (%)	± 2
Характеристики ИУ	
ли DN 4173 при усредненном заряде и сохранении	
Напряжение	(В) 24 Pb батареи
усредненное заряд	1,55 А/ч батареи
Напряжение	(В) 220 Pb батареи
сохранения	1,40 А/ч батареи
Напряжение	(В) 217 Pb батареи
высвечивающего	1,7 А/ч батареи
заряда	при установившемся зарядном токе
Диапазон установок (%)	± 5
Неустойчивость (%)	± 0,5
напряжения	
Пульсации	< 5 без батарей
относительно	< 2 без батарей
КПД, %	85 – 94 типичные

Корпус	Вяз. (т)	Размеры (мм)		Выс. (т)
		Шир. (т)	Глуб. (т)	
WGZ	755	758	534	470
PSJ	1564	1500	600	400
UC/PSJ 1565		1500	600	600
UC/PSJ 1666		1900	600	600
PSJ	1896	1800	900	600
PSJ	2268	2200	600	800
PSJ 221208		2200	1200	800

WGZ – Настенный шкаф
PSZ – Настольный шкаф
UC – Настольный шкаф



Unconstrained growth

Optimal growth

**ВЯРНО С
ОРИГИНАЛА**



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BEGINNING

БЯРНО С
СРИГИНАЛА



10.12.2013
Rev. Inform

Rev.	Change	Date	Name	Approved	Checked	Drawn	Date
1		21.10.2013	RUOH	ANAPH			

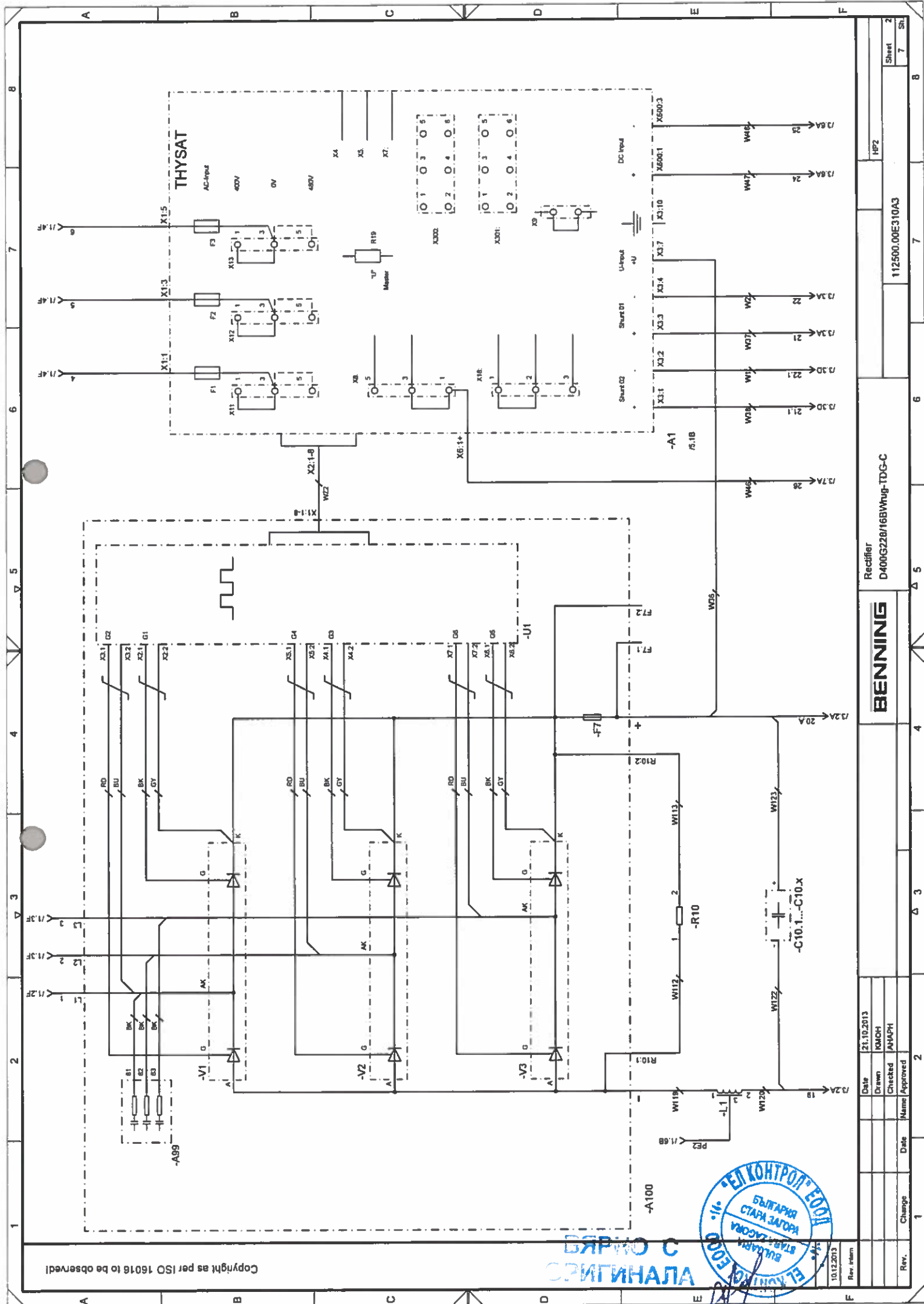
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HP2

Sheet 2
7 Sh.



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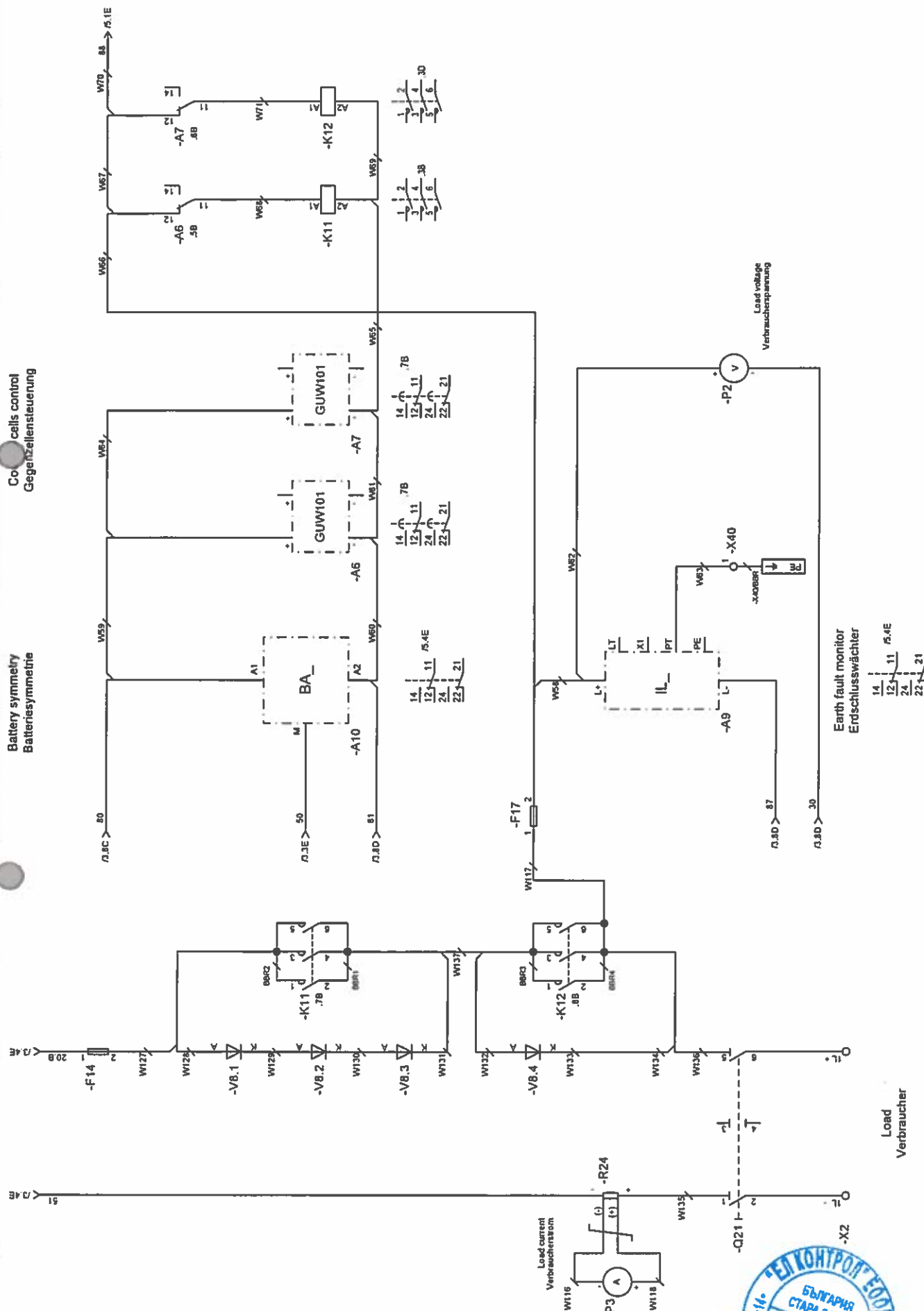
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Sheet 2



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6									
7									
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Rectifier
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HP2

Sheet 4



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Rectifier D400G228/16BWug-TDG-C							
112500.00E310A3							
HP2							
Sheet 6							
7 Sh.							

LED Display

✓ H1 Float charging
Erhaltungsladen

✓ H2 Boost charging / Equalizing charge
Starkladen / Ausgleichsladen

✓ H3 Battery test
Batterietest

✓ H4 Mains failure
Netzstörung

✓ H5 Equipment failure
Gerätestörung

✓ H6 High DC voltage
DC-Spannung zu hoch

✓ H7 Low battery voltage
Batteriespannung zu tief

✓ H8 Battery test negative
Batterietest negativ

✓ H9 Battery circuit fault
Batteriekreis gestört

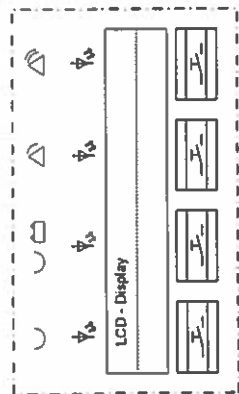
✓ H10 Earth fault
Erdschluss

✓ H11 Battery symmetry failure
Batteriesymmetrie gestört

✓ H12 Load voltage too high
Verbraucherspannung zu hoch

✓ H13 Load voltage too low
Verbraucherspannung zu tief

✓ S1 LED-Test / reset
LED-Test / Reset



15.8A > 15
WZ

-A31

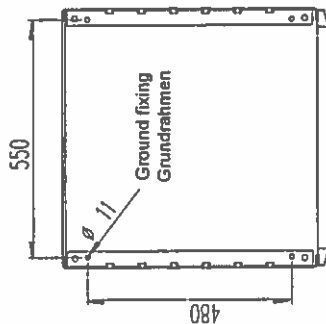
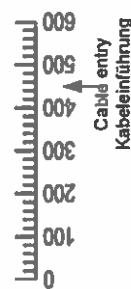
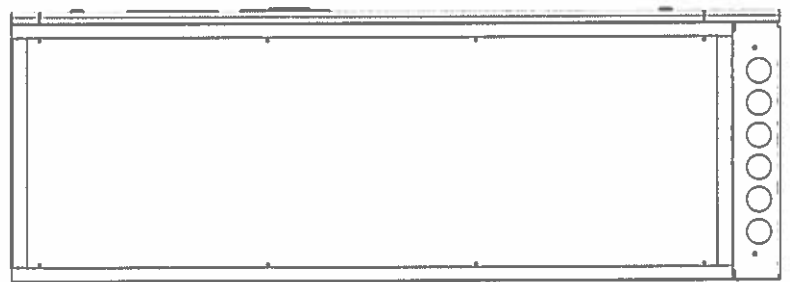
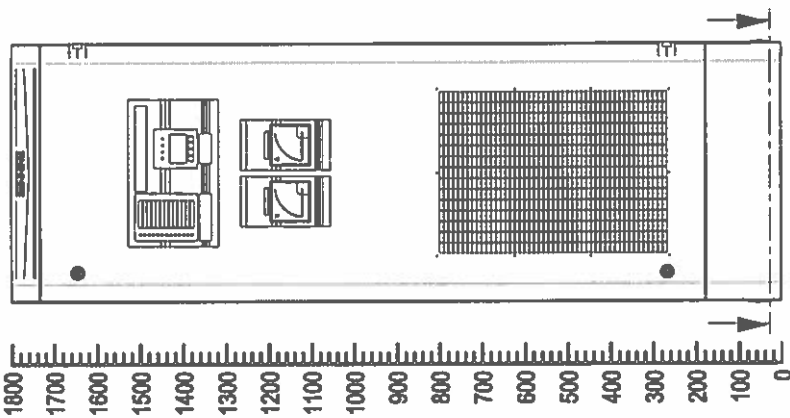


RELAY BOX

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Shunte und Drossel Rückseite



Degree of protection IP20
Schutzart IP20

BENNING

Rectifier
D400G228/168Wwug-TDG-C
Dimension and front view drawing

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HP2

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Date 20.10.2013

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Approved

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ВЯРНО С
ОРИГИНАЛА

Rectifier
D400G228/16BWing-TDG-C

BENNING

109895.00E628A3

2641

Sheet 1

ТЕХНИЧЕСКА СПЕЦИФИКАЦИЯ – УНИВЕРСАЛЕН ТИРИСТОРЕН ТОКОНЗПРАВИТЕЛ 220V/25A

с МИКРОПРОЦЕССОРНО УПРАВЛЕНИЕ и МОНИТОРИНГ – СЕРИЯ THYROTTRONIC LINE

Серията THYROTTRONIC LINE работи с микропроцесорно управляван тиристорен регулиращ блок *Thysat*, микропроцесорна система за мониторинг MCU 2500, батерия шунт, автоматичен диоден стабилизатор (двустепенна противоелементна група), TCP/IP адаптер с Modbus интерфейс за връзка със СКАДА.

THYROTTRONIC LINE има над 15 интегрирани функции на мониторинг и сигнализации за работното състояние, аномалиите и повредите, контрол на изходното напрежение към консуматорите и към батериите. Посредством PC през RS232 порт, или през менюто на лицевия цифрено-буквен дисплей може да се контролира състоянието на системата и да се променят базовите настройки- аларми и повреди, продължителност и честота за тестове на батерията, брой клетки, тип на АБ, стойност на подзарядното и зарядно напрежение, температур. коефициент, токоограничение, според типа на батерията – VRLA или Ni-Cd и според броя на елементите, и т.н.

ПАРАМЕТРИ /ТИП НА ТОКОНЗПРАВИТЕЛЯ:	D400 G216/25 BWrug-TDG 3
Производител:	BENNING GmbH – Германия
Мрежов вход:	
Захранващо напрежение:	3 × 400V ±10%, трифазно, N, PE
Максимален захранващ ток:	12A при пълно натоварване
Мрежова честота:	50Hz ± 5%
Разделителен трансформатор на входа:	За галванична изолация от мрежата
Пуск:	Плавен старт с пълна автодиагностика
Изход на токонзправителя:	
Номинално изходно напрежение:	220V DC
Номинален изходен ток:	25A

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"МАРПЕКС" ООД
Бул. "Черен връх" №.67
1407 София, ПЛК 2
тел.: (02) 964-0840
факс: (02) 964-0861

Marplex

Дименсии/Тегло:	Стоманен шкаф – модел PSJ 1866 / H 1800 × W 600 × D 600mm / 220kg
Клас на защита на шкафа / Боя:	IP 30 IEC 60529 / RAL 7035
Подзарядно напрежение (настройваемо):	2,27V/кл. За Pb батерии / 1,40V/кл. За Ni-Cd батерии
Напрежение на автоматичен ускорен заряд:	2,40V/кл. За Pb батерии / 1,55V/кл. За Ni-Cd батерии
Изравнително зареждане (ръчен режим):	2,70V/кл. За Pb конвенционални батерии / 1,70V/кл. За Ni-Cd батерии
Обхват на настройка на зарядното напрежение:	± 5% от зададената стойност
Стабилизация на изходното напрежение:	± 0,5%
Стабилизация на изходния ток:	± 2%
Ограничение на изходния ток:	Inom
Електронно ограничение при късо съединение:	< 105% Inom
Зарядна характеристика:	IU по DIN 41773 с ограничение на зарядния ток до 1/10 Snom
Изглаждане на пулсациите на напрежението:	< 5% rms / типично 2,5% rms (без свързана батерия)
Изглаждане на пулсациите в тока:	< 5% eff / типично 2% eff (без свързана батерия)
Динамични характеристики (отделена батерия):	± 5% измен. В Изх. / след 200ms, при промяна в товара 100% – 20% – 100%/
Фактор на мощността (cos φ):	Приблизително 0,8 в режим на подзаряд при номинален товар
Коефициент на полезно действие:	От 90% до 95% при натоварване от 50% до 100%
Относителна влажност:	Приблизително 95%, без кондензация
Технически норми и стандарти:	Актуалните DIN, VDE стандарти, EN50081-1, EN50082-2, IEC146-1-1, 204-1
Подтискане на високочестотни смущения EMC:	Съгл. EN610006-2, EN610006-3
Работна температура:	0 °C до +40 °C
Клас на влажност:	"F" по DIN 40040
Ниво на акустичния шум:	макс. 60dB (A)
Надморско равнище за инсталиране:	Макс. 1000 м – 100% номинален товар / макс 2000м – 92% номинален товар
Охлаждане:	Естествена конвекция

Провкт.: "Мини Марица Изток"

ВЯРНО С
ОРИГИНАЛА



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ЛИЦЕВ ПАНЕЛ НА ШКАФА	
Интегриран буквено-цифров LCD-дисплей с реален текст и мониторинг юнит MCU 2500:	изходен ток, изходно напрежение, ток на акумулаторната батерия, с реален текст на работното състояние, повреди, меню и rapopти
Клавиатура с 4 клавиша:	За въвеждане и/или четене на данни и параметри, промяна на настройките
Светодиоди (СД) за фиксирани функции-4 броя:	нормална работа режим на разряд на батерията неуспешна повреда спешна повреда
Светодиоди (СД) за работното състояние-13 бр.	подзаряд подзаряд/ускорен заряд тест на батерията липса на мрежово захранване (1 или повече фази) повреда на устройството високо изходно напрежение ниско батерийно напрежение прекъсване и несиметрия на батерийната верига отрицателен батерийен тест земно съединение в положителния клон земно съединение в отрицателния клон високо DC напрежение към консуматорите ниско DC напрежение към консуматорите
ИНТЕГРИРАНИ ФУНКЦИИ посредством MCU 2500:	
Пряк мониторинг:	мрежов мониторинг мониторинг на изхода на токoнзправителя токово-зависим мониторинг за ниско изходно напрежение мониторинг за високо изходно напрежение с импулсно блокиране мониторинг за ниско батерийно напрежение периодичен тест на батерийната верига периодичен кондензитивен батерийен тест

Проект: "Мини Марица Изток"

Стр. 3/8

	мониторинг за наличие на земно съединение температурна корекция на подзарядното напрежение + температурен датчик I x R компенсация на спада на напрежението върху батерията програмируемо автоматично зареждане (подзаряд/ускорен заряд) фаза на изравнителен заряд индикация на работния режим възможност за паралелна работа без декупиращи диоди напредна базова настройка в случай на повреда в процесора RS232 интерфейс за връзка с PC 8 цифрови порта за външни функции на мониторинг
Дистанционен мониторинг посредством безпотенциални контакти (стандартни):	Липса на мрежа или 1 фаза, мрежово напрежение/честота извън толеранс; обща аларма (за обща повреда); ниско напрежение на батерията
Допълнителна реле платка за дист. мониторинг:	С 8 безпотенциални сигнала за дистанционен мониторинг на всички повреди
Звукова сигнализация:	При повреда или аномалии на системата ТИ-АБ
Пренос на данни за работното състояние на системата ТИ-АБ, за повреди или аномалии:	TCP/IP адаптер с Modbus интерфейс за връзка със СКАДА
Аналогови входове:	3 входа: 1 за DC напрежение, 1 за DC ток и 1 за DC ток или температура.
Цифрови входове:	8 входа за аларма изгорял предпазител или външно работно оборудване, като въздушни условия, пожароизвестителна аларма или газгенераторна аларма
Памет:	В паметта се съхраняват 100 rapopта за работата на ТИ и за повреди
Защити софтуерни:	Най-важните настройки са защитени чрез парола (4 нива на достъп).
Бутон за тест на светодиодите:	Ресет на СД индикации на запомнените повреди и тест за изправност на СД.
ОПИСАНИЕ НА ИНТЕГРИРАНИТЕ ФУНКЦИИ:	
Контрол за наличие на мрежовото захранване:	При отпадане на мрежовото напрежение, се активира електронен регулиращ блок и се появява сигнализация "отпаднала мрежа". След възстановяване на мрежата, регулиращия блок се изключва, токoнзправителят започва да работи отново и светва сигнализацията "наличие на мрежово захранване".
Контрол на изхода на токoнзправителя:	Токовозависим контрол за ниско напрежение и контрол на IU характеристики

Проект: "Мини Марица Изток"

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	ката на токоизправителя. Ако изходното напрежение спадне под настроената стойност 2,10V/кл., а изходния ток е $\leq 90\%$ от номиналния, то тогава се задейства алармения сигнал "повреда на устройството".
Контрол за високо напрежение:	Ако поради външни или вътрешни смущения (над 20 ms) изходното напрежение стане прекалено високо (стойността се настройва), тогава се задейства импулсна блокировка и токоизправителя се изключва автоматично. Контролирането е динамично и с автоматично възстановяване. В продължение на 30 сек. Контролният блок опитва 4 пъти да възстанови работата на ТИ и ако не успее, светва аларма "високо изходно напрежение", както и "обща аларма" на безпотенциалния контакт.
Ниско батерийно напрежение:	Ако при разряд напрежението на АБ се понижи под определена стойност (настройваема), напр. 1,80V/кл. Светва сигнал "ниско батерийно напрежение", както и "обща аларма" на безпотенциалния контакт.
Контрол целостта на батерийната верига:	Батерийната верига се тества автоматично на всеки 24 часа. За тази цел ТИ понижават изходното си напрежение до 1,90V/клетка за около 5 сек, в резултат на което АБ започва да се разрежда. През това време се проверява батерийното напрежение. Ако то е над 1,90V/кл., то батерийната верига е наред. Ако напрежението падне под тази стойност, светва СД сигнал "прекъсване на батерийната верига", и излиза "обща аларма" на безпотенциалния контакт.
Тест за функционалност на батерията:	По време на този тест токоизправителят отново понижават изходното си напрежение и батерията започва да се разрежда, както в случая на проверка на батерийната верига. Но батерията ще бъде разреждана до една настройваемо минимално гранично напрежение в продължение на определено време, също настройваемо. Тези граници са в пропорционална зависимост от капацитета на АБ, отнет по време на разряда, и могат да бъдат определени от разрядните криви на свързаната батерия. Ако по време на функционалния тест стойностите спаднат под настроените граници, излиза СД индикация за "отрицателен батерийен тест", а също така и "обща аларма" на безпотенциалния контакт. След теста ТИ автоматично се връща към "ускорен" или "подзаряд".
Контрол за наличие на земно в положителния и отрицателния клон на DC- веригата:	Контролира се изоляционното съпротивление на постоянно- токовия изход спрямо земя. Плюсът и минусът се измерват и контролират последователно

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	един след друг. Ако изоляционното съпротивление спадне под настроената стойност (настройваема от 100 kΩ до 1 MΩ), това се индицира от съответния СД и от "обща аларма" на безпотенциалния контакт.
I*R компенсация:	Компенсират се падът на напрежение от кабелните връзки между батерията и токоизправителя, като програмно се въвеждат сечение и дължината им.
Програмируемо автоматично преминаване от режим на подзаряд към ускорен заряд и обратно:	Ако батерийното напрежение се понижи поради отпадане на мрежово захранване (или по друга причина), токоизправителя започва да работи в режим на токоограничение. Ако работи в този режим за повече от 30 сек. След началото на заряда, той автоматично преминава към режим на ускорен заряд. След като бъде достигнато (с токоограничение) напрежението на ускорен заряд и зарядния ток спадне под 90% от номиналната стойност, се включва таймер. След изтичане на зададеното време (настройваемо от 0 до 6 часа), токоизправителят автоматично се връща към подзаряд. Автоматичния заряд може да бъде изключен със ключ, така че да е възможно само ръчно преминаване към ускорен заряд и обратно. Преминаването към ускорен заряд може да се блокира и чрез външен контакт, или шунтиращ мост на регулатора
Контрол на токоограничението на ТИ по I _{nom} :	При работа в токоограничение над 10 s, светва СД "токоограничение".
Контрол симетрия между двата клона на АБ:	Сравнява се напрежението между двата клона на АБ. При нарушена симетрия има прекъсване на клетка, клетка на к.с., прекъсване на веригата на АБ и т.н. Излиза СД сигнализация на лицева панел.
Хардуерни базови настройки:	При повреда на микропроцесора, ТИ продължава работа, като автоматично преминава към базовите настройки в паметта. Подзаряд на АБ и захранване на товара със същото напрежение. В този случай излиза и сигнал за "обща аларма" на безпотенциалния контакт.
Температурна компенсация на зар. напрежение:	Променя подзарядното напрежение в зависимост от околната температура
Автоматична противоелементна група 25A (диоден стабилизатор):	За автоматично поддържане на напрежение към товара в толеранс 220V +5% / - 10% във всички работни режими, максимален продължителен ток 25A
КОНСТРУКЦИЯ:	
Изпълнение на шкафа:	Управляващ ключ, дисплей, фиксирани СД индикатори са отпред

Проект: "Мини Марица Изток"

Стр. 6/8








Връзки:	АС- и DC страна, нормални или болтови терминали.
Защити:	Si- полупроводници са защитени от к. с. чрез свръх бързи предпазители
Трифазна защита срещу АС пренапрежение:	Срещу комутационни и/или атмосферни пренапрежения по АС мрежата
Вход на токонизправителя:	Автоматични прекъсвачи 400V AC
Изход на токонизправителя:	Изолиращи прекъсвачи 220V DC с NH00 предпазители
Изход към товара:	Двуполуосен изолиращ прекъсвач 220V DC с NH00 предпазители
Батериен изход:	Двуполуосен изолиращ прекъсвач 220V DC с NH00 предпазители
ДОКУМЕНТАЦИЯ:	
Техническа документация:	1 бр. на английски език + 1 бр. на български език
Ръководство за инсталиране, пуск и работа:	1 бр. на английски език + 1 бр. на български език
Сервизна документация:	1 бр. на английски език
Списък на части с кодови номера:	1 бр. на английски език
Тест репорт:	От проведени ваводски изпитания и настройки
Снабдяване с резервни части:	10 год. след спиране от производство
Отстраняване на повреди в гаранционен срок:	До 8 часа от уведомяването.
Производствен опит:	Над 40 години
MTBF:	Над 15 год.

Проект: "Мини Марица Изток"

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СВЕТОДИОДИ:

-  Работен режим
-   Работа на акумулаторна батерия
-  Обща неизправност
-  Спешна неизправност

БУТОНИ:

- ▲ Бутон за придвижване нагоре в менюто
- ▼ Бутон за придвижване надолу в менюто
- E Потвърждаване на опция в менюто
- Съхраняване на новоизбрана стойност
- Извикване на следващото ниво от менюто
- C Излизане от менюто без промяна на стойността
- Извикване на следващото по-високо ниво от менюто

ДИСПЛЕЙ:



22.04.2015 год.
гр. София

Изготвил:
И. Иванов
/Р-л Проект/

Проект: "Мини Марица Изток"

ВЯРНО С
ОРИГИНАЛА



Стр. 8/8

Type:	Artikel-Nr./ Part No.:
D400 G216/60 BWnug-TDG-C	00100052845
Zeichnungs-Nr./Drawing No.:	Serien-Nr./Serial No.:
112500.00E388	106000546742
	Auftrags-Nr./ Order No.:
	001-00223337.1

Die Anlage wurde geprüft nach/ Equipment tested according to/	DIN EN 60146-1-1 Absatz/Section 4
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EINGANG/INPUT							
Spannung / voltage:		400 V	Strom / current:	31,5 A	3 -phasig/phase(s)	50 Hz	
AUSGANG/OUTPUT:							
Laden / Boost charging				Erhaltungsladen / Float charging			
258,9 V		60° A	244,9 V			60° A	
259,1 V		50 A	245,1 V			50 A	
259,2 V		30 A	245,2 V			30 A	
259,2 V		20 A	245,2 V			20 A	
259,3 V		10 A	245,3 V			10 A	
Ausgleichsladen/equalizing charge				291 V	ca. 12 A		
Frequenzbewertete Störspannung/ psophometric noise (nach/according CCITT) :				mV			
<input type="checkbox"/> bei Widerstandslast/by resistance load				<input type="checkbox"/> bei Batteriebelast/by battery load			
Restwelligkeit/ripple voltage:				1,1 Veff.	Vss		
<input checked="" type="checkbox"/> bei Widerstandslast/by resistance load				bei/by: 50 A	245,1 V DC = 0,45 %		
Schutzart/protection mode				<input type="checkbox"/> bei Batteriebelast/by battery load			
				IP 20			
Sicherheitstest/safety test:							
HV-Test (1 sec)							
prim.-sek.	2,1 kV	DC	mit with:	500 V	DC	24 V	25 A
prim.-GND	2,1 kV	DC	Riso	> 100 MΩ			
sek.-GND	2,1 kV	DC					
Bemerkungen/Remarks:							
Alle Messungen bei / all measurings at 20°C							
* = Strombegrenzung / current limitation							
Einsellungen siehe Technisches Datenblatt / adjustments see technical data sheet: 00100052845.00T000							
Alle Messungen ohne / all measurings without: Batteriestrombegrenzung / Battery current limitation							

Type:	Artikel-Nr./ Part No.:
D400 G216/60 BWnug-TDG-C	00100052845
Zeichnungs-Nr./Drawing No.:	Serien-Nr./Serial No.:
112500.00E388	106000540044
	Auftrags-Nr./ Order No.:
	001-00223337.1

Die Anlage wurde geprüft nach/ Equipment tested according to/	DIN EN 60146-1-1 Absatz/Section 4
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EINGANG/INPUT							
Spannung / voltage:		400 V	Strom / current:	31,5 A	3 -phasig/phase(s)	50 Hz	
AUSGANG/OUTPUT:							
Laden / Boost charging			Erhaltungsladen / Float charging				
258,9 V		60° A	244,9 V	60° A			
259,1 V		50 A	245,1 V	50 A			
259,2 V		30 A	245,2 V	30 A			
259,2 V		20 A	245,2 V	20 A			
259,3 V		10 A	245,3 V	10 A			
Ausgleichsladen/equalizing charge			291 V	ca. 12 A			
Frequenzbewertete Störspannung/ psophometric noise (nach/according CCITT) :			mV				
<input type="checkbox"/> bel Widerstandslast/by resistance load		<input type="checkbox"/> bel Batteriebelast/by battery load					
Restwelligkeit/ripple voltage:		1,1 Veff.		V ss			
<input checked="" type="checkbox"/> bel Widerstandslast/by resistance load		bel/by: 50 A		245,1 V DC		= 0,45 %	
Schutzart/protection mode		<input type="checkbox"/> bel Batteriebelast/by battery load					
Sicherheitstest/safety test:		IP 20					
HV-Test (1 sec)		ISO-Test (1 sec)		GND-Test (1 sec)			
prim.-sek.	2,1 kV	DC	mit with:	500 V	DC	mit with:	24 V DC
prim.-GND	2,1 kV	DC	Riso	> 100 MΩ			
sek.-GND	2,1 kV	DC					
Bemerkungen/Remarks:							
Alle Messungen bei / all measurings at 20°C							
* = Strombegrenzung / current limitation							
Einstellungen siehe Technisches Datenblatt / adjustments see technical data sheet: 00100052845.00T000							
Alle Messungen ohne / all measurings without: Batteriestrombegrenzung / Battery current limitation							

Typ/Type:
D400 G216/60 BWnug-TDG-C

Artikel-Nr./ Part No.:
00100052845

Zeichnungs-Nr./Drawing No.:
112500.00E388

Serien-Nr./Serial No.:
105000546740

Auftrags-Nr./ Order No.:
001-00223337 1

Die Anlage wurde geprüft nach/
Equipment tested according to/

DIN EN 60146-1-1 Absatz/Section 4

EINGANG/INPUT

Spannung / voltage: 400 V Strom / current: 31,5 A 3 -phasig/phase(s) 50 Hz

AUSGANG/OUTPUT:

Laden / Boost charging

Erhaltungsladen / Float charging	
258,9 V	60° A 244,9 V 60° A
259,1 V	50 A 245,1 V 50 A
259,2 V	30 A 245,2 V 30 A
259,2 V	20 A 245,2 V 20 A
259,3 V	10 A 245,3 V 10 A

Ausgleichsladen/qualifying charge 291 V ca. 12 A

Frequenzbewertete Störspannung/
psophometric noise (nach/according CCITT) : mV

☐ bei Widerstandslast/by resistance load ☐ bei Batterielast/by battery load

Restwelligkeit/ripple voltage: 1,1 Veff. V ss

bel/by: 50 A 245,1 VDC = 0,45 %

☒ bei Widerstandslast/by resistance load ☐ bei Batterielast/by battery load

Schutzart/protection mode IP 20

Sicherheitslastes/safety test:

HV-Test (1 sec)		ISO-Test (1 sec)		GND-Test (1 sec)	
prim.-sek.	2,1 kV DC mit with: 500 V DC	24 V DC	25 A		
prim.-GND	2,1 kV DC Rso > 100 MΩ				
sek.-GND	2,1 kV DC				

Bemerkungen/Remarks:
Alle Messungen bei / all measurings at 20°C
Strombegrenzung / current limitation
Einstellungen siehe Technisches Datenblatt / adjustments see technical data sheet: 00100052845.00T000
Alle Messungen ohne / all measurings without: Batteriestrombegrenzung / Battery current limitation

Datum/Date: 11.06.14

Datum/Date: 11.06.14

Prüfer/Tester: N. Mohr

freigegeben/approved: V. Sewergin

TB10.8 de-en MSch

Typ/Type:
D400 G216/60 BWnug-TDG-C

Artikel-Nr./ Part No.:
00100052845

Zeichnungs-Nr./Drawing No.:
112500.00E388

Serien-Nr./Serial No.:
108000546741

Auftrags-Nr./ Order No.:
001-00223337 1

Die Anlage wurde geprüft nach/
Equipment tested according to/

DIN EN 60146-1-1 Absatz/Section 4

EINGANG/INPUT

Spannung / voltage: 400 V Strom / current: 31,5 A 3 -phasig/phase(s) 50 Hz

AUSGANG/OUTPUT:

Laden / Boost charging

Erhaltungsladen / Float charging	
258,9 V	60° A 244,9 V 60° A
259,1 V	50 A 245,1 V 50 A
259,2 V	30 A 245,2 V 30 A
259,2 V	20 A 245,2 V 20 A
259,3 V	10 A 245,3 V 10 A

Ausgleichsladen/qualifying charge 291 V ca. 12 A

Frequenzbewertete Störspannung/
psophometric noise (nach/according CCITT) : mV

☐ bei Widerstandslast/by resistance load ☐ bei Batterielast/by battery load

Restwelligkeit/ripple voltage: 1,1 Veff. V ss

bel/by: 50 A 245,1 VDC = 0,45 %

☒ bei Widerstandslast/by resistance load ☐ bei Batterielast/by battery load

Schutzart/protection mode IP 20

Sicherheitslastes/safety test:

HV-Test (1 sec)		ISO-Test (1 sec)		GND-Test (1 sec)	
prim.-sek.	2,1 kV DC mit with: 500 V DC	24 V DC	25 A		
prim.-GND	2,1 kV DC Rso > 100 MΩ				
sek.-GND	2,1 kV DC				

Bemerkungen/Remarks:
Alle Messungen bei / all measurings at 20°C
Strombegrenzung / current limitation
Einstellungen siehe Technisches Datenblatt / adjustments see technical data sheet: 00100052845.00T000
Alle Messungen ohne / all measurings without: Batteriestrombegrenzung / Battery current limitation

Datum/Date: 11.06.14

Datum/Date: 11.06.14

Prüfer/Tester: N. Mohr

freigegeben/approved: V. Sewergin

TB10.8 de-en MSch

BENNING	Prüfprotokoll	Serien-Nr. / Serial No.: 106000540048
	Test Report	Blatt/Sheet: 1/7

Typ:	Auftrags-Nr.:
Type: D400G212/10-50B Wru-PDG	Order-No.: 001-00223337/2
Zeichn. Nr.:	Serien-Nr.:
Drawing No.: 104380.00E794	Serial No.: 106000540048

Die Anlage wurde geprüft nach:
Equipment tested according to:

EN 60146-1-1
IEC 60146-1-1

Prüfung test	Kapitel chapter	Typprüfung type test	Stichprüfung routine test	Zusatzprüfung optional test ¹
Sichtprüfung Visual test		X	X	
Isolationsprüfung Insulation test	7.2	X	X	
Schwerlast- und Funktionsprüfung Light load and functional test	7.3.1	X	X	
Prüfen mit Bemessungsstrom Rated current test	7.3.2	X		
Ermittlung der Verluste für Stromrichterstände und -geräte Power loss determination for assemblies and equipment	7.4.1	X		
Erwärmungsprüfung Temperature-rise test	7.4.2	X		
Messung des Leistungsfaktors Power factor measurement	7.4.3			(X)
Prüfen der Hilfeinrichtungen Checking of auxiliary devices	7.5.1	X	X	
Ermittlung der inneren Spannungsänderung Measurement of the inherent voltage regulation	7.5.4			(X)
Prüfen der Eigenschaften der Steuereinrichtung Checking the properties of the control equipment	7.5.2	X	X	
Prüfen der Schutzeinrichtungen Checking the protective devices	7.5.3	X	X	
Prüfen der Störfestigkeit Immunity test	7.6 a)			(X)
Überstromprüfung Overcurrent capability test	7.6.3			(X)
Funkstörgrad Radio interference level	7.6 b)			(X)
Geräuschmessung Audible noise	7.7			(X)
Ermittlung der überlagerten Wechselgrößen Measurement of ripple AC values	7.3.5			(X)
Zusätzliche Prüfungen Additional tests	7.7			(X)
Messung der Oberschwingungsströme Measurement of Harmonics	7.3.6			(X)

Die oben "(x)" gekennzeichneten Einzelprüfungen werden nur durchgeführt, wenn sie ausdrücklich im Vertrag vereinbart werden.
The above "(x)" characterized individual tests are accomplished only if they were agreed upon expressly in the contract.

BENNING	Prüfprotokoll	Serien-Nr. / Serial No.: 106000540048
	Test Report	Blatt/Sheet: 2/7

Vorgenommene Prüfungen und Kontrollen
Inspections and tests performed

Ergebnis/Result
Beurteilung
complaints
o.k.

Sichtprüfung Visual test		
Mechanische Kontrollen Mechanical checks		<input checked="" type="checkbox"/>
Kontrolle der eingebauten Geräte check of the incorporated devices		<input checked="" type="checkbox"/>
Kontrolle der Verdrahtung und Stromschienen Verification of the wiring and of the busbars		<input checked="" type="checkbox"/>
Kontrolle der Beschriftung und Schilder Verification of the markings and identification plates		<input checked="" type="checkbox"/>
Messkontrolle der Luft- und Kriechstrecken verification of the air gaps and creeping distances		<input checked="" type="checkbox"/>
Isolationsprüfung nach EN/IEC 60146-1-1/7.2 Insulation test according to EN/IEC 60146-1-1/7.2		
Spannungsprüfung Voltage test		
Primär/Sekundär Primarily/secondary	2,1 kV DC	<input checked="" type="checkbox"/>
Primär/GND Primarily/ground	2,1 kV DC	<input checked="" type="checkbox"/>
Sekundär/GND Secondary/ground	2,1 kV DC	<input checked="" type="checkbox"/>
Zeitdauer/duration	2 Sek.	<input checked="" type="checkbox"/>



BENNING	Prüfprotokoll	Serien-Nr. / Serial No.: 106000540048
	Test Report	Blatt/Sheet: 3/7

Vorgenommene Prüfungen und Kontrollen
Inspections and tests performed

Ergebnis/Result
Beastandung
complaints

o.k.

Isolationswiderstandsprüfung
Insulation resistance test

Stromkreis circuit	Meßspannung measuring voltage	Isolationswert insulation resistance
Hauptstromkreis Main circuit	500 V=	> 100 MOhm <input checked="" type="checkbox"/>
Hilfsstromkreis Aux. circuit	500 V=	> 100 MOhm <input checked="" type="checkbox"/>
Zeiddauer/duration	10 Sek.	<input checked="" type="checkbox"/>

Schwachlast- und Funktionsprüfung
Light load and functional test (EN/IEC 60146-1-1/7.3.1)
(Prüfen mit Bemessungsstrom Rated current test (EN/IEC 60146-1-1/7.3.1))
Aufnahme der Neundaten
checking of the nominal values

Eingang input	Spannung V voltage V	400	<input checked="" type="checkbox"/>
	Strom A current A	26 (34)	<input checked="" type="checkbox"/>
	Frequenz Hz frequency Hz	50	<input checked="" type="checkbox"/>

Ausgang output	Einstellung Set to 102 cells	Einstellung Set to 104 cells	Einstellung Set to 106 cells	<input checked="" type="checkbox"/>
	Batterie- spannung: V battery voltage: V	232,0 V	236,4 V	<input checked="" type="checkbox"/>
	Verbraucher- spannung: V load voltage: V	232,0 V	236,4 V	<input checked="" type="checkbox"/>
	Strom: A current A	10-50 A	10-50 A	<input checked="" type="checkbox"/>



BENNING	Prüfprotokoll	Serien-Nr. / Serial No.: 106000540048
	Test Report	Blatt/Sheet: 4/7

Vorgenommene Prüfungen und Kontrollen
Inspections and tests performed

Ergebnis/Result
Beastandung
complaints

o.k.

Ermittlung der Verluste für Stromrichtersätze und -geräte nach EN/IEC 60146-1-1/7.4.1
Power loss determination for assemblies and equipment according to EN/IEC 60146-1-1/7.4.1

Eingangsleistung/input power	kW	<input type="checkbox"/>
Ausgangsleistung/output power	kW	<input type="checkbox"/>
$\eta = P_{out}/P_{in} =$		<input type="checkbox"/>

Erwärmungsprüfung nach EN/IEC 60146-1-1/7.4.2
Temperature rise test according to EN/IEC 60146-1-1/7.4.2

Ausgangsspannung/output voltage	V	<input type="checkbox"/>
Ausgangsstrom/output current	A	<input type="checkbox"/>
Dauer/duration	h	<input type="checkbox"/>

Gemessene Temperaturen/measured temperatures:

Transformator/transformer °C ☐

Drossel/choke °C ☐

Thyristorsatz/thyristor set °C ☐

Umgebungstemperatur/ambient temperature °C ☐

Messung des Leistungsfaktors nach EN/IEC 60146-1-1/7.4.3
Power factor measurement according to EN/IEC 60146-1-1/7.4.3

$\cos \phi =$ ☐

Prüfen der Hilfsrichtungen nach EN/IEC 60146-1-1/7.5.1
Checking of auxiliary devices according to EN/IEC 60146-1-1/7.5.1

☒

BENNING	Prüfprotokoll Test Report	Serien-Nr. / Serial No.: 106000540048 Blatt/Sheet: 5/7
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Vorgenommene Prüfungen und Kontrollen
Inspections and tests performed

Ergebnis/Result
Beurteilung
complaints

o.k.

Ermittlung der inneren Spannungsänderung nach EN/IEC 60146-1-1/7.3.4
Measurement of the inherent voltage regulation according to EN/IEC 60146-1-1/7.3.4

Prüfen der Eigenschaften der Steuereinrichtung nach EN/IEC 60146-1-1/7.5.2
Checking the properties of the control equipment according to EN/IEC 60146-1-1/7.5.2

bei Netzennspannung
at rated mains voltage

U = 400 V

104 Zellen/cells			
231,7 V	30,0 A	30,0 A	<input checked="" type="checkbox"/>
231,8 V	20,0 A	20,0 A	<input checked="" type="checkbox"/>
231,9 V	15,0 A	15,0 A	<input checked="" type="checkbox"/>
232,0 V	10,0 A	10,0 A	<input checked="" type="checkbox"/>
232,0 V	5,0 A	5,0 A	<input checked="" type="checkbox"/>

bei Netzunterspannung
at mains undervoltage

U = 360 V

106 Zellen/cells			
231,7 V	30,0 A	30,0 A	<input checked="" type="checkbox"/>
231,8 V	20,0 A	20,0 A	<input checked="" type="checkbox"/>
231,9 V	15,0 A	15,0 A	<input checked="" type="checkbox"/>
232,0 V	10,0 A	10,0 A	<input checked="" type="checkbox"/>
232,0 V	5,0 A	5,0 A	<input checked="" type="checkbox"/>

bei Netzüberspannung
at mains overvoltage:

U = 440 V

104 Zellen/cells			
231,7 V	30,0 A	30,0 A	<input checked="" type="checkbox"/>
231,8 V	20,0 A	20,0 A	<input checked="" type="checkbox"/>
231,9 V	15,0 A	15,0 A	<input checked="" type="checkbox"/>
232,0 V	10,0 A	10,0 A	<input checked="" type="checkbox"/>
232,0 V	5,0 A	5,0 A	<input checked="" type="checkbox"/>

bei Ausgangsleistung/qualizing charging
at mains output/adjusted to

bis/to
V

Handladen eingestellt
manual charging adjusted

V

I-Kennlinie/-characteristic

V

BENNING	Prüfprotokoll Test Report	Serien-Nr. / Serial No.: 106000540048 Blatt/Sheet: 6/7
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Vorgenommene Prüfungen und Kontrollen
Inspections and tests performed

Ergebnis/Result
Beurteilung
complaints

o.k.

Prüfen der Schutzvorrichtungen nach EN/IEC 60146-1-1/7.5.3
Checking the protective devices according to EN/IEC 60146-1-1/7.5.3

- Berührungsschutz/shock protection ☒
- Schutzart/protection mode ☒
- Schutzklasse/protection class ☒
- Sicherungen/fuses ☒
- Automaten/MCBs ☒
- Leistungsschalter/MCCBs ☐

Prüfen der Störfestigkeit nach EN/IEC 60146-1-1/7.6 a)
Immunity test according to EN/IEC 60146-1-1/7.6 a)

Prüfen der Überstrombelastbarkeit nach EN/IEC 60146-1-1/7.3.3
Overcurrent capability test according to EN/IEC 60146-1-1/7.3.3

bei Netzennspannung
at mains voltage

U = V

Funktionsgrad nach EN/IEC 60146-1-1/7.6 b)
Radio interference level according to EN/IEC 60146-1-1/7.6 b)

Geräuschmessung nach EN/IEC 60146-1-1/7.7
Audible noise according to EN/IEC 60146-1-1/7.7

Ermittlung der überlagerten Wechselgrößen nach EN/IEC 60146-1-1/7.3.5
Measurement of ripple AC values according to EN/IEC 60146-1-1/7.3.5

bei Widerstands-/Batterielast
at resistance/battery load

V ☐ SS / ☐ eff. bei Ausgangsspannung/
at output voltage

ergibt/results in %

V DC

BENNING	Prüfprotokoll	Serien-Nr. / Serial No.: 106000540048 Blatt/Sheet: 7/7
	Test Report	

Vorgenommene Prüfungen und Kontrollen
Inspections and tests performed

Ergebnis/Result
Beurteilung
complaints

o.k.

Zusätzliche Prüfungen nach EN/IEC 60146-1-1/7.7
Additional tests according to EN/IEC 60146-1-1/7.7

Spannungsebene für 102 Zellen = 227,5V o.k.
Voltage level for 102 cells = 227,5V o.k.

Für Prüfung bestückt mit 3 Modulen / equipped with 3 modules for testing



Kontrollierung/supervisor: Schweink, Ingo
Datum/date: 13.06.2014

Kontrollierung/supervisor: Sewergin, Viktor
Datum/date: 13.06.2014

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TB407.3 de-en

BENNING	Prüfprotokoll	Serien-Nr. / Serial No.: 106000540049 Blatt/Sheet: 1/7
	Test Report	

Typ:	D400G212/10-50BWRu-PDG	Auftrags-Nr.:	001-00223337/2
Zeichn. Nr.:	104380.00E794	Serien-Nr.:	106000540049
Drawing No.:		Serial No.:	

Die Anlage wurde geprüft nach:
Equipment tested according to:

EN 60146-1-1
IEC 60146-1-1

Prüfung test	Kapitel chapter	Typ-Prüfung type test	Stückprüfung routine test	Zusatzprüfung optional test ¹
Sichtprüfung Visual test		X	X	
Isolationsprüfung Insulation test	7.2	X	X	
Schwachlast- und Funktionsprüfung Light load and functional test	7.3.1	X	X	
Prüfen mit Bemessungsstrom Rated current test	7.3.2	X		
Ermittlung der Verluste für Stromrichtersätze und -geräte Power loss determination for assemblies and equipment	7.4.1	X		
Erwärmungsprüfung Temperature-rise test	7.4.2	X		
Messung des Leistungsfaktors Power factor measurement	7.4.3			(X)
Prüfen der Hilfseinrichtungen Checking of auxiliary devices	7.5.1	X	X	
Ermittlung der inneren Spannungsänderung Measurement of the inherent voltage regulation	7.3.4			(X)
Prüfen der Eigenschaften der Steuereinrichtung Checking the properties of the control equipment	7.5.2	X	X	
Prüfen der Schutzvorrichtungen Checking the protective devices	7.5.3	X	X	
Prüfen der Störfestigkeit Immunity test	7.6 a)			(X)
Überstromprüfung Overcurrent capability test	7.3.3			(X)
Funkstörgrad Radio interference level	7.6 b)			(X)
Geräuschmessung Audible noise	7.7			(X)
Ermittlung der überlagerten Wechselgrößen Measurement of ripple AC values	7.3.5			(X)
Zusätzliche Prüfungen Additional tests	7.7			(X)
Messung der Oberschwingungsströme Measurement of Harmonics	7.3.6			(X)

¹ Die mit "(x)" gekennzeichneten Einzelprüfungen werden nur durchgeführt, wenn sie ausdrücklich im Vertrag vereinbart wurden.
With "(x)" characterized individual tests are accomplished only if they were agreed upon expressly in the contract.

BENNING	Prüfprotokoll Test Report	Serien-Nr. / Serial No.: 106000540049 Blatt/Sheet: 2/7
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Vorgenommene Prüfungen und Kontrollen
Inspections and tests performed

Ergebnis/Result
Beastandung
complaints
o.k.

Sichtprüfung
Visual test

Mechanische Kontrollen
Mechanical checks

Kontrolle der eingebauten Geräte
check of the incorporated devices

Kontrolle der Verdrahtung und Stromschienen
Verification of the wiring and of the busbars

Kontrolle der Beschriftung und Schilder
Verification of the markings and identification plates

Messkontrolle der Luft- und Kriechstrecken
verification of the air gaps and creeping distances

Isolationsprüfung nach EN/IEC 60146-1-1/7.2
Insulation test according to EN/IEC 60146-1-1/7.2

Spannungsprüfung
Voltage test

Primär/Sekundär
Primarily/secondary

Primär/GND
Primarily/ground

Sekundär/GND
Secondary/ground

Zeitdauer/duration

☒

☒

☒

☒

☒

☒

☒

☒

☒

2,1 kV DC

2,1 kV DC

2,1 kV DC

2 Sek.



TB407.3 de-en

BENNING	Prüfprotokoll Test Report	Serien-Nr. / Serial No.: 106000540049 Blatt/Sheet: 3/7
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Vorgenommene Prüfungen und Kontrollen
Inspections and tests performed

Ergebnis/Result
Beastandung
complaints
o.k.

Isolationswiderstandsprüfung
Insulation resistance test

Stromkreis
circuit

Hauptstromkreis
Main circuit

Hilfsstromkreis
Aux. circuit

Zeitdauer/duration

Schwachlast- und Funktionsprüfung
Light load and functional test (EN/IEC 60146-1-1/7.3.1)
(Prüfen mit Bemessungsstrom Rated current test (EN/IEC 60146-1-1/7.3.1))
Aufnahme der Nenndaten
checking of the nominal values

Eingang input	Spannung V voltage V	400
	Strom A current A	26 (34)
	Frequenz Hz frequency Hz	50

Ausgang output		Einstellung Set to 102 cells	Einstellung Set to 104 cells	Einstellung Set to 106 cells
	Batterie- spannung: V battery voltage: V	227,5 V	232,0 V	236,4 V
	Verbraucher- spannung: V load voltage: V	227,5 V	232,0 V	236,4 V
	Strom: A current A	10-50 A	10-50 A	10-50 A

TB407.3 de-en

BENNING	Prüfprotokoll	Serien-Nr. / Serial No.: 106000540049
	Test Report	Blatt/Sheet: 4/7

Vorgenommene Prüfungen und Kontrollen
Inspections and tests performed

Ergebnis/Result
Beaustandung
complaints

o.k.

Ermittlung der Verluste für Stromrichtersätze und -geräte nach EN/IEC 60146-1-1/7.4.1
Power loss determination for assemblies and equipment according to EN/IEC 60146-1-1/7.4.1

Eingangsleistung/input power ☐ kW
Ausgangsleistung/output power ☐ kW
 $\eta = P_{out}/P_{in} =$ ☐

Erwärmungsprüfung nach EN/IEC 60146-1-1/7.4.2
Temperature rise test according to EN/IEC 60146-1-1/7.4.2

Ausgangsspannung/output voltage ☐ V
Ausgangsstrom/output current ☐ A
Dauer/duration ☐ h

Gemessene Temperaturen/measured temperatures:

Transformator/transformer ☐ °C
Drossel/choke ☐ °C
Thyristorsatz/thyristor set ☐ °C
Umgebungstemperatur/ambient temperature ☐ °C

Messung des Leistungsfaktors nach EN/IEC 60146-1-1/7.4.3
Power factor measurement according to EN/IEC 60146-1-1/7.4.3

$\cos \varphi =$ ☐

Prüfen der Hilfseinrichtungen nach EN/IEC 60146-1-1/7.5.1
Checking of auxiliary devices according to EN/IEC 60146-1-1/7.5.1

☒



BENNING	Prüfprotokoll	Serien-Nr. / Serial No.: 106000540049
	Test Report	Blatt/Sheet: 5/7

Vorgenommene Prüfungen und Kontrollen
Inspections and tests performed

Ergebnis/Result
Beaustandung
complaints

o.k.

Ermittlung der inneren Spannungsänderung nach EN/IEC 60146-1-1/7.3.4
Measurement of the inherent voltage regulation according to EN/IEC 60146-1-1/7.3.4

Prüfen der Eigenschaften der Steuereinrichtung nach EN/IEC 60146-1-1/7.5.2
Checking the properties of the control equipment according to EN/IEC 60146-1-1/7.5.2

bei Netznominalspannung
at rated mains voltage

U = 400 V ☒

104 Zellen/cells

231,8 V 30,0 A
231,9 V 20,0 A
232,0 V 15,0 A
232,0 V 10,0 A
232,1 V 5,0 A

106 Zellen/cells

236,1 V 30,0 A
236,2 V 20,0 A
236,4 V 15,0 A
236,4 V 10,0 A
236,4 V 5,0 A

bei Netzunterspannung
at mains undervoltage

U = 360 V ☒

104 Zellen/cells

231,8 V 30,0 A
231,9 V 20,0 A
232,0 V 15,0 A
232,0 V 10,0 A
232,1 V 5,0 A

106 Zellen/cells

236,1 V 30,0 A
236,2 V 20,0 A
236,4 V 15,0 A
236,4 V 10,0 A
236,4 V 5,0 A

bei Netzüberspannung
at mains overvoltage:

U = 440 V ☒

104 Zellen/cells

231,8 V 30,0 A
231,9 V 20,0 A
232,0 V 15,0 A
232,0 V 10,0 A
232,1 V 5,0 A

106 Zellen/cells

236,1 V 30,0 A
236,2 V 20,0 A
236,4 V 15,0 A
236,4 V 10,0 A
236,4 V 5,0 A

Ausgleichsladen/qualizing charging
von/from
eingestellt/adjusted to

bis/to
V A ☐

Handladen eingestellt
manual charging adjusted

V A max ☐

I-Kennlinie/-characteristic

V A ☐

BENNING	Prüfprotokoll Test Report	Serien-Nr. / Serial No.: 106000540049 Blatt/Sheet: 6/7
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Vorgenommene Prüfungen und Kontrollen
Inspections and tests performed

Ergebnis/Result
Beurteilung
complaints

o.k.

Prüfen der Schutzeinrichtungen nach EN/IEC 60146-1-1/7.5.3
Checking the protective devices according to EN/IEC 60146-1-1/7.5.3

- ☒ Berührungsschutz/shock protection
- ☒ Schutzart/protection mode
- ☒ Schutzklasse/protection class
- ☒ Sicherungen/fuses
- ☒ Automaten/MCBs
- ☐ Leistungsschalter/MCCBs

Prüfen der Störfestigkeit nach EN/IEC 60146-1-1/7.6 a)
Immunity test according to EN/IEC 60146-1-1/7.6 a)

Prüfen der Überstrombelastbarkeit nach EN/IEC 60146-1-1/7.3.3
Overcurrent capability test according to EN/IEC 60146-1-1/7.3.3

bei Netzennspannung
at mains voltage

U = V

Funktionsgrad nach EN/IEC 60146-1-1/7.6 b)
Radio interference level according to EN/IEC 60146-1-1/7.6 b)

Geräuschmessung nach EN/IEC 60146-1-1/7.7
Audible noise according to EN/IEC 60146-1-1/7.7

Ermittlung der überlagerten Wechselgrößen nach EN/IEC 60146-1-1/7.3.5
Measurement of ripple AC values according to EN/IEC 60146-1-1/7.3.5

bei Widerstands-/Batterielast
at resistance/battery load

V ☐ SS / ☐ eff. bei Ausgangsspannung/
at output voltage V DC ☐ ☐
ergibt/results in %

ВЯРНО С
ОРИГИНАЛ



TB407.3 de-en

BENNING	Prüfprotokoll Test Report	Serien-Nr. / Serial No.: 106000540049 Blatt/Sheet: 7/7
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Vorgenommene Prüfungen und Kontrollen
Inspections and tests performed

Ergebnis/Result
Beurteilung
complaints

o.k.

Zusätzliche Prüfungen nach EN/IEC 60146-1-1/7.7
Additional tests according to EN/IEC 60146-1-1/7.7

Spannungsebene für 102 Zellen = 227,5V o.k.
Voltage level for 102 cells = 227,5V o.k.

Für Prüfung bestückt mit 3 Modulen / equipped with 3 modules for testing

Prüfer/tester: Schmeink, Ingo Datum/date: 13.06.2014

Kontrolle/supervisor: Sewergin, Viktor Datum/date: 13.06.2014

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TB407.3 de-en

BENNING

EG-Konformitätserklärung
EC-Conformation / Déclaration de conformité UE

Dokument-Nr./ AB-Nr.: 0095204.01

Hersteller:
Manufacturer / Fabricant: Theo Benning GmbH & Co. KG
Münsterstraße 135-137
D-46397 Bocholt
Anschrift:
Address / Adresse: Telefon: +49 (0)2871 / 930

Produkt:
Product name / Nom du produit: Beurrethe: Thymbrocke
E230 G2420 Bwug-TDG - D400 G216/400 Bwug-TDG

Geräte-Nr.:
Serial No / Numéro de série: _____

Das bezeichnete Produkt stimmt mit den Vorschriften folgender Europäischen Richtlinien überein:
The product is in accordance with European-Directive:
Le produit indiqué ci-dessus est conforme aux directives européennes:

Nummer:
Number / Nr.: 7323/EWG, Niederspannungsrichtlinie
89/336/EWG, EMV-Richtlinie

Normen:
Standards / Normes: IEC 64, VDE 0108 Teil 101
VDE 0160, VDE 435 Teil 320,
EN 60742,
EN 60145, VDE 871,
EN 50178, EN 50081-2
EN 50082-2

Aussteller:
Issued by / Délivreur: Hr. Rummel
GW

Bocholt, Datum und
rechtsverbindliche Unterschrift 03.04.2001
ppa. W. Saul

Date et
légal binding Signature / Signature légale

ВЯРНО
ОРИГИНАЛ



Seite: Page:	1/7	Prüfprotokoll Test record	BENNING
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Typ / Type: Rectifier	Artikel-Nr./ Part No.:
Zeichnungs-Nr./ Drawing No.:	Serien-Nr./ Serial No.:
	Auftrags-Nr./ Order No.:

Die Anlage wurde geprüft nach Equipment tested according to/	DIN EN IEC 60146-1-1
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Prüfung Test	Kapitel Chapter	Typ-prüfung Type test	Stück- prüfung Routine test	Zusatz- prüfung Optional test
Schprüfung Visual test		X	X	
Isolationsprüfung Insolation tests	7.2	X	X	
Schwachlast- und Funktionsprüfung Light load test and functional test	7.3.1	X	X	
Prüfen mit Bemessungsstrom Rated current test	7.3.2	X		
Ermittlung der Verlustleistung für Stromrichtersätze und - geräte Power loss determination for assemblies and equipment	7.4.1	X		
Erwärmungsprüfung Temperature rise test	7.4.2	X		
Messung des Leistungsfaktors Power factor measurement	7.4.3			(X)
Prüfen der Hilfseinrichtungen Checking of auxiliary devices	7.5.1	X	X	
Ermittlung der inneren Spannungsänderung Measurement of the inherent voltage regulation	7.3.4			(X)
Prüfen der Eigenschaften der Steuereinrichtung Checking the properties of the control equipment	7.5.2	X	X	
Prüfen der Schutzeinrichtungen Checking the protective devices	7.5.3	X	X	
Prüfen der Störfestigkeit Immunity test	7.6a			(X)
Prüfung der Überstrombelastbarkeit Over-current capability test	7.3.3			(X)
Funkstörgrad Radio interference degree	7.6.3			(X)
Geräuschmessung Measurement of audible noise	7.7			(X)
Messung von überlagerten Wechselgrößen Measurement of ripple voltage and current	7.3.5			(X)
Harmonische Störungen Harmonic disturbances	7.7			X)
Überschwingungsströme Overswinging currents	7.3.6			(X)

Seite Page	2/7	Prüfprotokoll Test record	BENNING
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Sonstige Messungen/Bemerkungen Other measurements/remarks		Ergebnis Result
		O.K. Not O.K.

Measurement of harmonic currents			
Sicht- und Ausführungskontrollen: Visual and workmanship tests		<input type="checkbox"/>	<input type="checkbox"/>
Mechanische Kontrollen Mechanical tests		<input type="checkbox"/>	<input type="checkbox"/>
Gerätekontrolle (Kontrolle der eingebauten Geräte) Equipment tests (checks of the incorporated devices)		<input type="checkbox"/>	<input type="checkbox"/>
Kontrolle der Schutzmaßnahmen Verification of the protective measures		<input type="checkbox"/>	<input type="checkbox"/>
Kontrolle der Kriech- und Luftstrecken Verification of the creepage distances, clearances and distances		<input type="checkbox"/>	<input type="checkbox"/>
Kontrolle der Verdrahtung und Stromschienen Verification of the wiring and of the busbars		<input type="checkbox"/>	<input type="checkbox"/>
Kontrolle der Beschriftung und Schilder Verification of the markings and identification label		<input type="checkbox"/>	<input type="checkbox"/>
Überprüfung der Geräteunterlagen auf Übereinstimmung mit der Spezifikation Verification of the documentation if it is in accordance with the specification		<input type="checkbox"/>	<input type="checkbox"/>

Sonstige Messungen/Bemerkungen Other measurements/remarks	Ergebnis Result	
	O.K.	Not O.K.

7.2	Isolationsprüfung Insulation test		
Stromkreis Electric circuit	Messspannung Measuring voltage	Isolationswert Insulation value	
Hauptstromkreise Main circuits	kV	MQ	<input type="checkbox"/>
Hilfsstromkreise Auxiliary electrical circuits	kV	MQ	<input type="checkbox"/>

Hochspannungsprüfung High voltage test		
	Prüfspannung Test voltage	Ergebnis Result
Primär -> GND Primary -> ground	kV	<input type="checkbox"/>
Sekundär -> GND Secondary -> ground	kV	<input type="checkbox"/>
Primär -> Sekundär Primary -> secondary	kV	<input type="checkbox"/>

7.3.1	Schwachlast- und Funktionsprüfung Light load and functional test		
7.3.2	Prüfen mit Bemessungsstrom Rated current test		
Aufnahme der Nenndaten Checking of the nominal values			
Eingang Input			
Spannung Voltage	V	<input type="checkbox"/>	<input type="checkbox"/>
Strom Current	A	<input type="checkbox"/>	<input type="checkbox"/>
Frequenz Frequency	Hz	<input type="checkbox"/>	<input type="checkbox"/>
Ausgang Output			
Batteriespannung Battery voltage	V	<input type="checkbox"/>	<input type="checkbox"/>
Verbraucherspannung Load voltage	V	<input type="checkbox"/>	<input type="checkbox"/>
Strom Current	A	<input type="checkbox"/>	<input type="checkbox"/>

Sonstige Messungen/Bemerkungen Other measurements/remarks	Ergebnis Result	
	O.K.	Not O.K.

7.4.1	Ermittlung der Verluste für Stromrichterschätze und -geräte Power loss determination for assemblies and equipment		
Eingangsleistung Input power	kW	<input type="checkbox"/>	<input type="checkbox"/>
Ausgangsleistung Output power	kW	<input type="checkbox"/>	<input type="checkbox"/>
$\eta = P_{out}/P_{in} =$	%	<input type="checkbox"/>	<input type="checkbox"/>

7.4.2	Erwärmungsprüfung Temperature rise test		
Ausgangsspannung output voltage	V	<input type="checkbox"/>	<input type="checkbox"/>
Ausgangsstrom output current	A	<input type="checkbox"/>	<input type="checkbox"/>
Transformator Transformer	°C	<input type="checkbox"/>	<input type="checkbox"/>
Drossel Choke	°C	<input type="checkbox"/>	<input type="checkbox"/>
Thyristorsatz Thyristor set	°C	<input type="checkbox"/>	<input type="checkbox"/>
Umgebungstemperatur Ambient temperature	°C	<input type="checkbox"/>	<input type="checkbox"/>

7.4.3	Messung des Leistungsfaktors Power factor measurement		
cos $\phi =$		<input type="checkbox"/>	<input type="checkbox"/>

7.5.1	Prüfen der Hilfsleinrichtungen Checking of auxiliary devices	<input type="checkbox"/>	<input type="checkbox"/>
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7.3.4	Ermittlung der inneren Spannungsänderung Measurement of the inherent voltage regulation	<input type="checkbox"/>	<input type="checkbox"/>
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Sonstige Messungen/Bemerkungen Other measurements/remarks	Ergebnis Result	
	O.K.	Not O.K.

7.7	Zusätzliche Prüfungen: Additional tests:

Prüfer: Tester:		Datum: Date:	
Freigegeben: Approved:		Datum: Date:	

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ВЪПРО С
 ОРИГИНАЛ



BENNING Conversion d'énergie 27400 Louviers - FRANCE	Test Report Procès-verbal d'essais	Serial N° / n° de série 3549001001 Sheet / folio : 1/8
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Type: D380G125 / 200 BW/rug-TDG3	Order N°: Commande n°N 3549
Zeichn. Nr.: N3549	Serial-Nr.: 3549001001
Plan n°	n° de série :
Redresseur 1	Rectifier 1

Equipment tested according to:
Conformité de l'équipement testée selon

Test Essai	Chapitre Chapitre	Type Test Test de type	Individual Test Test individuel	Optional Test Essai facultatif
Visual test Contrôle visuel		X	X	
Insulation test Essai d'isolation	7.2	X	X	
Light load and functional test Essai à faible charge et essai de fonctionnement	7.3.1	X	X	
Rated current test Essai à courant nominal	7.3.2	X		
Overload capability test Essai d'aptitude aux surcharges	7.3.3			(X)
Measurement of ic inherent voltage regulation Mesure de la régulation interne de tension	7.3.4			(X)
Measurement of the voltage and current ripple AC values	7.3.5			(X)
Mesure de la tension et du courant d'ondulation				
Measurement of the harmonic distortion currents Mesure des courants harmoniques	7.3.6			(X)
Power loss determination for assemblies and equipment		X		
Détermination des pertes pour les assemblages et les équipements	7.4.1			
Temperature-rise test Essai d'échauffement	7.4.2	X		
Power factor measurement Mesure du facteur de puissance	7.4.3			(X)
Checking of the auxiliary devices Contrôle des dispositifs auxiliaires	7.5.1	X	X	
Checking of the properties of the control equipment Contrôle des propriétés du système de commande	7.5.2	X	X	
Checking of the protection devices Contrôle des dispositifs de protection	7.5.3	X	X	
Immunity test Test d'immunité	7.6 a)			(X)
Radio interference level Niveau d'interférence radioélectriques rayonnées et par retour	7.6 b)			(X)
Quality tests Essais complémentaires	7.7			(X)
	7.7			(X)

EN 60146-1-1 (April 2011)
IEC 60146-1-1 (Avril 2011)

Witness (s) characterize individual tests are accomplished only of the were agreed upon expressly in the contract.
Les essais marqués de la lettre (x) ne sont exécutés que s'il en a été expressément convenu au contrat.

Witness (s) Release
On behalf of: S.G. ...
Print Name: ...
Signature: ...
Date: ...

Typetest 2013En-fr
File: commande-2013-N3549-test-report-N3549001001_type_enl.doc

BENNING Conversion d'énergie 27400 Louviers - FRANCE	Test Report Procès-verbal d'essais	Serial N° / n° de série 3549001001 Sheet / folio : 2/8
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Inspections and test performed
Inspection et essais réalisés

Result/ Résultat
complaints
Réclamation

o.k.

- Type test and following optional tests :
- Overload capability test
 - Measurement of the inherent voltage regulation
 - Measurement of the ripple AC values
 - Measurement of the power factor
 - Measurement of the audible noise

Visual test Contrôle visuel		
Mechanical checks Contrôles mécaniques		
Check of the incorporated devices Contrôle des dispositifs intégrés		
Checking of the wiring and of the busbars Vérification du câblage et des Bus barres		
Checking of the marking and indication plates Vérification des marquages et des plaques d'identification		
Checking of the air gaps and creeping distances Vérification des entrefers et des distances		
Insulation test according to EN/IEC 60146-1-1/7.2 Essai d'isolation suivant EN/IEC 60146-1-1/7.2		
Voltage test Tension d'essai		
Primarily/secondary Primaire /secondaire :	2,5 kV DC.	
Primarily/ground Primaire /terre :	2,5 kV DC.	
Secondary/ground Secondaire /terre :	2,5 kV DC.	
Duration / durée :	72 sec.	

Witness (s) Release
On behalf of: S.G. ...
Print Name: ...
Signature: ...
Date: ...

BENNING Conversion d'énergie 27400 Leerskoven - FRANCE	Test Report Procès-verbal d'essais	Serial N° / n° de série 3549001001 Sheet / folio : 5/8
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Inspections and test performed Inspections et essais réalisés	Result/ Résultat complaints Réclamation
	o.k.

Equalizing (manual) charging / Charge d'égalisation

Adjusted to / réglée à : 136.5 V 30.9A max ☒

I-Characteristic / Courbe I : 120.4 V 220 A ☒

Measurement of ripple AC values according to EN/IEC 60146-1-1/7.3.5
Mesure de la résiduelle des valeurs c. a. selon EN/IEC 60146-1-1/7.3.5

at resistance/battery load
sur charge resistive / Util.-batterie :

60mV ☐ SS / ☒ eff. at output voltage/
à tension de sortie 133.3 V DC ☒
results in / soit 0.08 % ☒

Power loss determination for assemblies and equipment according to EN/IEC 60146-1-1/7.4.1
Détermination des pertes pour les assemblages et les équipements selon EN/IEC 60146-1-1/7.4.1

Input power / Puissance à l'entrée : 29.5 kW ☒

Output power / Puissance à la sortie : 26.55 kW ☒

$\eta = P_{out}/P_{in} = 0.892$ ☒

Temperature rise test according to EN/IEC 60146-1-1/7.4.2
Essai d'échauffement selon EN/IEC 60146-1-1/7.4.2

Output voltage / Tension de sortie : 129.2 V ☒
Output current / Intensité de sortie : 200 A ☒
Duration / durée h ☒

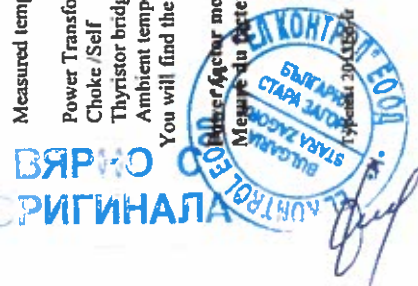
Measured temperatures / Températures mesurées :

Power Transformer / Transformateur de puissance ☒
Choke / Self ☒
Thyristor bridge / pont thyristor ☒
Ambient temperature / Température ambiante ☒

You will find the graph and the tab of datas enclosed

Power factor measurement according to EN/IEC 60146-1-1/7.4.3
Mesure du facteur de puissance selon EN/IEC 60146-1-1/7.4.3

cos φ = 0.86



BENNING Conversion d'énergie 27400 Leerskoven - FRANCE	Test Report Procès-verbal d'essais	Serial N° / n° de série 3549001001 Sheet / folio : 6/8
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Inspections and test performed Inspections et essais réalisés	Result/ Résultat complaints Réclamation
	o.k.

Checking of auxiliary devices according to EN/IEC 60146-1-1/7.5.1
Contrôle des dispositifs auxiliaires selon EN/IEC 60146-1-1/7.5.1 ☒

Checking the protective devices according to EN/IEC 60146-1-1/7.5.3
Contrôle des dispositifs de protection selon EN/IEC 60146-1-1/7.5.3

Shock protection / Protection contre les contacts ☒
Protection mode / Mode de protection ☒
Protection class / Classe de protection ☒
Fuse / Fusible ☒
MCBs, MCBs / Disjoncteurs ☒

Audible noise according to EN/IEC 60146-1-1/7.7
Bruit audible selon EN/IEC 60146-1-1/7.7 62.8 dB ☒

Reviewed/Visé et/ou Released
On behalf of / Pour
Print Name / Nom
Signature / Signature
Date / Date

Inspections and test performed
Inspections et essais réalisés

Result/ Résultat
complaints
Réclamation
o.k.

Additional tests according to EN/IEC 60146-1-17.7
Essais supplémentaires selon EN/IEC 60146-1-17.7

- 16h testrun, result attached.

burn in > 16 hours rectifier 125 V / 200 A

03/07/2013

time	voltage	current	voltage/2	Current/4	transforme	dc choke	bridge	entry airf	exit airf
00:08:06	129.6	129.0	64.8	49.8	53.9	35.1	29.9	24.4	27.0
00:11:06	129.9	200.0	65.0	50.0	53.6	33.9	31.9	24.3	29.2
00:18:06	129.8	199.8	64.9	50.0	56.0	36.2	33.8	23.7	32.0
00:22:06	129.6	200.8	64.8	50.2	58.2	39.2	34.6	24.4	33.4
00:28:06	129.5	199.9	64.8	50.0	58.9	38.9	35.2	24.3	34.4
00:33:06	130.0	200.2	65.0	50.1	58.6	37.4	35.8	24.4	35.3
00:38:06	129.8	199.3	64.9	49.8	60.5	39.3	36.6	24.1	36.2
00:43:06	129.9	200.1	65.0	50.0	62.2	40.7	37.0	24.6	37.0
00:48:06	129.8	200.0	64.9	50.0	64.7	43.3	37.0	24.8	37.1
00:53:06	130.1	199.7	65.1	49.9	64.7	42.0	37.0	25.0	37.0
01:03:06	129.8	199.7	64.9	49.9	65.1	41.5	37.2	24.5	37.6
01:08:06	129.9	199.9	65.0	50.0	68.8	45.5	37.6	24.5	37.9
01:13:06	129.5	200.0	64.8	50.0	69.5	45.0	38.0	24.4	38.4
01:18:06	129.7	200.2	64.9	50.1	69.2	44.0	37.7	24.8	38.1
01:23:06	129.5	199.7	64.8	49.9	70.0	44.8	37.9	24.9	39.1
01:28:06	129.2	200.5	64.6	50.1	72.0	46.2	38.1	24.4	38.7
01:33:06	129.7	200.0	64.9	50.0	74.0	48.5	38.3	24.9	38.5
01:38:06	130.1	199.4	65.1	49.9	73.7	47.5	38.2	25.2	38.7
01:43:06	129.9	199.7	64.9	49.9	73.8	46.6	38.4	25.2	38.9
01:48:06	129.9	200.0	65.0	50.0	75.2	48.2	38.6	25.2	39.3
01:53:06	129.8	200.3	64.9	50.1	76.9	50.3	38.7	25.5	39.2
01:58:06	130.1	199.8	65.1	50.0	77.1	50.0	38.7	25.0	39.2
02:03:06	130.1	200.3	65.1	50.1	76.5	48.1	38.9	25.5	39.8
02:08:06	129.7	200.0	64.9	50.0	77.7	49.8	39.2	25.5	39.9
02:13:06	129.9	199.5	65.0	49.9	79.5	51.9	39.1	25.7	39.8
02:18:06	129.4	199.7	64.7	49.9	79.8	51.8	39.1	25.2	39.7
02:23:06	130.1	200.2	65.1	50.1	79.7	51.6	39.0	25.2	39.8
02:28:06	129.5	199.7	64.8	49.9	79.8	51.1	39.1	25.3	40.1
02:33:06	129.8	200.0	64.9	50.0	81.3	52.2	39.3	25.5	40.2
02:38:06	130.1	199.6	65.1	49.9	82.0	53.2	39.6	25.2	40.4
02:43:06	129.8	200.3	64.9	50.1	82.1	53.4	39.2	25.1	40.1
02:48:06	129.7	199.5	64.9	49.9	81.1	51.7	39.3	25.4	40.2

On behalf of
Signature
Date
03/07/2013



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burn in > 16 hours rectifier 125 V / 200 A

03/07/2013

	voltage	current	voltage/2	Current/4	transforma	dc choke	bridge	entry airf	exit airf1
02:51:06	129.8	200.2	64.9	50.1	82.8	53.7	39.5	25.2	40.5
02:58:06	129.8	199.7	64.9	49.9	84.6	55.8	39.7	25.3	40.3
03:03:06	129.7	199.8	64.9	50.0	84.0	54.0	39.5	25.4	40.2
03:08:06	129.5	199.4	64.8	49.9	83.3	53.1	39.5	25.5	40.3
03:13:06	129.9	200.2	65.0	50.1	84.2	53.7	39.6	25.5	40.4
03:18:06	129.7	199.7	64.9	49.9	85.9	56.5	39.7	25.5	40.3
03:23:06	129.7	199.5	64.9	49.9	85.7	55.7	39.5	25.5	40.3
03:28:06	129.7	199.9	64.9	50.0	84.8	53.9	39.6	25.5	40.4
03:33:06	129.6	199.5	64.8	49.9	85.1	55.1	39.7	25.7	40.5
03:38:06	129.6	199.3	64.8	49.8	87.1	56.9	39.9	25.5	40.5
03:43:06	129.8	199.9	64.9	50.0	87.0	56.4	39.9	25.7	40.3
03:48:06	129.8	200.0	64.9	50.0	86.1	55.0	39.7	25.6	40.5
03:53:06	129.8	199.7	64.9	49.9	86.3	56.0	39.8	25.6	40.5
03:58:06	129.3	200.0	64.7	50.0	88.3	57.4	40.1	25.6	40.8
04:03:06	129.8	199.8	64.9	50.0	88.1	56.9	40.1	25.8	40.4
04:08:06	129.9	199.5	65.0	49.9	87.1	55.7	39.9	25.6	40.5
04:13:06	130.1	200.0	65.1	50.0	87.3	55.7	39.9	25.8	40.5
04:18:06	129.9	199.9	65.0	50.0	88.5	57.2	40.0	25.8	40.6
04:23:06	129.5	199.9	64.8	50.0	89.0	57.3	40.1	25.6	40.6
04:28:06	129.7	199.5	64.9	49.9	88.6	57.2	40.0	25.8	40.5
04:33:06	129.8	200.0	64.9	50.0	88.1	56.1	39.9	25.6	40.7
04:38:06	130.1	200.0	65.1	50.0	89.1	57.2	40.2	25.5	40.7
04:43:06	129.7	199.4	64.9	49.9	89.4	57.6	40.1	25.7	40.6
04:48:06	129.8	200.2	64.9	50.1	89.3	57.9	39.9	25.6	40.7
04:53:06	129.7	199.4	64.9	49.9	88.0	55.6	39.9	25.6	40.8
04:58:06	129.7	199.1	64.9	49.8	89.7	57.6	40.2	25.5	40.8
05:03:06	129.9	199.9	65.0	50.0	91.1	59.4	40.2	25.6	40.8
05:08:06	129.8	199.5	64.9	49.9	89.9	58.1	40.0	25.6	40.7
05:13:06	129.7	199.7	64.9	49.9	88.7	56.1	40.0	25.5	40.7
05:18:06	130.2	199.4	65.1	49.9	90.0	58.0	40.1	25.4	40.7
05:23:06	129.8	199.7	64.9	49.9	91.0	60.2	40.1	25.5	40.7
05:28:06	129.5	199.5	64.8	49.9	90.3	58.3	39.9	25.3	40.6
05:33:06	129.8	199.7	64.9	49.9	89.5	57.1	40.0	25.4	40.9

2/7

Reviewed/Witnessed/Released
On behalf of 365
Print Name
Signature
Date 03/07/2013

burn in > 16 hours rectifier 125 V / 200 A

03/07/2013

time	voltage	current	voltage/2	Current/4	transforma	dc choke	bridge	entry airf	exit airf1
05:38:06	129.5	199.8	64.8	50.0	90.4	57.8	40.0	25.4	40.9
05:43:06	129.6	199.6	64.8	49.9	91.3	60.4	40.1	25.3	40.8
05:48:06	129.9	199.4	65.0	49.9	91.0	58.9	39.9	25.3	40.8
05:53:06	129.7	199.9	64.9	50.0	90.0	57.3	39.9	25.2	40.9
05:58:06	129.8	199.9	64.9	50.0	90.2	58.5	40.0	25.1	40.9
06:03:06	129.7	199.7	64.9	49.9	91.6	60.2	40.0	25.1	40.9
06:08:06	129.8	199.6	64.9	49.9	91.5	59.3	40.0	25.2	40.7
06:13:06	129.9	199.5	65.0	49.9	90.2	57.2	39.8	25.1	40.8
06:18:06	129.5	199.5	64.8	49.9	90.5	58.6	39.9	25.2	40.8
06:23:06	129.7	200.0	64.9	50.0	92.0	60.5	40.1	25.1	40.8
06:28:06	130.2	199.5	65.1	49.9	91.6	59.3	39.9	25.1	40.6
06:33:06	129.3	200.3	64.7	50.1	91.2	59.1	39.8	25.1	40.7
06:38:06	129.4	199.2	64.7	49.8	90.6	58.1	39.8	25.2	40.7
06:43:06	129.8	199.5	64.9	49.9	91.4	58.9	40.0	25.1	40.7
06:48:06	130.0	199.3	65.0	49.8	92.7	61.1	39.9	25.0	40.9
06:53:06	129.6	199.8	64.8	50.0	91.3	59.3	39.7	25.0	40.7
06:58:06	129.9	200.0	65.0	50.0	90.3	58.3	39.8	25.0	40.8
07:03:06	129.7	200.1	64.9	50.0	91.4	59.0	39.8	24.9	40.8
07:08:06	129.6	199.5	64.8	49.9	92.4	60.9	39.9	24.9	40.6
07:13:06	129.9	199.6	65.0	49.9	91.9	59.5	39.6	24.9	40.6
07:18:06	129.7	199.8	64.9	50.0	90.8	58.0	39.6	24.8	40.8
07:23:06	129.5	199.4	64.8	49.9	91.0	59.0	39.6	24.9	40.8
07:28:06	129.9	199.8	65.0	50.0	92.1	60.6	39.8	24.9	40.9
07:33:06	130.0	199.6	65.0	49.9	92.2	60.0	39.7	24.9	40.4
07:38:06	129.6	200.1	64.8	50.0	91.1	58.8	39.6	24.8	40.4
07:43:06	129.8	199.2	64.9	49.8	90.9	58.6	39.5	24.8	40.6
07:48:06	129.8	199.3	64.9	49.8	91.7	59.3	39.6	24.8	40.5
07:53:06	129.6	199.2	64.8	49.8	92.8	61.3	39.7	24.7	40.4
07:58:06	129.9	198.8	65.0	49.7	91.8	59.9	39.4	24.7	40.6
08:03:06	129.8	199.5	64.9	49.9	90.8	58.3	39.5	24.7	40.7
08:08:06	129.4	199.9	64.7	50.0	91.5	59.4	39.5	24.7	40.9
08:13:06	129.7	200.2	64.9	50.1	92.5	61.5	39.6	24.7	40.3
08:18:06	130.1	199.8	65.1	50.0	92.1	61.5	39.5	24.6	40.6

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БЪЛГАРИЯ
СТАРА ЗАГОРА



Reviewed/Witnessed/Released
On behalf of 365
Print Name
Signature
Date 03/07/2013

time	voltage	current	voltage/2	Current/4	transforme	dc choke	bridge	entry airf	exit airf1
08:23:06	129.5	199.8	64.8	50.0	90.8	58.2	39.4	24.7	40.5
08:28:06	129.8	199.8	64.9	50.0	91.1	59.2	39.4	24.6	40.8
08:33:06	129.7	199.8	64.9	50.0	92.6	61.0	39.6	24.6	40.5
08:38:06	130.0	199.7	65.0	49.9	92.1	60.0	39.4	24.5	40.3
08:43:06	130.2	200.2	65.1	50.1	91.8	59.9	39.2	24.4	40.5
08:48:06	129.5	199.9	64.8	50.0	90.2	57.8	39.2	24.5	40.5
08:53:06	129.8	199.6	64.9	49.9	91.7	59.7	39.4	24.5	40.8
08:58:06	129.9	199.8	65.0	50.0	92.6	61.4	39.5	24.4	40.5
09:03:06	129.7	199.3	64.9	49.8	91.9	59.6	39.1	24.4	40.3
09:08:06	130.0	199.4	65.0	49.9	90.8	58.3	39.3	24.5	40.5
09:13:06	129.6	199.3	64.8	49.8	90.8	59.3	39.3	24.4	40.6
09:18:06	130.1	199.9	65.1	50.0	92.3	60.9	39.3	24.3	40.8
09:23:06	129.7	199.5	64.9	49.9	91.9	60.4	39.3	24.3	40.7
09:28:06	129.6	199.3	64.8	49.8	91.3	60.1	39.1	24.3	40.6
09:33:06	130.0	199.2	65.0	49.8	90.4	57.8	39.0	24.2	40.6
09:38:06	129.7	199.9	64.9	50.0	91.5	59.6	39.3	24.2	40.4
09:43:06	129.7	200.0	64.9	50.0	92.3	61.4	39.2	24.1	40.4
09:48:06	130.0	200.0	65.0	50.0	91.9	60.0	38.9	24.2	40.3
09:53:06	129.9	199.9	65.0	50.0	90.8	58.7	39.0	24.1	40.4
09:58:06	129.4	199.9	64.7	50.0	90.9	59.3	39.1	24.1	40.7
10:03:06	130.1	200.0	65.1	50.0	92.4	61.2	39.2	24.1	40.5
10:08:06	129.4	199.8	64.7	50.0	91.8	59.8	39.1	24.0	40.3
10:13:06	129.5	200.1	64.8	50.0	91.5	60.1	39.0	24.0	40.5
10:18:06	129.7	199.8	64.9	50.0	90.2	58.0	39.0	24.0	40.6
10:23:06	129.6	199.9	64.8	50.0	91.3	59.5	39.1	23.9	40.5
10:28:06	129.7	200.0	64.9	50.0	92.2	61.6	39.2	24.0	40.4
10:33:06	129.8	199.8	64.9	50.0	91.9	60.4	39.0	23.9	40.4
10:38:06	129.8	199.8	64.9	50.0	90.6	58.3	38.9	23.9	40.2
10:43:06	129.8	199.8	64.9	50.0	90.6	59.1	38.9	23.9	40.6
10:48:06	129.9	200.1	65.0	50.0	91.4	59.7	39.0	23.9	40.5
10:53:06	129.9	199.4	65.0	49.9	92.7	61.6	39.0	23.8	40.2
10:58:06	129.6	199.3	64.8	49.8	91.2	59.7	38.8	23.8	40.4
11:03:06	129.8	200.3	64.9	50.1	90.4	58.6	38.8	23.8	40.3

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Reviewed/Witnessed/Released
On behalf of SCS
Print Name
Signature
Date 03/07/2013

time	voltage	current	voltage/2	Current/4	transforme	dc choke	bridge	entry airf	exit airf1
11:08:06	129.8	199.9	64.9	50.0	90.7	59.5	38.8	23.8	40.6
11:13:06	129.8	199.8	64.9	50.0	91.8	60.7	38.9	23.8	40.3
11:18:06	129.6	199.5	64.8	49.9	91.6	60.1	38.8	23.8	40.1
11:23:06	129.7	199.8	64.9	50.0	91.2	59.8	38.6	23.7	40.4
11:28:06	129.7	200.0	64.9	50.0	89.7	57.8	38.5	23.6	40.4
11:33:06	129.6	199.8	64.8	50.0	91.1	59.0	38.8	23.6	40.6
11:38:06	129.8	199.7	64.9	49.9	91.9	61.4	38.8	23.6	40.4
11:43:06	129.9	199.8	65.0	50.0	91.6	60.2	38.7	23.6	40.3
11:48:06	130.0	199.9	65.0	50.0	90.4	58.4	38.6	23.6	40.1
11:53:06	129.4	200.0	64.7	50.0	90.5	58.8	38.5	23.6	40.3
11:58:06	130.0	199.4	65.0	49.9	91.2	59.6	38.7	23.6	40.4
12:03:06	129.7	199.7	64.9	49.9	92.0	61.4	38.7	23.6	40.3
12:08:06	129.7	200.0	64.9	50.0	91.5	59.9	38.5	23.5	40.2
12:13:06	129.6	200.2	64.8	50.1	90.4	58.1	38.5	23.5	40.1
12:18:06	129.9	199.8	65.0	50.0	90.3	59.0	38.5	23.4	40.3
12:23:06	129.6	199.5	64.8	49.9	91.2	59.6	38.7	23.4	40.3
12:28:06	129.6	199.3	64.8	49.8	92.2	61.3	38.6	23.4	40.2
12:33:06	130.0	199.5	65.0	49.9	91.1	59.4	38.4	23.3	40.2
12:38:06	129.9	199.8	65.0	50.0	90.1	58.2	38.4	23.4	40.2
12:43:06	130.1	199.9	65.1	50.0	90.4	59.1	38.4	23.4	40.1
12:48:06	130.0	200.3	65.0	50.1	91.7	60.6	38.7	23.3	40.3
12:53:06	129.8	199.8	64.9	50.0	91.4	59.8	38.5	23.3	40.1
12:58:06	129.6	199.9	64.8	50.0	91.0	59.7	38.2	23.3	40.1
13:03:06	129.6	199.9	64.8	50.0	90.2	58.3	38.3	23.3	40.0
13:08:06	129.8	199.3	64.9	49.8	90.3	59.1	38.4	23.3	40.1
13:13:06	129.5	200.0	64.8	50.0	91.6	60.7	38.5	23.2	40.0
13:18:06	129.9	199.9	65.0	50.0	91.4	59.9	38.4	23.2	39.8
13:23:06	129.9	199.5	65.0	49.9	91.0	59.6	38.2	23.2	39.9
13:28:06	130.1	199.9	65.1	50.0	90.0	58.2	38.3	23.2	40.0
13:33:06	129.6	199.5	64.8	49.9	90.4	58.8	38.3	23.3	39.9
13:38:06	130.0	200.0	65.0	50.0	91.4	60.8	38.4	23.2	40.1
13:43:06	129.5	199.9	64.8	50.0	91.3	59.7	38.3	23.2	39.7
13:48:06	129.7	200.1	64.9	50.0	90.8	58.8	38.2	23.1	39.7

БЪЛГАРСКО
СЪДИЩЕ



Reviewed/Witnessed/Released
On behalf of SCS
Print Name
Signature
Date 03/07/2013

time	voltage	current	voltage/2	Current/4	transforma	dc choke	bridge	entry airf	exit airf1
13:53:06	129.9	200.1	65.0	50.0	89.9	58.0	38.2	23.2	39.9
13:58:06	129.8	199.8	64.9	50.0	90.6	58.6	38.2	23.1	39.9
14:03:06	129.6	200.0	64.8	50.0	91.3	60.6	38.3	23.1	39.9
14:08:06	129.9	200.2	65.0	50.1	91.2	59.8	38.2	23.1	39.8
14:13:06	130.1	200.3	65.1	50.1	90.8	59.7	38.1	23.0	39.6
14:18:06	130.0	199.9	65.0	50.0	89.6	57.7	38.2	23.1	40.1
14:23:06	129.7	200.2	64.9	50.1	90.7	58.6	38.2	23.1	39.7
14:28:06	130.1	200.2	65.1	50.1	91.3	60.8	38.2	23.0	39.9
14:33:06	129.8	199.7	64.9	49.9	91.3	60.0	38.2	23.1	39.7
14:38:06	129.5	200.0	64.8	50.0	90.6	59.7	38.1	23.0	39.7
14:43:06	129.7	200.0	64.9	50.0	89.6	57.3	38.0	23.1	39.8
14:48:06	129.7	200.3	64.9	50.1	90.5	58.6	38.1	23.1	39.9
14:53:06	130.0	200.0	65.0	50.0	91.2	60.8	38.3	23.2	39.8
14:58:06	129.7	199.9	64.9	50.0	91.1	59.6	38.2	23.1	39.7
15:03:06	130.0	199.3	65.0	49.8	90.6	59.6	38.0	23.1	39.6
15:08:06	130.1	199.8	65.1	50.0	89.3	57.4	38.1	23.1	39.7
15:13:06	129.9	200.3	65.0	50.1	90.6	58.8	38.2	23.1	39.9
15:18:06	129.7	200.2	64.9	50.1	91.1	60.8	38.2	23.1	39.5
15:23:06	130.1	199.9	65.1	50.0	91.3	59.2	38.3	23.3	39.1
15:28:06	129.5	199.8	64.8	50.0	90.8	59.0	38.2	23.3	39.2
15:33:06	129.9	199.3	65.0	49.8	89.3	57.1	38.1	23.3	39.4
15:38:06	129.9	199.9	65.0	50.0	90.7	58.2	38.2	23.3	39.4
15:43:06	129.7	199.8	64.9	50.0	91.3	60.7	38.4	23.4	39.6
15:48:06	129.3	200.0	64.7	50.0	91.1	59.6	38.3	23.5	39.8
15:53:06	130.3	199.7	65.2	49.9	90.6	59.2	38.2	23.4	39.7
15:58:06	130.0	200.2	65.0	50.1	89.2	56.5	38.2	23.5	39.4
16:03:06	129.7	199.4	64.9	49.9	90.5	58.0	38.2	23.6	39.3
16:08:06	130.1	199.4	65.1	49.9	91.4	60.4	38.2	23.4	39.2
16:13:06	129.3	200.2	64.7	50.1	91.3	59.1	38.1	23.2	39.0
16:18:06	129.5	199.8	64.8	50.0	90.5	58.7	37.9	23.1	38.9
16:23:06	129.8	199.9	64.9	50.0	89.6	56.9	37.9	23.1	39.1
16:28:06	129.6	199.5	64.8	49.9	90.6	58.5	37.9	23.1	39.2
16:33:06	130.1	199.9	65.1	50.0	91.4	60.2	38.1	23.1	39.0

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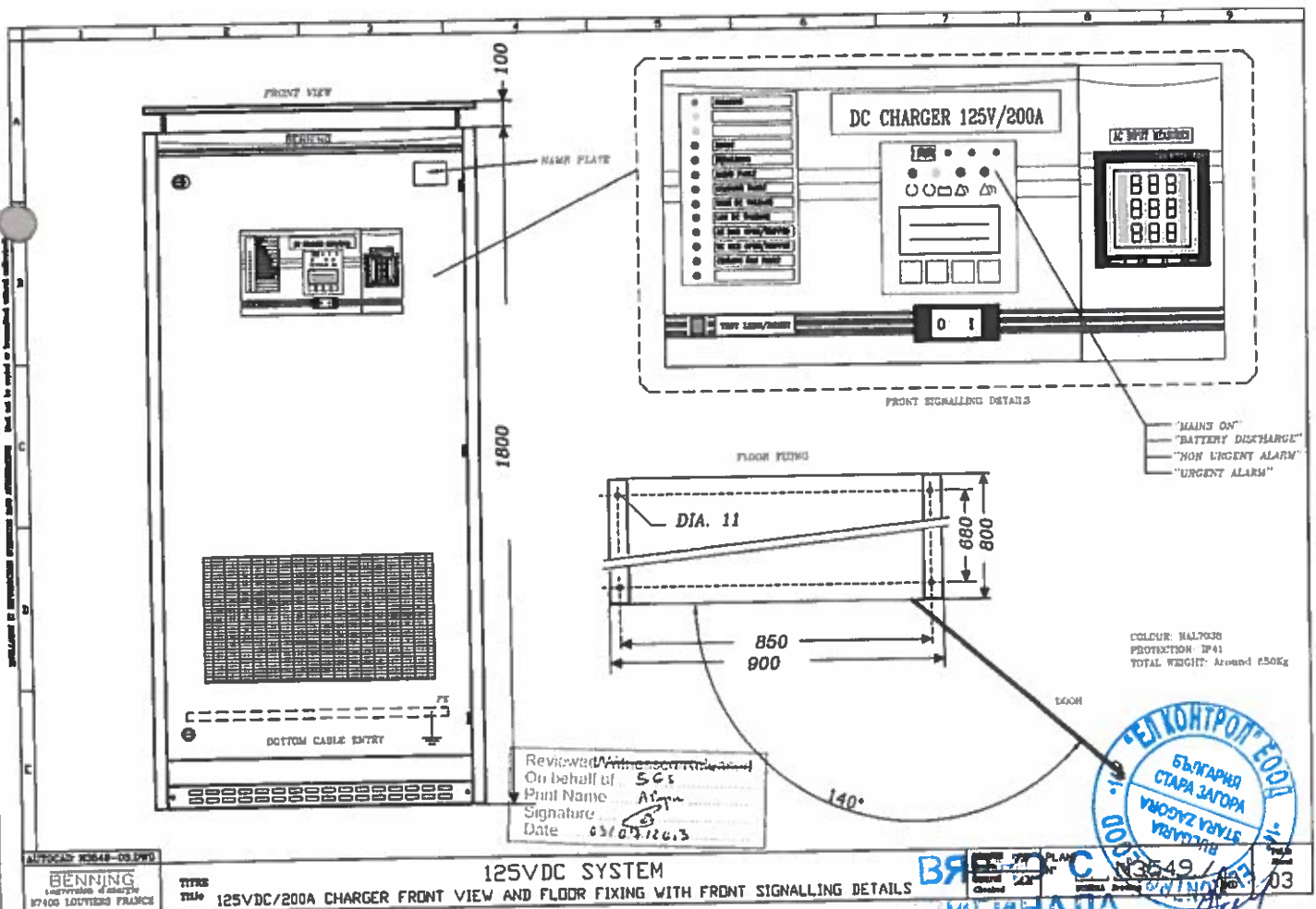
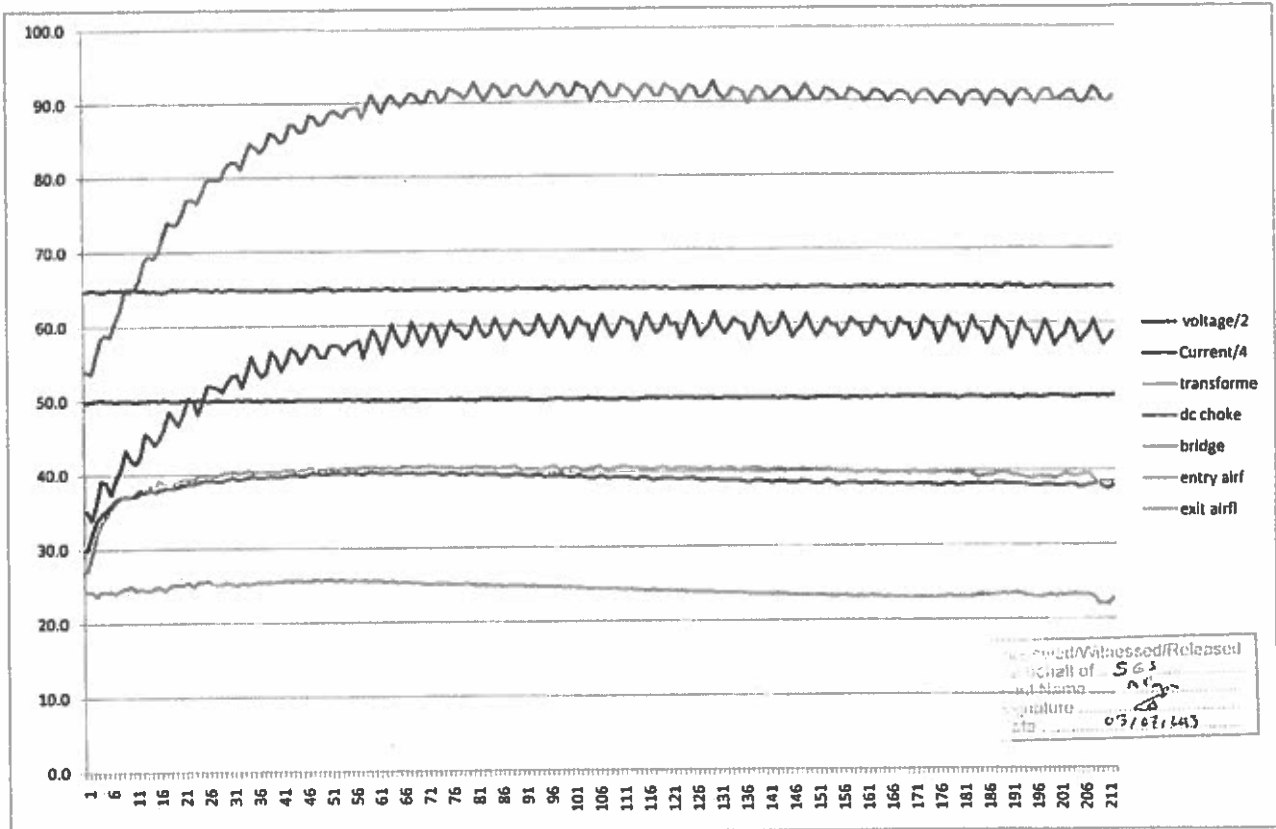
Reviewed/Witnessed/Released
 On behalf of SCS
 Plant Name AT-1
 Signature [Signature]
 Date 03/07/2013

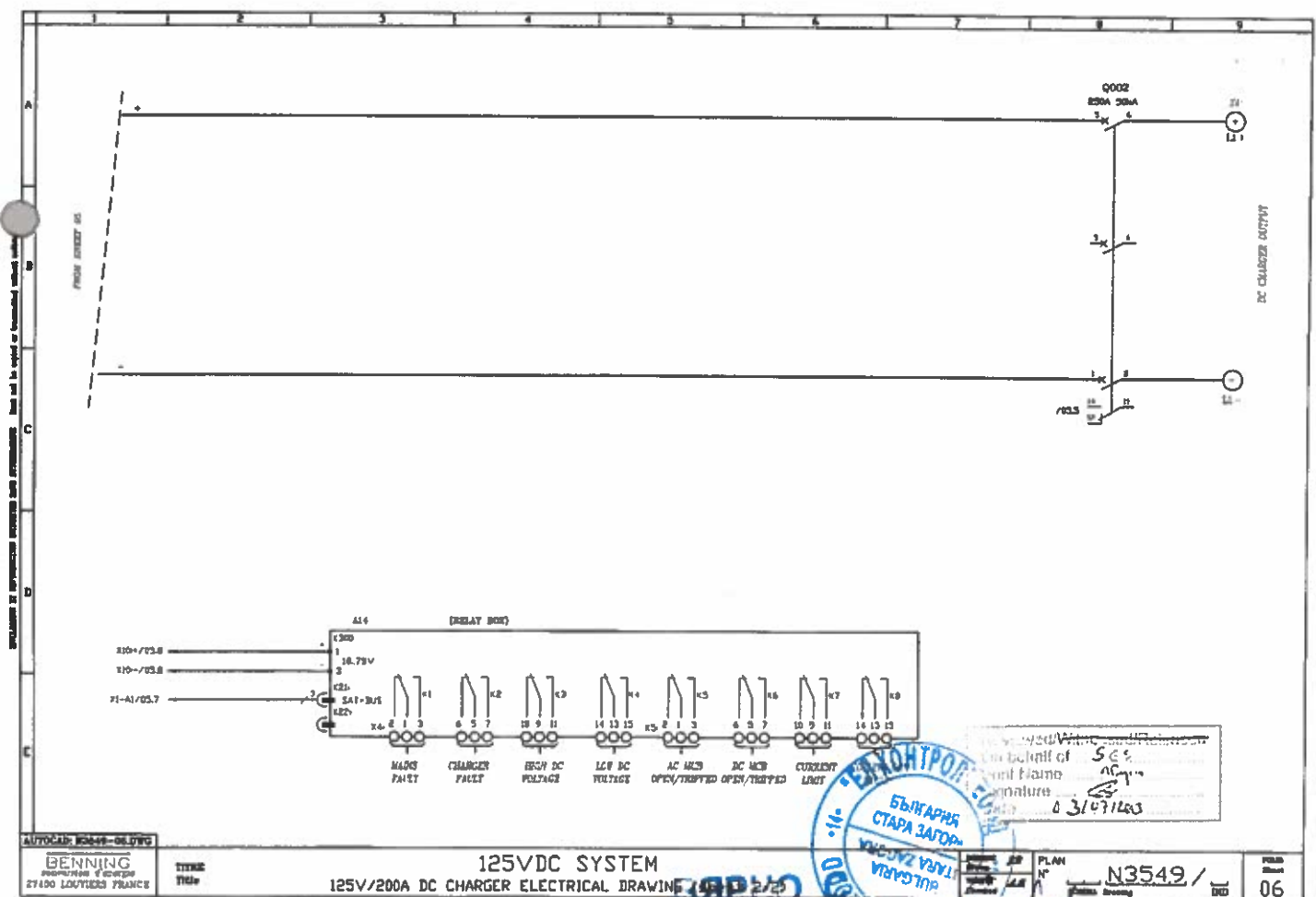
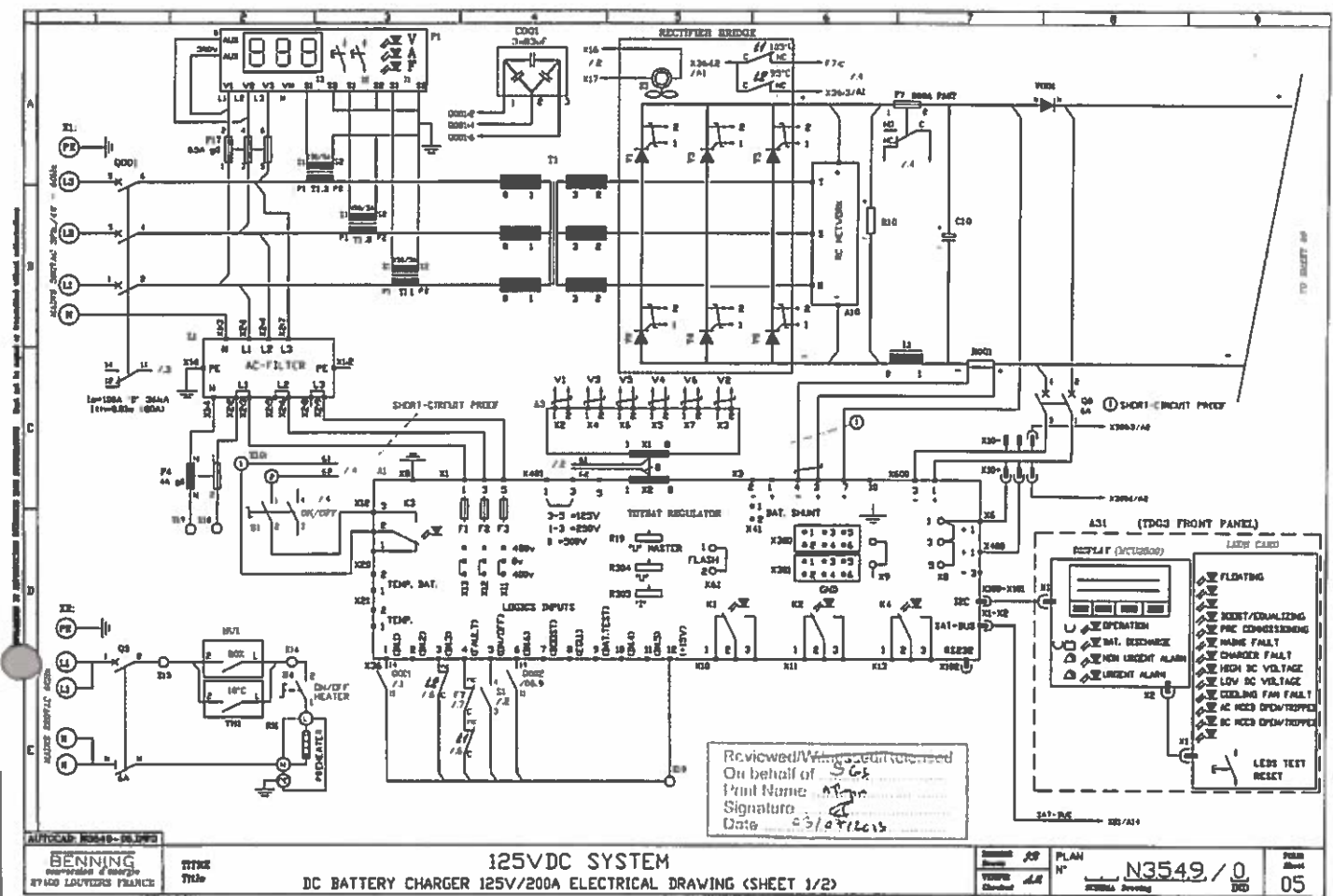
time	voltage	current	voltage/2	Current/4	transforme	dc choke	bridge	entry airf	exit airf1
16:38:06	130.0	200.3	65.0	50.1	91.4	58.8	38.1	23.3	39.1
16:43:06	129.5	200.5	64.8	50.1	90.1	56.9	37.9	23.1	38.9
16:48:06	129.7	200.3	64.9	50.1	90.2	57.9	37.9	23.3	39.2
16:53:06	129.6	200.0	64.8	50.0	90.7	58.4	37.9	23.2	39.6
16:58:06	129.7	200.0	64.9	50.0	91.3	60.3	38.1	23.3	39.4
17:03:06	129.4	199.5	64.7	49.9	91.1	59.3	38.1	23.4	39.2
17:08:06	129.7	200.1	64.9	50.0	89.8	57.2	37.7	23.3	39.3
17:13:06	129.6	200.1	64.8	50.0	89.7	58.0	37.8	23.3	39.5
17:18:06	129.7	200.1	64.9	50.0	90.5	58.7	38.0	23.3	39.5
17:23:06	129.8	200.3	64.9	50.1	91.8	60.3	38.1	23.0	38.8
17:28:06	129.5	199.9	64.8	50.0	91.1	58.4	38.3	22.1	38.3
17:33:06	129.7	200.3	64.9	50.1	90.0	57.0	37.7	22.1	38.5
17:38:06	130.0	200.0	65.0	50.0	89.8	57.6	37.5	22.0	38.4
17:43:06	129.5	200.5	64.8	50.1	90.5	58.6	37.9	22.8	38.5

Reviewed/Witnessed/Released
 On behalf of SCS
 Plant Name AT-1
 Signature [Signature]
 Date 03/07/2013



Burn in Activation 125V/200A

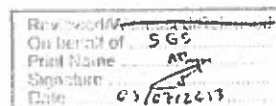




Numéro d'article	Index	Nom d'article	Numéro de dessin	Groupe d'article	Unité	Achats	Quantité de commande standard	Quantité de commande min.	Stock	Quantité de commande standard	Quantité de commande min.	Prix de revient HT	Prix
						1 00			1,00			0,00	0,00

Numéro d'article	Index	Nom d'article	Numéro de dessin	Type d'article	Position	N° ordre	Quantité	Quantité de base	Unité	Désignation de composant	Norme
780030		RESISTOR 25 24*130 70W 800E		Article			1,0000	1	Pcs	R10	
780482		WASHER ISOPLAN 20x12x2MM R10		Article			2,0000	1	Pcs	R10	
780600		SCREW M5 LENGTH 150		Article			1,0000	1	Pcs	R10	
81300216		RESISTOR HEATER 60W 120-240V		Article			1,0000	1	Pcs	R5	
10030683		TDO MAINS FILTER 400V		Article			1,0000	1	Pcs	Z1	
10001005		CAPA TRIPHAS 3x85uF 440VAC M8		Article			1,0000	1	Pcs	C001	
10006254		ELECTROLYTIC CAPACITOR 250V 1 E32 (78.2X147)		Article			14,0000	1	PCS	C10	
787253		RUBBER DISK FOR ELKO 74mm		Article			14,0000	1	Pcs	C10	
81300206		WHITE PLASTIC NUT D=16 FOR CA		Article			2,0000	1	Pcs	C10	
584090		MOUNTING PLATE CAPA 19 PSJ100		Article			1,0000	1	Pcs	A10	
547387		RC NETWORK FOR 8 TH BRIDGE		Article			1,0000	1	Pcs	V1 VS	
81307982		BRIDGE 68C 380x10-500F 500A A		Article			3,0000	1	Pcs	F17	
81300930		SOCKET 1P 10x38 MSC10		Article			1,0000	1	Pcs	F4	
81300851		SOCKET 1P+M MSC10		Article			24,000	1	Pcs	F17	
81300490		FUSE 10*38 G1 0 5A		Article			2,0000	1	Pcs	F4	
81300203		FUSE 10*38 G2 4A		Article			1,0000	1	Pcs	F17	
81300682		ASSEMBLY 2P CMS101 FERRAZ		Article			2,0000	1	Pcs	F17	
81301343		"CB TRI NSK 100T" 100A LV4200		Article			1,0000	1	Pcs	Q001	
81300897		MCOR TRI DC NSK2050DC LV43821		Article			1,0000	1	Pcs	Q002	
81301477		"ALIX...OF60" (M8 100/630) 79450		Article			2,0000	1	Pcs	D001-Q002	
81300898		COUNTS E50 80*96 230400VAC W		Article			1,0000	1	Pcs	P1	
81300905		TC 3 PHASES 1803A1(CS)18-70		Article			1,0000	1	Pcs	TH 1.3	
81300901		THERMOSTAT 0-80°C 0		Article			1,0000	1	Pcs	TH1	
10006220		HYGRO 30%-95% OF STEGO 01220		Article			1,0000	1	Pcs	HU1	
81310100		SWITCH ON/OFF HEATER 230V/2A:		Article			1,0000	1	Pcs	S4	
81308790		CABINET PSJ1800 RAL7038 IP41 W1		Non-nomenclature			1,0000	1	Pcs	CABINET	
81308790		COVER IP20 800*800 RAL7038		Non-nomenclature			2,0000	1	Pcs	GRID	
818138F38		CORNER POST 30*30*1800 RAL7038		Article			4,0000	1	Pcs		
828330F38		BASE FRAME SKURTING 800mm RAL		Article			2,0000	1	Pcs		
828341F38		FRONT COVER TOP FRAME 800mm		Article			1,0000	1	Pcs		
828333F38		BASE FRAME CROSS BAR 800mm R		Article			2,0000	1	Pcs		
828337F38		SIDE COVER TOP FRAME 800mm R		Article			2,0000	1	Pcs		
818771F38		FRONT DOOR ADAPTATOR PSJ 18C		Article			2,0000	1	Pcs		
828338F38		SIDE COVER TOP FRAME 800mm R		Article			1,0000	1	Pcs		
828403F38		RAISED FACE IP42 PSJ1800 RAL7038		Article			2,0000	1	Pcs		
735050		PLASTIC TUB COVER 30*30		Article			4,0000	1	Pcs		
718181		BRACKET CORNER BASE/TOP FRA		Article			8,0000	1	Pcs		
818908		SIDE PANEL ANGLE 1800mm		Article			2,0000	1	Pcs		
81308707		BOTTOM PLATE GALVA 1210 832x7		Article			1,0000	1	Pcs		
777558		COLUMB BLACK MFL 1-100 M8		Article			4,0000	1	Pcs	CABINET	
818118		SUPPORT ANGLE FOR BASE BLIND		Article			2,0000	1	Pcs	CABINET	
7816368		ADD. FRONT PLATE IP40 PSJ1800X		Article			1,0000	1	Pcs	CABINET	
781106		LOCK 028 7010 SW BLACK		Article			2,0000	1	Pcs	CABINET	
780586		FRONT DOOR HANDLE BLACK		Article			1,0000	1	Pcs	CABINET	
727141		DOOR DAMPER		Article			2,0000	1	Pcs	CABINET	
780077		DOOR HANGER 1110-UB		Article			2,0000	1	Pcs	CABINET	
780020		KEY FOR LOCK 028 7010 SW		Article			1,0000	1	Pcs	CABINET	
81308703		CABLE PLATE GALVA 1510 830x185		Article			1,0000	1	Pcs	CABINET	
785416		HANDLING BOX for DESCRIPTION		Article			1,0000	1	Pcs	CABINET	
516878		SUPPORT TRANSFO FIXING 900mm		Article			4,0000	1	Pcs	CABINET	
81308704		SWITCH SUPPORT DIAM 22-RAIL C		Article			1,0000	1	Pcs	CABINET	
516192		CROSS ANGLE 800		Article			2,0000	1	Pcs	CABINET	
787130		"ADHESIVE LABEL "BENNING"		Article			1,0000	1	Pcs	CABINET	
81308708		UPPER TRANSFORMER ANGLE 800		Article			1,0000	1	Pcs	CABINET	
81308705		MECHANICAL KIT FOR RECT. PSJ		Non-nomenclature			1,0000	1	Pcs	CABINET	
516182		CROSS ANGLE 800		Article			8,0000	1	Pcs	CABINET	
516184		MOUNTING ANGLE PSJ 1280mm		Article			2,0000	1	Pcs	CABINET	
516174		MOUNTING PLATE 320*800		Article			2,0000	1	Pcs	CABINET	
516848		MOUNTING PLATE 160*800		Article			1,0000	1	Pcs	CABINET	
573363		UNIVERSAL CROSS ANGLE 800		Article			2,0000	1	Pcs	CABINET	

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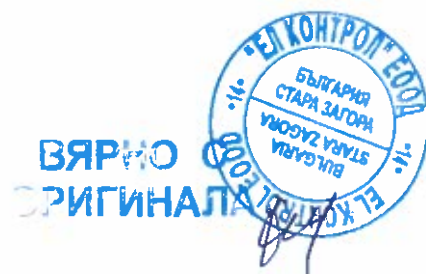


Numéro d'article	Index	Nom d'article	Numéro de dessin	Type d'article	Position	N° ordre	Quantité	Quantité de base	Unité	Désignation de composant	Norme
818187		REAR MOUNT ANGLE 30*30 450mm		Article			2,0000	1	Pcs	CABINET	
818187		CORNER RETAINING BAR 1800		Article			4,0000	1	Pcs	CABINET	
818149F38		SIDE WALL 1800*800 RAL7038		Article			2,0000	1	Pcs		
10007020F38		FRONT DOOR PSJ1800X WITH BOTI		Article			1,0000	1	Pcs	DOOR	
818181F38		BASE BLIND VENTIL. PSJ 900 RAL70		Article			1,0000	1	Pcs		
818123F38		TOP OF COVER IP21 800*800 RAL70		Article			1,0000	1	Pcs		
818148F38		SIDE WALL 1800*800 RAL7038		Article			1,0000	1	Pcs		
81301183		"CB UN-N DT40N "C" 6A 21364"		Article			1,0000	1	Pcs	C3	
748248		CB 61 6A 320VDC CB DEX-21 1310		Article			1,0000	1	Pcs	Q8	
748256		SHUNT DIN 43703 250A 60mV		Article			1,0000	1	Pcs	R001	
81300331		FAST FUSE 170A275A 250A		Article			1,0000	1	Pcs	F7	
808678		M.S. C-F 170A0235		Article			1,0000	1	Pcs	F7	
808186		COMP. FRONT STD TDG3		Non-nomenclature			1,0000	1	Pcs	A31	
791274		SWITCH 2P		Article	1		1,0000	1	Pcs	S1	
791271		COVER FOR SWITCH		Article	2		1,0000	1	Pcs	S1	
827056		REGUL. COVER PLATE THYSAT		Article	3		1,0000	1	Pcs		
848396		COMP. FRONT SDT+TDG3/MCU2501		Article	4		1,0000	1	Pcs	A31	
839707		CABLE L=1.5m FOR I2C-BUS		Article	8		1,0000	1	Pcs	QC	
848461		COVER FRONT DISPLAY		Article			1,0000	1	Pcs		
587144		THY. FRONT CABLING FOR THY		Article			1,0000	1	Pcs	CABLING	
10058218		8 PULSES A1A1 CABLE SET for W/c		Article			1,0000	1	Pcs	CABLING	
810259		CABLE SET THYSAT 3Pm >1500mm		Article			1,0000	1	Pcs	CABLING	
548833		MCU SAT 8 RELAY BOX 75.270V		Article			1,0000	1	Pcs	A14	
734286		SAT-BUS CABLE RJ45/RJ45 2m		Article			1,0000	1	Pcs	A1A14	
848884		PULSES 8TH THYREG 2.1		Article			1,0000	1	Pcs	A3	
538050		COMP REG THYSAT 3 3Pm 60-330V		Article			1,0000	1	Pcs	A1	
525173		FRONT PLATE M88 BLEU ANALOG		Article			1,0000	1	Pcs	P1	
81302183		HEATSINK BRUT 1M15 P4200		Article			1,0000	1	Pcs	V001	
81300900		DIODE 400V 240A S4R24004 M16		Article			1,0000	1	Pcs	V001	
10006736		DC CHOKER 120V/260A 8mH T8B		Article			1,0000	1	Pcs	L1	
81300909		KIT ACCESSORIES FOR TDG 200A		Non-nomenclature			1,0000	1	Pcs		
81302056		VIS TH 6X10		Article			4,0000	1	Pcs		
81302058		VIS TH 8X20		Article			30,0000	1	Pcs		
81302064		VIS TH 8X18		Article			6,0000	1	Pcs		
81302069		VIS TH 8X80		Article			8,0000	1	Pcs		
81302102		VIS NYLON 8/15		Article			4,0000	1	Pcs		
81308257		VIS SANIS TETE 8x18		Article			4,0000	1	Pcs		
81307838		VIS INOX 3 X 12 CRUCI RONDE		Article			44,0000	1	Pcs		
81302100		VIS TAPITE TCBL 4x20		Article			4,0000	1	Pcs		
786282		VIS TAPITE TCBL P021 2N Blanc M		Article			5,0000	1	Pcs		
81302048		VIS TRAUT. 6X10		Article			1,0000	1	Pcs		
81302120		RONDELLE PLATE BLANC 8		Article			10,0000	1	Pcs		
81302121		RONDELLE PLATE 8		Article			2,0000	1	Pcs		
81302123		RONDELLE PICOT 6x30		Article			80,0000	1	Pcs		
81302126		RONDELLE EVARAR 8		Article			4,0000	1	Pcs		
81302138		RONDELLE AZ 2x BL Dug 8x13		Article			8,0000	1	Pcs		
81302124		RONDELLE PICOT DIA 3		Article			2,0000	1	Pcs		
81302144		RONDELLE LARGE PLT 6		Article			6,0000	1	Pcs		
81302105		ECROU SERPRESS 3		Article			10,0000	1	Pcs		
81302108		ECROU SERPRESS 5		Article			30,0000	1	Pcs		
81302109		ECROU SERPRESS 8		Article			6,0000	1	Pcs		
81302118		ECROU NYLON M8		Article			6,0000	1	Pcs		
81307637		ECROU M3 INOX		Article			10,0000	1	Pcs		
81308498		ECROU FREN DMS 5x 05 2N BICH		Article			1,0000	1	Pcs		
81302106		ECROU SERPRESS 4		Article			16,0000	1	Pcs		
81302107		ECROU SERPRESS 5		Article			2,0000	1	Pcs		
81302140		ENTRETOISE Regul M3/40 M/F		Article			4,0000	1	Pcs		
81302150		ENTRETOISE NYLON 8/15/20		Article			2,0000	1	Pcs		
81302200		ENTRETOISE LISSE 8x12		Article			2,0000	1	Pcs		
786077		ISOLATING WASHER M/F DASH 3X1		Article			8,0000	1	Pcs		
720077		ISOLATOR H40014 8/1/16		Article			8,0000	1	Pcs		
720532		ISOLATOR H140M		Article			8,0000	1	Pcs		
81301822		BARRE 6M 30'S MEPLAT CuAl		Article			0,9000	1	Pcs		
81301824		BARRE 6M 40'S MEPLAT CuAl		Article			0,3000	1	Pcs		
81302050		CAPACITORS (49) COPPER COUP		Article			6,0000	1	Pcs		
81301824		GOULOTTE SECMA 25x40 21184		Article			1,0000	1	Pcs		</

Numéro d'article	Index	Nom d'article	Numéro de dessin	Type d'article	Position	N° opér.	Quantité de base	Unité	Désignation de composants	Norme
01301630		BAR DIN PERFORÉ PDR15		Article			1,4000	1	Pcs	
01301630		COLLIER 100x2,5mm Da=16mm		Article			40,0000	1	Pcs	
01301621		COLLIER 200x4,8mm Da=50mm		Article			20,0000	1	Pcs	
720070		ISOLATOR H30D30MM F.F		Article			10,0000	1	Pcs	
720083		ISOLATOR H30D30MM		Article			2,0000	1	Pcs	
736187		GROUND LABEL		Article			3,0000	1	Pcs	
01301818		"ETIQ REPERE MASSE "CLIENT"		Article			1,0000	1	Pcs	
01301726		BUTEE BADL 019940802		Article			18,0000	1	Pcs	
01301744		TERMINAL WAGO 2002-1401		Article			7,0000	1	Pcs	
01301745		FLASQUE WAGO 2002-1491		Article			8,0000	1	Pcs	
010912		SPACER L=30mm D=18mm		Article			2,0000	1	Pcs	
01301884		TERMINAL M35/16 11812407		Article			1,0000	1	Pcs	
01301709		TERMINAL M35/16P 10311114		Article			2,0000	1	Pcs	
01301726		BUTEE BADL 010940802		Article			1,0000	1	Pcs	
10050121		TERMINAL PPV 4 CR 36x7,5 DGR		Article			2,0000	1	Pcs	
10050122		END PLATE PAP PRIV/PPV 4 CR		Article			1,0000	1	Pcs	
10050123		DEVISING PLATE TW PRIV 4 A-D		Article			1,0000	1	Pcs	
10078787		TR. COMOG 118220 TDG 60x4 T88 AJ		Article			1,0000	1	Pcs	

On behalf of SGS
Print Name SGS
Signature SGS
Date 03/07/2013

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Certificate

Standard

ISO 9001:2008 and ISO 14001:2004

Certificate Registr. No. 01 150 079699

TÜV Rheinland Cert GmbH certifies:

Certificate Holder:

**Benning Elektrotechnik und
Elektronik GmbH & Co. KG**
Münsterstraße 135-137
Robert-Bosch-Straße 20
D - 46397 Bocholt

Scope:

Development, manufacture and sales of power supply equipment (such as battery chargers, power supply-modules and -systems, rectifiers, inverters, DC-converters) and test- and measurement-devices, as well as repair, or revamping, installation and testing of electrical devices, systems and engines (such as motors and generators)

An audit was performed, Report No. 079699. Proof has been furnished that the requirements according to ISO 9001:2008 and ISO 14001:2004 are fulfilled.

The due date for all future audits is 08-05 (dd.mm).

Validity:

The certificate is valid from 2012-05-22 until 2015-05-21 for ISO 9001 and from 2012-05-22 until 2015-05-21 for ISO 14001.

2012-03-26

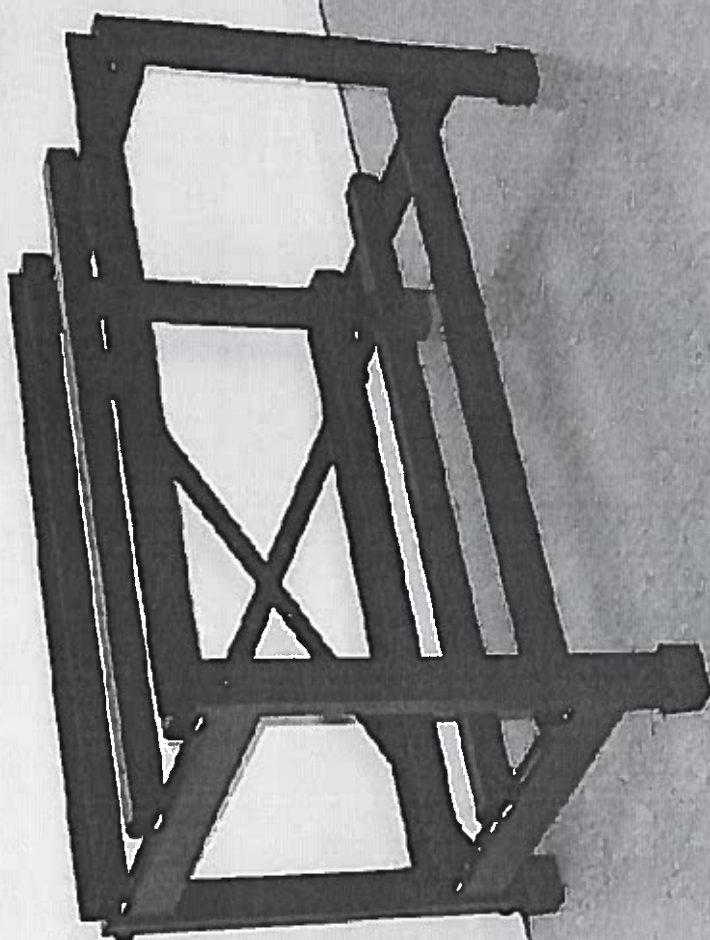

TÜV Rheinland Cert GmbH
Am Grauen Stein 51105 Köln



DGA-ZM-58-95-00 / DGA-ZM-58-95-60

www.tuv.com



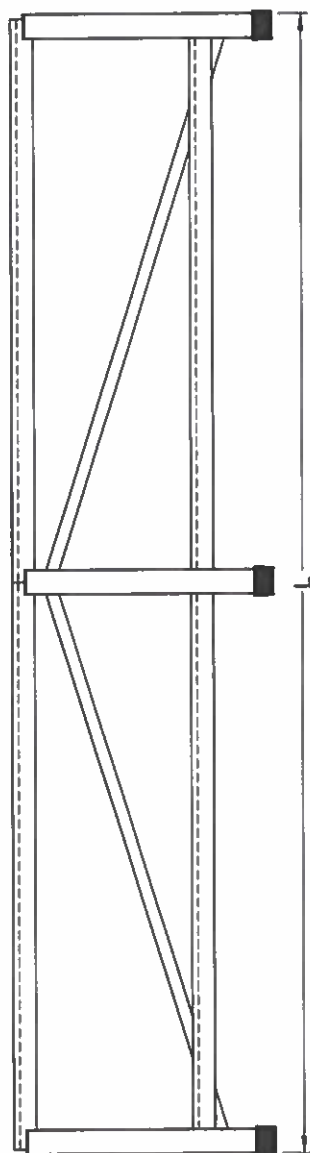
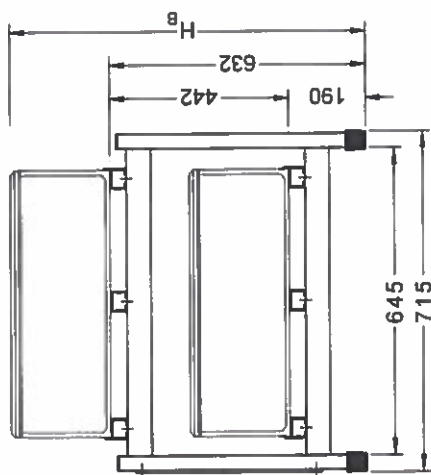


ВЯРНО С



Handwritten signature

Article No: 2U1186 Rack-Type: 2E-PGU 1-18 H Battery: 18 x A412/100,0 A

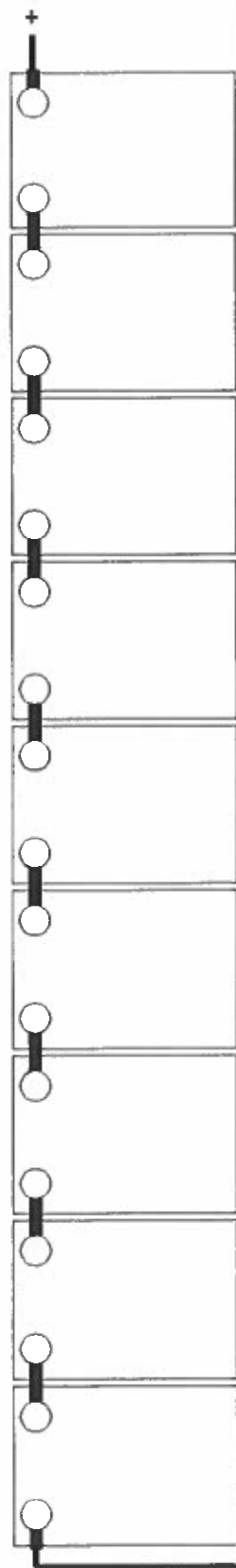


ВЯРНО С
ОРИГИНАЛА



Length: L = 1800 mm

Height incl. battery: HB = 855 mm



Certificate of Compliance

IEC 60896-21,-22 (replacing IEC 896-2)

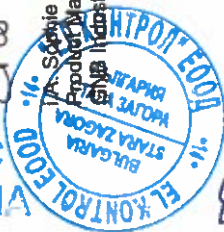
Herewith GNB Industrial Power declares that Sonnenschein A400 monoblocks (including A412/120 FT) comply with the above mentioned international standard. Please see attached document for further details.

Date: April 2nd, 2012
Bidingen, Germany

Storck

Stefanie Merlant

Product Management Europe
Industrial Power, a Division of Exide Technologies



Storck

Supplier statement of product range test results

Supplier statement on product range test results									
1) General product type information									
Product manufacturer	Exide Technologies GmbH								
Manufacturing site of tested product	Büdingen, Germany								
Product model range	Sonnenschein A400								
Product comprising the above model range	see Annex 1								
Product tested	A412/90 A as a representative of the range								
2) Product test performance information									
IEC 60896-21 test clause result									
6.1 Gas emission (at the float voltage and at 2.40Vpc)	2.27Vpc - 0.026 ml/Cell x h x Ah / 2.40Vpc - 0.271 ml/Cell x h x Ah								
6.2 High current tolerance	No.1 - 2.13 Vpc No.2 - 2.13 Vpc No.3 - 2.13 Vpc								
6.3 Short circuit and d.c. internal resistance	see Annex 2								
6.4 Internal ignition from external spark sources	Passed, no evidence of rapid combustion or explosion beyond valve								
6.5 Protection against ground short propensity	< 1mA, passed, no ground short current flow was detected (detection limit 1mA)								
6.6 Content and durability of required markings	Passed								
6.7 Material identification	Passed								
6.8 Valve operation	Container: PP Before: Passed: gas release could be detected After: Passed: gas release could be detected								
6.9 Flammability rating of materials	Lid and case: according to UL94 HB, for all models except those identified as V0 flame retardant: UL94-V0								
6.10 Interconnect performance	Passed, no hazard (max. temperature: 48°C)								
Product durability in service									
IEC 60896-21 test clause result									
6.11 Discharge capacity at 20°C	Compliant (≥ 95%)								
	see Annex 3								
	Compliant (≥ 70%)								
6.12 Charge retention during storage	91.5%	90.5%	90.8%	91.7%	91.0%	91.3%			
6.13 Float service with daily discharges	Classification: suitable for "very unreliable mains power" (more than 300 cycles)								
Cycles:	950	928	1000						
	C at:	84.2%	49.8%	62.6%					
	C at:	86.0%	46.6%	73.8%					
6.14 Recharge behavior	24h:	102.0	101.9	101.7	%	Passed (≥ 90%)			
	168h:	102.2	102.1	102.0	%	Passed (≥ 95%)			
Product durability in service									
IEC 60896-21 test clause result									
6.15 Float service life at 40°C	1086	951	980	Days with C3 rate test at 40°C >80%					
	1066	906	974	Days with C0.25 rate test at 40°C >80%					
6.16 Impact of stress temperature of 55°C or 60°C	353	358	364	Days with C3 rate test at 55°C >80%					
	298	310	300	Days with C0.25 rate test at 55°C >80%					
6.17 Abusive over-discharge unbalanced string over-discharge test cyclic over-discharge test	92.46 %								
	No.1=117%	No.2=115%	No.3=117%	Passed (≥ 80%)					
6.18 Thermal runaway sensitivity	after 168 h with 2.45Vpc: 25.0°C after 168 h with 2.60Vpc: 24.1°C								
6.19 Low temperature sensitivity	no damage caused by freezing								
	No.1=112%	No.2=113%	No.3=109%	Passed (≥ 95%)					
6.20 Dimensional stability at elevated internal pressure and temperature	Length: 3.0 mm (0.01%) Width: 11.3 mm (0.04%)								
6.21 Stability against mechanical abuse of units during installation	Passed (no leakage)								
Company name:	Exide Technologies GmbH								
Company officer:	Director Product Management Dr. Martin Sinz								
Address/phone/fax/e-mail:	Im Thiergarten, 63654 Büdingen								
Signature/date/place:	Büdingen, March 7th, 2012								
Document established as reply for RFI:									

NOTE The data in above Product Range Test Result Supplier Statement must comply with the test methods and degree of detail specified in the requirements 6.1 to 6.21 of the IEC 60896-21 and IEC 60896-22

Supplier statement of product range test results

1) General product type information		
Product manufacturer	Eside Technologies GmbH	
Manufacturing site of tested product	Büdingen, Germany	
Product model range	Sonnenschein A400	
Product comprising the above model range	A412 / 20 G5 A412 / 32 G6 A412 / 32 F10 A412 / 50 A A412 / 50 F10 A412 / 50 G6 A412 / 65 G6 A412 / 65 F10 A412 / 65 F10 A412 / 90 A A412 / 90 F10 A412 / 100 A A412 / 100 F10 A412 / 120 A A412 / 120 F10 A412 / 120 FT A406 / 165 A A406 / 165 F10 A412 / 170 FT A412 / 180 A A412 / 180 F10	

Supplier statement of product range test results

2.) Product Test Performance		
Product manufacturer	Eside Technologies GmbH	
Manufacturing site of tested product	Büdingen, Germany	
Product model range	A400	
Clause 6.3 Short circuit and DC internal resistance	A412 / 12 SR	174
	A412 / 20 G5	445
	A412 / 32 G6	667
	A412 / 32 F10	667
	A412 / 50 A	1050
	A412 / 50 F10	1050
	A412 / 50 G6	1050
	A412 / 65 G6	1229
	A412 / 65 F10	1229
	A412 / 85 F10	1099
	A412 / 90 A	1744
	A412 / 90 F10	1744
	A412 / 100 A	1917
	A412 / 100 F10	1917
	A412 / 120 A	1576
	A412 / 120 F10	1576
	A412 / 120 FT	1134
	A406 / 165 A	2419
	A406 / 165 F10	2419
	A412 / 170 FT	2432
	A412 / 180 A	1994
	A412 / 180 F10	1994
		RI [mOhm]
		72.6
		27.8
		18.5
		18.5
		11.8
		11.8
		10.0
		10.0
		11.3
		7.1
		7.1
		6.5
		6.5
		7.8
		7.8
		11.2
		2.6
		2.6
		5.1
		6.2
		6.2

ВЕРНО С
ОРИГИНАЛА



Supplier statement of product range test results

2. Product Test Performance
Product manufacturer
Manufacturing site of tested product
Product model range

Exide Technologies GmbH
Bielefeld, Germany
A400

Clause 6.1.1 Discharge capacity at 20 °C

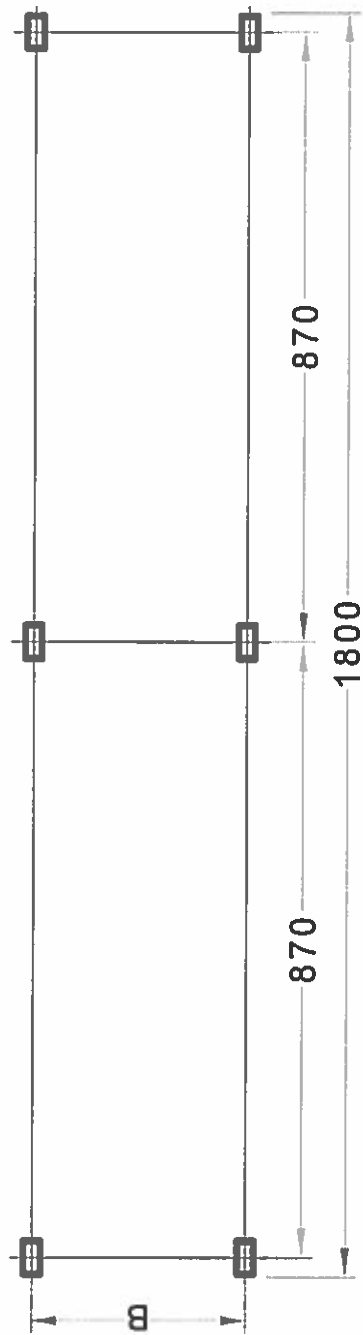
			min	min	min	min	min	min	min	min	min
AA12 / 20 GS		C10	649	648	646	628	603	649	628	603	649
		C8	556	549	554	477	541	595	477	541	595
		C3	200	209	202	206	211	205	206	211	205
		C1	67	68	57	66	63	64	66	63	64
AA12 / 32 G6		C0.25	17	19	18	18	18	18	18	18	18
		C10	614	608	621	605	620	615	605	620	615
		C8	506	503	503	502	500	491	502	500	491
		C3	194	187	180	176	187	186	176	187	186
AA12 / 50 A		C1	65	66	66	65	64	65	65	64	65
		C0.25	16	16	16	16	15	16	16	15	16
		C10	577	573	571	542	577	577	542	577	577
		C8	465	458	461	464	470	465	464	470	465
AA12 / 50 F10		C3	172	171	171	173	173	172	173	173	172
		C1	58	57.0	57.0	58.0	58.0	57.0	58.0	58.0	57.0
		C0.25	15	15	15	14	14	15	14	14	15
		C10	595	602	602	590	599	597	602	590	599
AA12 / 65 G6		C8	488	491	498	493	492	492	493	492	492
		C3	178	181	177	181	178	182	181	178	182
		C1	57	53	57.0	57.0	58	53	57.0	58	53
		C0.25	19	20	19	19	19	19	19	19	19
AA12 / 85 F10		C10	613	602	609	619	622	624	619	622	624
		C8	513	521	532	521	508	500	521	508	500
		C3	186	195	183	188	187	191	188	187	191
		C1	69	72	68	68	60	65	68	60	65
AA12 / 90 A		C0.25	18	18	17	17	17	16	18	17	16
		C10	615	604	598	622	612	621	622	612	621
		C8	488	493	472	483	470	491	483	470	491
		C3	188	186	184	188	186	186	188	186	186
AA12 / 100 A		C1	66	65	66	65	65	66	65	65	66
		C0.25	17	17	16	17	17	17	17	17	17
		C10	622	627	627	625	627	621	627	625	621
		C8	532	539	541	535	542	538	542	535	538
AA12 / 100 F10		C3	205	203	201	206	200	198	206	200	198
		C1	72	73	74	72	73	71	72	73	71
		C0.25	17	17	17	16	16	17	16	16	17
		C10	629	635	647	638	647	606	638	647	606
AA12 / 120 A		C8	576	580	581	584	576	573	584	576	573
		C3	207	213	213	215	210	205	215	210	205
		C1	68	67	67	68	67	66	68	67	66
		C0.25	19	19	19	19	19	19	19	19	19
AA12 / 120 FT		C10	629	615	621	613	622	623	613	622	623
		C8	509	515	520	515	505	503	515	505	503
		C3	197	188	188	178	194	175	188	178	194
		C1	64	57	62	66	64	70	66	64	70
AA06 / 165 A		C0.25	17	17	17	17	17	17	17	17	17
		C10	654	649	643	632	639	644	632	639	644
		C8	533	570	594	568	561	510	568	561	510
		C3	202	207	207	206	206	201	207	206	201
AA06 / 165 F10		C1	74	74	70	72	70	63	72	70	63
		C0.25	19	19	19	19	19	19	19	19	19
		C10	651	670	654	657	647	660	657	647	660
		C8	582	581	586	578	574	578	586	578	574
AA12 / 180 A		C3	212	211	211	210	210	211	210	210	211
		C1	75	77	75	79	82	77	79	82	77
		C0.25	19	19	19	19	20	19	19	20	19
		C10	651	670	654	657	647	660	657	647	660
AA12 / 180 F10		C8	582	581	586	578	574	578	586	578	574
		C3	212	211	211	210	210	211	210	210	211
		C1	75	77	75	79	82	77	79	82	77
		C0.25	19	19	19	19	20	19	19	20	19

[Handwritten signature]



Footprint for racktype

2E-PGU 1-18 H



ВЯРНО С
СИГНИЛ



18 x A412/100,0 A

584,69 kg/m²


188,12 kg

675 mm

Projected surface load:

Load per insulator:

B:

Inspection and Test Schedule								
	Battery Type: All battery types	Status: Serial Production	Plant: Bodingen	ID-No. PAP 1000	FMCA established	FMCA Status:	ID-No. PAP 0000	Rev. Index 01
	Working Process: Battery Production	Inspection and Test Schedule Production			Established:	Günter Weibshitz	Date: 08.02.13	
					Approved:	Christine Krawczyk	Date: 08.02.13	

This Inspection and Test Schedule described the correlation of documents and tests for pre, intermediate and final products during the different production steps.

List of used abbreviations


DC = Dry Charge (tank formation)
DF = Direct formation
GF = Gel formation
CL = Closed Loop formation

FA W = production procedure
RA W = Setting up procedure
MT W = Measuring table
PP = Test/Inspection plan

PA = Test/Inspection
procedure
MV = Material Specification

Seq. No.	Process	Machine Device	Product	Specification Process		Test/Inspection Specification			Date collection	Measure to be taken in case of non-conformance
				Materials	Process procedure	Measuring Device Measuring Methode	Test Plan	Test/Inspection Procedure		
1	Decasting	Witz C40 Witz C80	Positive Grid PbCaSn, with respect without Cu Negative Grid PbCaSn without Cu	High pressure decastring MV 835, 837 MV 10,23 High pressure decastring MV 833 MV 10,23 in addition MV 801, 831 Recycling MV 831	FA W 708, 707, 709 FA W 708, 711, 712, 729 MT W 708 RA W 708	Weighting Test of moisture Spectrometer analysis Visual test	PP 1200 PP 1210 PP 1230	PA 1200 PA 1201 PA 1010	CAQ-System	
2	Lead acid production	Chromis	Outside iron mat	Grinding of ingots	FA W 701, 705	Pro-Centent Acid absorption Process parameter	PP 1150	PA 1010 PA 1800 PA 1150 PA 1160	CAQ	
		CAM	Outside for ends mixture	Casting of cylinder and milling	FA W 731a, b, c, d, e, f, g	Pro-Centent Acid absorption Process parameter			CAQ	
	Grids Mixing	Reactor	Grids mixture for production of plates	Grids distributed adding of H2SO4 MV 811	FA W 702	Process parameter Sulfuric content	PP 1160	PA 1160	CAQ Records	
	Meat Chamber filter press	Drive-Mixer	Active masses Recovery of recyclable lead deposit	Dry/Wet mixing production	FA W 713, 734 MT W 715, 718 FA W 730	Lab device Weighting Permeation Temperature	PP 1170	PA 1170 PA 1171 PA 1800	Records	
3	Pasting	Sovema Bendipaster	Pasted grids	Pasting on Sovema and pre-drying redistribution of active mass	FA W 718, 717 FA W 732, 733, 734 MT W 715, 718 RA W 718 FA W 719	Weighting Residual moisture content Visual test Test of moisture	PP 1250 PP 1270	PA 1250 PA 1270 PA 1270a PA 1170 PA 1300	CAQ-System	
4	Curing	OS-Chamber Insulation-Chamber Cast-Chamber	Cured neg. plates Cured pos. Plates	Curing in curing chambers Curing in curing chambers	FA W 718 MT W 718	Analysis Visual test Physic. Tests	PP 1270	PA 1270a	Batch card	


Seite 1 von 8

Inspection and Test Schedule										
		Battery Type: All battery types	Status: Serial Production	Plant: Bidingen	ID-No. PAP 1000	FMCA established	FMCA Status:	ID-No. PAP 0000	Rev. Index 01	
Working Process: Battery Production			Inspection and Test Schedule Production			Established:	Günter Weibshitz		Date: 08.02.13	
						Approved:	Christine Krawczyk		Date: 08.02.13	
5	Tank formation	Formation-series	semi formed, dried plates	Assembly and disassembly of plates Curing out of formation Programme of currents	FA W 721 MT W 721, 721a	Add density Temperature Visual test Formation programme	PP 1300 PP 1310	PA 1800	Records Correction software	
6	Washing Drying	Stal-Equipment	Washed and dried, formed pos. and neg. plates	Washing, drying	FA W 723 MT W 722, MT W 708	Analysis of bath Temperature Analysis of plates Visual test Residual moisture content Vibration resistance	PP 1350	PA 1350 PA 1361 PA 1800	Batch card Batch record	
7	Separation - brushing	Milling shop	Assembly-ready formed plates	Cutting/brushing	FA W 724, 723, 728, 727, 728 MT W 726 RA W 723, 728, 727	Measure test (mechanical) Visual tests	PP 1400	PA 1400	OK	
8	Plate set production COS	Stacker COS	Stacking of plate sets COS and return, plate set easy	Production of plate sets COS COS COS 5, 8/1, 8/2, 8/3	FA W 802, 804, 805, 804 FA W 878, 882, 884 MT W 802, 802a, 804, 804b, MT W 878, 878b, 879a, MT W 882, 882b RA W 802, 804a, 804b, RA W 878, 882 FA W 833 (File: TB, WAG)	Embedding Alignment Analysis of alloy Visual test Measure test Polished microsection test	PP 1450	PA 1450 PA 1777 PA 1010 PA 1800 PA 1300	PCL ABK	
	Production of cork PP 1450									
	Plate set production Manual welding	Welding Jig	Plate set	Plate set production COS 18 by manual welding	FA W 807, MT W 807	Embedding Alignment				


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DRPHO C




Inspection and Test Schedule									
 GNB INDUSTRIAL POWER <small>A Division of Enbridge Technology</small>		Battery Type: All battery types	Status: Serial Production	Plant: Södingen	ID-No. PAP 1000	TRELA certification	FMEA Status:	ID-No. PAP 1000	Rev. Index 01
Working Process: Battery Production		Inspection and Test Schedule Production				Established:	Günter Weissholz		Date: 05.02.13
						Approved:	Christine Krawczyk		Date: 05.02.13
9	Battery assembly	Assembly line 1361, 1362, 1363, 1364	Assembled unfilled batteries	Assembly and mounting	FAW 801, 801b FAW 812, 812 FAW 812, 814, 818 FAW 818b, 817, 817a, 819 FAW 821b, 826, 826, 828 FAW 884, 825, 887, 888 FAW 889a, 893, 893 MTW 801a, 801b, 801c MTW 808a, 808c MTW 810a, 810c, 810d MTW 813, 813a, 818a MTW 817, 826 MTW 887a, 887b, 887c, 882 RAW 801, 810, 818a, 821, 828 RAW 887, 888, 890, 892, 893	HSP- Short circuit test 7 duty selection HSE- Insulating current monitoring Revolving breaking test Diagnosis in pressure Destroying test Measure test	PP 1500	PA 1500 PA 1501 PA 1502 PA 1504 PA 1505 PA 1508 PA 1509 PA 1500	DEK PCL ASK
	Return shipment			Residual amount of battery shipment	FAW 884 (Flu PM)				
	Container punching	Punching machine Haid		Punching of container and seal Schrader	FAW 816, 818a, MTW 818a RAW 818a	Gauge test	PP1362		ASK
	Re-work	Assembly line	Finished batteries	Re-work	FAW 808, FAW 827				
10	Get production DC, GP Filling acid DF Acid mixture CL Get mixture CL	Get mixing dept.	Electrolyt DC, GP	Get preparation Mixing of films and mixing of acid mixture Mixing of Gel	FAW 848, 850, 884 MTW 850, 850a MTW 871, 871b	Temperature H2SO4 H2SO4	PA 1806	PA 1810	Computer
11	Get filling	Filling machines	Batteries filled with Gel (DC and GP)	Filling of Gel electrolyt DC and GP Get ridges for dryfil-batteries Carry out of films and connection to charging circuits Filling of commissioning water battery or acid filling Carry out of filling (DF), transport to water bathes and connection to charging circuits Formation takes place in the battery	FAW 851, 854, 884, 888, MTW 851a, 851g, 888b FAW 874, MTW 878, MTW 875a FAW 840, 841, 842, 843, 844 MTW 840, 842, 844a, 844b RAW 840, 842, 842	Open-circuit-voltage Filling weight Filling height Temperature of Gel Commissioning-temperature (GP) Water level of battery (GP)	PP 1800 PP 2005	PA 1810 PA 1800	PCL
11a	Acid filling DF and formation	Direct formation	Batteries filled with acid (DF)			Filling weight Commissioning-temperature Water level of battery	PP 2000	PA 1800 PA 1800	BP PCL

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Inspection and Test Schedule									
		Battery Type: All battery types	Status: Serial Production	Plant: Södingen	ID-No. PAP 1000	TRELA certification	FMEA Status:	ID-No. PAP 1000	Rev. Index 01
Working Process: Battery Production		Inspection and Test Schedule Production				Established:	Günter Weissholz	Date: 05.02.13	
						Approved:	Christine Krawczyk	Date: 05.02.13	
11b	Fast Formation	Closed Loop	Fast and charged batteries	Commissioning and Gel filling	MTW 870 MTW 870a, MTW 871b MTW 872, 873, 873a	Acid density suite Acid density manual Filling weight manual Analysis of acid Leveling man		DEK CAQ CAQ	
12	Commissioning DC and GP	Commissioning/ charging circuits	dryfil-Batteries	Commissioning/charging current programmes	FAW 851, 851b, 857, 857a, 857b FAW 888 MTW 857, 889a, 889b		PP 1803 PP 2005 (GP)		
12	Filling	Filling conveyors	dryfil-Batteries	Shops set storage time customers and final production (finishing)	FAW 883 FAW 832a, 842, 843 FAW 832, 832a, 832b, 832c, 833a, FAW 833, 833c FAW 884, 886, 888 MTW 825, 842, 842a, 844a, 851b, MTW 832a, 832b, 832c, 832d, MTW 832, 832g, MTW 833, 893 RAW 842, 843, 852, 852g, RAW 832b, 833c MTW 874, 878, 875a, 878b FAW 884 FAW 854	Butt, Manager Commissioning records Open-circuit-voltage HVT HVT Leakage proof of valve Suction level Loosening torque of valve Visual test	PP 1008 (DF) PP 3000 (GP) PP 2005 (GP) PP 1810 PP 1700	PA 1700-1 PA 1774, 1775 PA 1778, 1779 PA 1780, 1781 PA 1782	PCL BP Computer
		Sealing of batteries Seal joints	Sealing check dryfil-batteries	Sealing test	FAW 884			PA 1680 PA 1681	
	Commissioning records	Commissioning/ charging circuits	VZ Power Kaddy	Re-work	FAW 888			PA 1800	
13	Final test	Electrical lab	Shipping ready dryfil-Batteries	Electrical tests Mechanical tests	VG 8824 T2, VG 8824 T3, 9, 10	Capacity Cycle Self-discharge Over discharge Float High voltage Weight Thermo- cycle test	PP 1700 PP 1703 PP 1705	PA 1700-1, 1700-2, PA 1700-3, 1700-4 PA 1700-5, 1700-6 PA 1700-7, 1700-8, PA 1702, 1705-7, PA 1700-8, 1788 PA 1772, 1773 PA 1774, 1775, 1778 PA 1778, 1779, 1780, PA 1781, 1782, 1782	Records Computer
14	Storage Shipment	Shipping units	Packing		FA-820M 110.00, 121.00, 125.00, 173.00, 180.00, 183.00, 210.00, 225.00, 221.00, 238.00, 235.00, 290.00, 291.00, 282.00, 300.00, 380.00	Open-circuit-voltage Visual test	PP 1703, 1705, 1780 PP 3702, 4001 PA 1788, 1772, 1773, PA 1774, 1778, 1779, PA 1778, 1780, 1781, 1782	PCL Standard value list	
16	Injection moulding	Injection moulding machines No. 1-3	Valve body, valve lid, adaptor	Injection	FAW 800, 881, 882	Visual test Measure test Gauge test Pressure measuring	PP 1130 PP 1131 PP 1134 PP 1135 PP 1136 PP 1137 PP 1140	PA 1120	DEK PCL
16	Assembly	Assembly summit	Valve	Assembly	FA W 780	Visual test	PP 1124		PCL
			Test of subunit		FAW 781	Opening pressure Closing pressure Leak tightness Non-conformity record	PP 1124		Data
	Adaptor assembly	Adaptor Manual (opt.)	Valve with adaptor (optional)	Assembly	FAW 783, 784, 785, 853, 864 RA W 784, 786	Visual test Breaking test	PP 1124 PP 1121	PA 1121 PA 1125 PA 1181	
	Assembly post insert cap			Assembly O-Range Packing of valves	FAW 801 FAW 788 FAW 785, 785a (Optional Flap)				

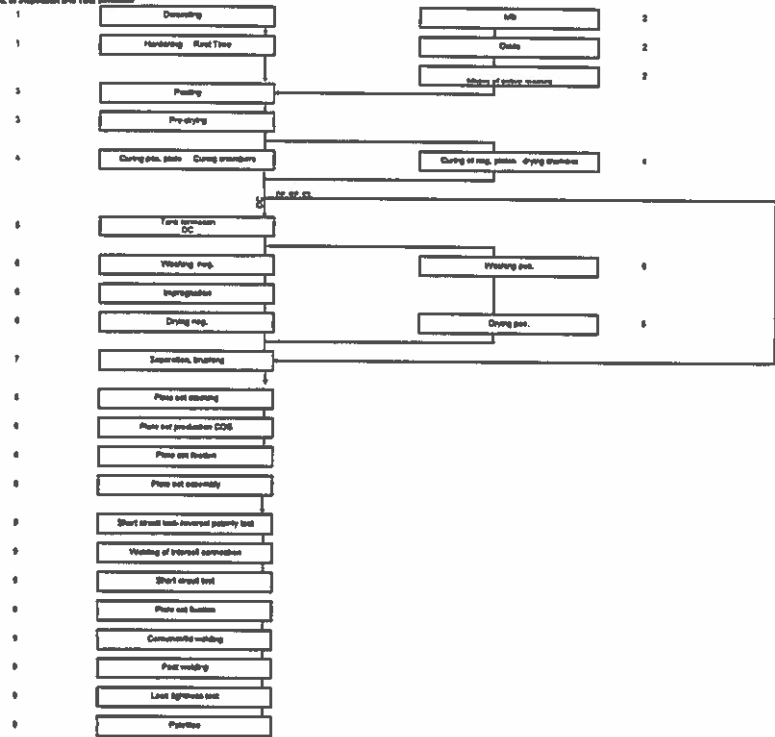
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Inspection and Test Schedule							
	Battery Type: All battery types	Status: Serial Production	Plant: Böttingen	ID-No. PAP 1000	FMEA reproduction	FMEA Status: Göster Wiederholt	ID-No. PAP 1000
	Working Process: Battery Production	Inspection and Test Schedule Production			Established: Christine Krawczyk	Approved: Christine Krawczyk	Rev. Index 01
				Date: 08.02.13			

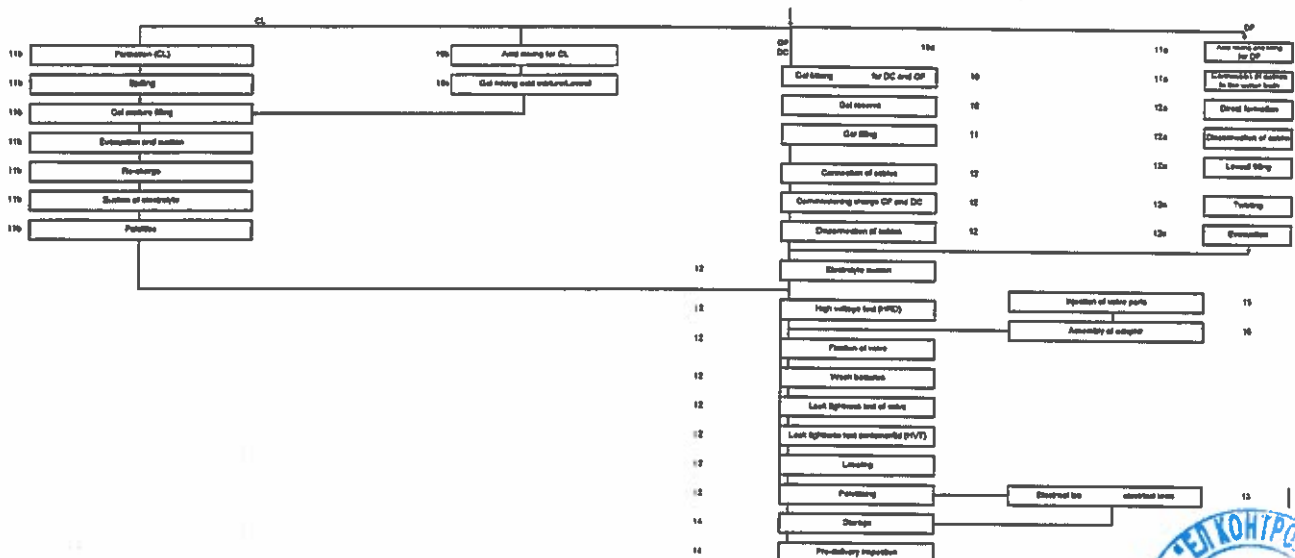
Flowchart

Figure 8: Sequence of Inspection and Test Schedule



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Inspection and Test Schedule							
	Battery Type: All battery types	Status: Serial Production	Plant: Böttingen	ID-No. PAP 1000	FMEA reproduction	FMEA Status: Göster Wiederholt	ID-No. PAP 1000
	Working Process: Battery Production	Inspection and Test Schedule Production			Established: Christine Krawczyk	Approved: Christine Krawczyk	Rev. Index 01
				Date: 08.02.13			



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Тип на акумулаторите	Клиент
Каталожен №	Проект
Номинално напрежение	Обект
Зарядно напрежение (20°C)	Устройство
Доставчик / Изпълнител	Дата на монтаж
Производител	Гаранция

ИНСТРУКЦИЯ ЗА ЕКСПЛОАТАЦИЯ

за стационарни, необслужваеми оловно-киселинни акумулаторни батерии

НОМИНАЛНИ СТОЙНОСТИ:

- Номинално напрежение на AB : U_N :
- Номинален капацитет : $C_N = C_{10}$:
- Крайно разрядно напрежение : U_S :
- Номинална температура : T_N : 20 °C
- Коефициенти на корекция : f_1, f_2 : За вентилация (по DIN/VDE 0510, част 1) $f_1=0.5$; $f_2=0.5$

	• Спазвайте тези инструкции и ги съхранявайте в близост до батерията, за справка по всяко време. За работа с батерията трябва да се допуска само квалифициран персонал.
	• Не пушете в акумулаторното помещение! Не използвайте необезопасени електрически прибори, инструменти и апаратура, както и други източници на огън!
	• По време на работа с батериите носете защитни очила и дрехи! Спазвайте правилата за безопасност и предпазване от злополука, също така и DIN VDE 0510, VDE 0105 част II!
	• Всяка капка киселина попаднала върху кожата или очите, трябва незабавно да бъде промита с обилно количество студена и чиста вода! След това потърсете спешна медицинска помощ. Разпелените по дрехите капки трябва да бъдат изплакнати и отстранени с вода.
	• Опасност от експлозия и пожар при възникване на къси съединения в токопреносната мрежа! Внимателно! Металните части на батерията са винаги под напрежение, затова не поставяйте токопроводящи предмети или инструменти върху батерията.
	• Електролитът е силно разтопен. При нормални работни условия контактът с електролита е невъзможен. Ако корпусът е механически повреден (счупен и разклатен), откритият желиран електролит не изтича, но изпаренията са също толкова разядващи, както и на течния електролит.
	• Батериите/клетките са тежки! Осигурете достатъчна безопасност при манипулиране с тях и винаги използвайте подходящи съоразения за товарене, разтоварване и транспортиране.
	• Металните части са винаги под напрежение, поради което не слагайте инструменти върху батерията.
	• Пази от деца!

ВЯРНО



[Signature]

2.1.

Стационарните херметизирани необслужваеми оловно-киселинни батерии не изискват никаква текуща техническа поддръжка (следователно не изискват доливане с вода). Копиите срещу прецизно налигане се използват за херметизация на корпуса и ако бъдат отворени се разрушават.

1.

Пускане в експлоатация

Проверете всички клетки/блокове за механични повреди, свързането на поларността и надлъжното свързване на съединителите. За завинтаване и затегане на съединителите съединители към полюсите накрайници да се използва динамометричен ключ със следните усилвания на затягане:

Key-тип	14-32x45	С-45	F-45	W-45	W-45	F-45
Universal	-	-	-	4 Nm	1 Nm	2 Nm
Universal MT	4 Nm	-	11 Nm	4 Nm	-	-
Spring P	-	-	-	4 Nm	4 Nm	-
Spring S	-	-	11 Nm	-	-	-
Power S20	-	3 Nm	-	-	-	-
Power S20	-	-	-	4 Nm	4 Nm	-
Key-тип	С-45	F-45	С-45	А	F-45	F-45
A 40	3 Nm	-	4 Nm	4 Nm	-	1 Nm
A 50	3 Nm	-	4 Nm	4 Nm	-	2 Nm
A 60 cbs	-	-	-	-	-	12 Nm
A 60 cbs	-	-	-	-	-	12 Nm
A 70	-	-	4 Nm	-	-	2 Nm

Таблица 1

Преди монтажа трябва да се поставят и в двета крапа на кабелните връзки защитните гумени капачки (полюсни капачки).

Контрол на изолационното съпротивление:

Нови батерии:

> 100 Ω/V

Използвани батерии: > 100 Ω/V
Свържете батерията към токоизправителя като винаги за свързване на правилната полярност (положителния полюс към положителната присъединителна клемма). Този процес трябва да се извършва при изключен токоизправител и изключени консуматори. След това включете токоизправителя и започнете зареждането съгласно точка 2.2.

2.

Експлоатация на батерията

За монтаж и експлоатация на стационарните батерии е задължително спазването на DIN VDE 0510, част I (сертификат) и част 2.

Батерията трябва да бъде инсталирана в такава помещение, където температурните разлики между отделните елементи не са по-големи от 3 градуса по Целзий/Келвин.

Разряд на батерията

Крайното разрядно напрежение, под което батерията не трябва да бъде разредена, се определя от полемната на разрядния ток. При необходимост от по-дълбоки разряди се консултирайте с производителя. Заредете отново батерията веднага след нейния пълен или частичен разряд.

2.2.

Зареждане на батерията

Приложими са всички зарядни способи със съответните ограничения, прописани от DIN 41773 (U-характеристика). По време на заряд, през батерията освен постоянния ток протича и променлив, който се налага върху постоянния, и чийто величина зависи от характеристиките на токоизправителя. Променилият ток е съставка (ако назовава допустимата стойност) и реакцията на товара могат да доведат до допълнително нарастване на вътрешната температура на батерията и механичен натиск върху електродите с възможност за повреда (виж т. 2.5).

В зависимост от начина на експлоатация на батерията и вида на зарядната апаратура (съгласно DIN VDE 0510, част I), могат да бъдат приложени някои от следните зарядни способности:

а).

Работа на батерията в standby режим.

Тук товарът, източникът на постоянен ток и батерията са постоянно свързани в паралел. При наличие на външно захранване, батерията е в режим на поддържащо дохранване (подзаряд), не се използва като основен енергиен източник, а само като резерв. В този случай зарядното напрежение е едновременно и работното напрежение и напрежението на батерията, а токоизправителят е в състояние да осигури във всеки момент максималния товар на консуматорите и зарядния ток на батерията. Батерията преминава от аварен в основен източник само при повреда на зарядното устройство, или отпадане на мрежовото захранване. Стойността на зарядното напрежение, измерено при изводите на батерията, трябва да бъде според Таблица 2 x броя на клетките.

	Float voltage [Vdc]	Nominal temp. [°C]
Marathon L	2.27	20
Marathon M	2.27	25
Sprinter P	2.27	25
Sprinter S	2.27	25
Powerfit S 300	2.27	20
Powerfit S 500	2.27	20
A 400	2.27	20
A 500	2.30	20
A 600	2.25	20
A 700	2.25	20

Таблица 2

За напълване времето на пълно зареждане, може да се пренебрегне към ускорен заряд, като се повиши зарядното напрежение според Таблица 3 V/кл. $\pm 1\%$ броя на клетките, по само ако това е допустимо за нормалната работа на консуматорите. Следва автоматичното прекъсване към подзаряд.

	Voltage on boost charge stage [Vdc]	Nominal temp. [°C]
Marathon L	2.35-2.40	20
Marathon M	2.35-2.40	25
Sprinter P	2.35-2.40	25
Sprinter S	2.35-2.40	25
Powerfit S 300	2.35-2.40	20
Powerfit S 500	2.35-2.40	20
A 400	2.37-2.40	20
A 500	2.40-2.45	20
A 600	2.35-2.40	20
A 700	2.35-2.40	20

Таблица 3

6). Работа на батериите в буферен режим
При работа в буферен режим, източникът на постоянен ток не може да поддържа през цялото време товара на консуматорите. През периодите, в които този консуматор достига максималните си стойности и пресичава по стойност номинални ток на токоизправителя, батериите го буферират и поема допълнителния товар. Батериите не се намират в напълно заредено състояние през цялото време. Ето защо, в зависимост от големината на товара, зарядното напрежение трябва да бъде настроено според Таблица 4 V/кл. $\pm 1\%$ броя на клетките. Този режим следва да се прилага в съответствие с препоръките на производителя.

ВЯРНО С
ОРИГИНАЛА



	Voltage in buffer operation [Vdc]	Nominal temp. [°C]
Marathon L	2.27	20
Marathon M	2.29-2.33	25
Sprinter P	2.30	25
Sprinter S	2.29-2.33	25
Powerfit S 300	2.27	20
Powerfit S 500	2.27	20
A 400	2.27	20
A 500	2.30-2.35	20
A 600	2.27-2.30	20
A 700	2.27-2.30	20

Таблица 4

с). Прекъсващ режим на работа.
Когато зареждаме, батериите са отделени от товара. Максималната стойност на зарядното напрежение е според Таблица 3. Процесът на зареждане трябва да се контролира. Ако зарядния ток спадне под 1.5A/100Ah номин. капацитет при 2.35V/кл., работния режим се превключва към подзаряд, съгл. точка 2.3. (преключва се след достигане до 2.35V/кл.)

д). Циклически работен режим (заряд/разряд)
Товарът се захранва само от батериите. Зарядния процес зависи от начина на експлоатация и трябва да се прилага в съответствие с препоръките на производителя.

2.3. Поддържащ заряд (подзаряд) - float заряд
Батериите е в състояние на пълна зареденост във всеки един момент. Трябва да се използват зарядни устройства, изпълняващи инструкцията на DIN 41773. Те се нагласят така, че средната стойност на напрежението да е съгласно Таблица 2.

2.4. Изравняващ заряд
По време на изравняващ заряд е възможно да се надхвърлят допустимото напрежение на товара, поради което трябва да се вземат съответните мерки, т.е. да се изключи товара. Изравняващ заряд се изисква след дълбоки разряди и/или недостатъчен заряд. Те трябва да бъдат провеждани в продължение на не повече от 48 часа с напрежение съгласно Таблица 3. Зарядния ток не трябва да надхвърля 10A/100Ah номинален капацитет. Ако максималната температура по време на заряд пресъхне 45°C, изравняващото зареждане трябва да бъде прекратено, или превключено към подзаряд, за да позволи снижаване на температурата.

2.5. Промениливи токове

При ускорен заряд до 2.4V/клетка, съгласно посочените в точка 2.2. зарядни способи, допустимо е стойността на променливия ток да достигне до 20A/100Ah номинален капацитет. В напълно заредено състояние, при работа на батериите в поддържащ (float) или stand-by режим, реалната стойност на променливия ток не трябва да надхвърля 5A/100Ah номинален капацитет.

2.6. Зарядни токове

При работа в поддържащ или в stand-by режим, когато отсъства необходимостта от ускорено зареждане, зарядния ток не се ограничава. Приблизителната стойност на максималния заряден ток е съгласно Таблица 5. При напълно заредена батерия, остатъчните зарядни токове са минимални и при различните температури трябва да имат стойности, по-ниски от посочените по-долу гранични стойности (необходима предостатъка за това е подзарядното напрежение да бъде в съответствие с Таблица 2).

	Charging current
Marathon L	10 to 30 A per 100Ah
Marathon M	10 to 35 A per 100Ah
Sprinter P	10 to 30 A per 100Ah
Sprinter S	10 to 35 A per 100Ah
Powerfit S 300	10 to 30 A per 100Ah
Powerfit S 500	10 to 30 A per 100Ah
A 400	10 to 35 A per 100Ah
A 500	10 to 35 A per 100Ah
A 600	10 to 35 A per 100Ah
A 700	10 to 35 A per 100Ah

Таблица 5

Измерването може да се счита за представително само когато остатъчният заряден ток е достатъчно постоянен. Това става след около 6 дни (150 часа) от приключване на последното зареждане. При отклонение на измерените данни от изискваните, трябва да се проведе контролен разряд съгласно изискванията на DIN 43539 в точка 8.3. (напр. 10-часов разряд на напълно заредена батерия при 20°C, с разряден ток 0.1xC₁₀ до достигане на крайно разрядно напрежение 1.80 V/кл.), или да се потвърди сериалния представител. Протоколирайте резултатите!

2.7. Температура

Номиналният работен температурен обхват за оловно-киселинни батерии е между 10°C и 30°C (най-добър е обхватът 20°C $\pm 5^\circ$ C). Всички технически номинални данни са измерени

при 20°C. Високите температури снижават значително експлоатационния срок и повишават съвсем изключително капацитета (Таблица 2). Абсолютният максимум на температурата с 55°C и той е недопустим за експлоатация, а средната стойност на постоянната работна температура не би трябвало да надхвърля 45°C. По-ниските температури намаляват капацитета (Таблица 2), и удължават изключително срока на експлоатация. Недопустима е постоянната работна температура под -20°C.

2.8. Зависимост на зарядното напрежение от температурата

Температурно зависимо регулиране на зарядното напрежение е съгласно фигури 1 до 5.

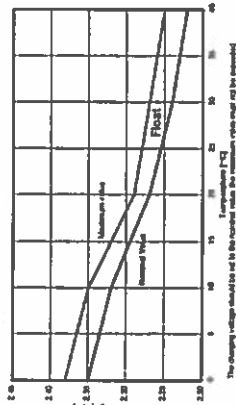


Fig. 1: Marathon L and Powerfit S; charging voltage vs. temperature

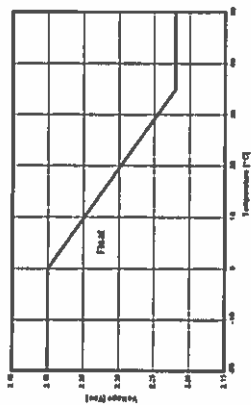


Fig. 2: Marathon M, Sprinter P, Sprinter S; charging voltage vs. temperature

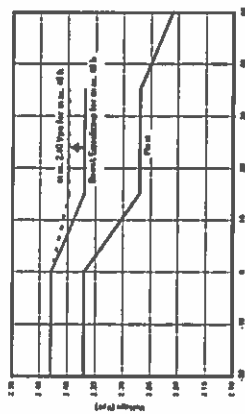


Fig. 3: A 400; charging voltage vs. temperature

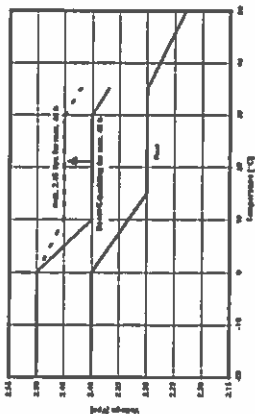


Fig. 4: A 500; charging voltage vs. temperature

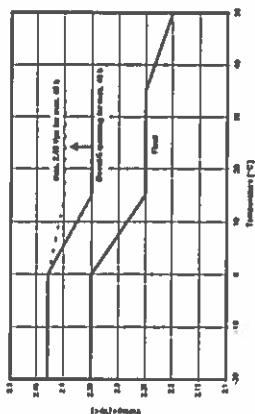


Fig. 5: A 600, A 700; charging voltage vs. temperature

2.9. Електролит

Електролитът е изготвен от разредена сарна киселина, изостигащо съдържание на водород, с относителна плътност 1,24 kg/l.

3.

Поддържане и контрол на батерията
Поддържайте батерията чиста и суха за да се избегне протичането на течни токове. Пластмасовите части на батерията, особено корпуса, трябва да се почистват само с чиста вода без добавки на химически препарати.

На всеки 6 месеца измерете и запишете:
напрежението в двата края на батерията;

2) напрежението на няколко клетки/блока;
3) повърхностната температура на няколко клетки/блока;

4) температурата в акумулаторния помещение;

Ако разликата между средната стойност на подзарядното напрежение (измерена в двата края на батерията и разделена на общия брой на клетките/блоковете) и конкретната стойност на подзарядното напрежение (измерена върху отделните клетки/блокове) е по-голяма от допустимото отклонение съгласно Таблица 6, или ако повърхностната температура между отделните клетки/блокове се различава с повече от 5°C, трябва да се обрънете към сервизния представител.

	2V	4V	6V	8V	12V
Marathon L	+0.2/-0.1	-	+0.35/-0.17	-	+0.6/-0.24
Marathon M	-	-	+0.35/-0.17	-	+0.6/-0.24
Sortor P	-	-	+0.35/-0.17	-	+0.6/-0.24
Sortor S	-	-	+0.35/-0.17	-	+0.6/-0.24
Powerfit S 300	-	-	+0.35/-0.17	-	+0.6/-0.24
Powerfit S 500	-	-	+0.35/-0.17	-	+0.6/-0.24
A 400	-	-	+0.35/-0.17	-	+0.6/-0.24
A 500	+0.2/-0.1	+0.26/-0.14	+0.35/-0.17	+0.48/-0.26	+0.6/-0.24
A 600	+0.2/-0.1	-	+0.35/-0.17	-	+0.6/-0.24
A 700	-	+0.26/-0.14	+0.35/-0.17	-	+0.6/-0.24

Таблица 6

Годишно измерване и протоколиране:

- 1) напрежението на всички клетки/блокове;
- 2) повърхностната температура на всички клетки/блокове;
- 3) температурата в акумулаторното помещение;
- 4) изолационното съпротивление съгласно DIN 43539, част 1

Годишна визуална проверка:

- 1) степен на нагнетаване на винтовете съединения;
- 2) монтаж и подреждане на батерията;
- 3) вентилацията.

Тестове

Тестовите се провеждат съгласно DIN 43539, част 1 и 100 (чертежа). Да се спазват и специалните инструкции като DIN VDE 0107 и DIN VDE 0108.

Повреди

В случай на повреда в батерията или зарядното устройство, незабавно потърсете сервизния представител. Наличието на протоколи с данните от т. 3 е много важно за откриване на причината за повредата.

6. Съхранение и снемане от експлоатация

Акумулаторните клетки/блокове се доставят от завода винаги напълно заредени и следва да се съхраняват само в заредено състояние, в сухи помещения, в които не съществува опасност от замръзване. Максимално време за съхранение без необходимост от дозарядване, е две години при 20°C. При постоянни температури над 30°C, дозарядване се правят на всеки 12 месеца, а при 1 > 40°C - на всеки 6 месеца.

7. Дозарядване

Дозарядването може да се извърши по един от следните зарядни методи:

- 1) годишен изравнителен заряд в съответствие с инструкцията на т. 2.4;
- 2) подзаряд - съгласно т. 2.3.

7. Транспорт

Съгласно изискванията на Международната асоциация за въздушен транспорт IATA, батериите трябва да се опаковат в специални контейнери, които да са изготвени в съответствие с изискванията на Международната асоциация за въздушен транспорт IATA, батериите трябва да се опаковат в специални контейнери, които да са изготвени в съответствие с изискванията на Международната асоциация за въздушен транспорт IATA, батериите трябва да се опаковат в специални контейнери, които да са изготвени в съответствие с изискванията на Международната асоциация за въздушен транспорт IATA.

Технически данни

В типа акумулаторна плоча се съдържа данни за номиналното напрежение, броят на клетките/блоковете, номиналната капацитет ($C_{10}=C_{20}$) и типа на батерията.

9.1 AGM - Types

9.1.1. Marathon L

Discharge time t_d	10 min	30 min	1 h	3 h	5 h	10 h	Length [mm]	Width [mm]	Height max. [mm]	Weight approx. [kg]
Capacity C ₁₀ [Ah]	C ₁₀	C ₃₀	C ₁	C ₃	C ₅	C ₁₀				
L12V15	6.5	8.5	9.9	13.2	13.0	14.0	181	76	167	6.5
L12V24	10.6	13.9	15.8	21.0	21.5	23.0	168	127	174	10.5
L12V32	14.1	18.7	21.4	27.9	30.0	32.0	198	148	175	13.5
L12V42	19.6	25.7	29.4	38.1	39.5	42.0	224	168	190	18.5
L12V55	21.6	29.5	36.0	44.7	49.0	53.0	272	166	190	22.0
L12V60	30.3	41.5	51.2	65.1	71.0	80.0	358	172	228	30.0
L6V110	48.4	65.0	73.5	102.3	107.0	112.0	272	166	180	23.0
L6V160	86.8	93.5	111.0	133.5	146.0	162.0	359	171	228	31.5
L2V220	87.4	127.0	150.0	186.8	196.0	220.0	208	135	282	18.0
L2V270	106.3	155.5	183.0	229.2	243.0	270.0	208	135	282	18.3
L2V320	135.8	190.5	225.0	271.8	289.0	320.0	208	201	282	24.2
L2V375	169.8	221.5	262.0	318.0	337.5	375.0	208	201	282	26.5
L2V425	169.9	247.0	291.0	360.0	382.5	425.0	208	201	282	28.8
L2V470	186.6	277.0	324.0	399.0	428.5	470.0	208	270	282	32.6
L2V520	204.1	304.5	357.0	438.0	474.0	520.0	208	270	282	35.0
L2V575	220.8	334.5	394.0	486.0	520.0	575.0	208	270	282	37.3
U ₁ M (2 V cell)	1.60	1.60	1.60	1.70	1.75	1.80				
U ₂ M (6 V block)	4.80	4.80	4.80	5.10	5.25	5.40				
U ₃ M (12 V block)	9.60	9.60	9.60	10.20	10.50	10.80				

All technical data refer to 20° C.

9.1.2. Marathon M

Type	Nominal voltage [V]	C ₁₀ [Ah]	Constant current discharge [Ah]	1.5 h	1 h	0.5 h	10 h	Length [mm]	Width [mm]	Height max. [mm]	Weight approx. [kg]
M12V30T	12	30	36.8	21.2	13.1	8.40	5.50	171	130	186	10.7
M12V40T	12	40	51.3	30.5	21.5	11.9	7.80	198	167	189	17.8
M12V45F	12	45	57.8	33.2	24.0	13.5	8.70	220	121	254	17.5
M12V70T	12	70	90.6	51.6	36.8	20.6	13.4	260	174	235	27.8
M12V90T	12	90	107	65.7	46.6	25.9	16.7	306	174	235	32.8
M6V180T	6	180	246	144	102	58.0	35.9	306	174	235	33.5
M6V200	6	200	220	135	100	55.2	36.3	361	132	250	34.0
M12V35FT	12	35	44.0	26.5	14.0	10.2	6.80	280	107	189	14.0
M12V50FT	12	47	61.0	34.3	20.0	13.5	8.00	280	107	231	18.0
M12V60FT	12	59	64.8	40.1	26.0	16.6	11.0	290	107	263	23.0
M12V90FT	12	96	108	64.0	46.4	24.9	15.9	395	105	270	31.0
M12V105FT	12	100	115	70.0	51.6	24.5	18.7	511	110	238	35.8
M12V125FT	12	121	141	88.1	63.3	37.2	23.4	559	124	263	47.5
M12V155FT	12	150	174	103	77.7	45.2	28.1	559	124	283	53.8

All technical data refer to 25° C.

9.1.3. Sprinter P

Type	Nominal voltage [V]	15 min. power [W], U ₁ = 1.80 V per cell	Capacity C ₂₀ [Ah], U ₁ = 1.80 V per cell	Length [mm]	Width [mm]	Height approx. [mm]	Weight approx. [kg]
P12V510	12	310	21	168	177	128	8.5
P12V600	12	600	24	188	127	174	9.5
P12V675	12	875	41	224	168	175	14.5
P12V1220	12	1220	51	234	169	180	19.5
P12V1575	12	1575	61	272	168	190	23.0
P12V2130	12	2130	86	359	172	228	33.0
P 6V1700	6	1700	122	272	166	190	24.0
P 6V2030	6	2030	178	359	172	226	32.5

These batteries are especially designed for high rate discharges. Further details depending on the discharge time and cut off voltage must be taken from the actual product brochure.

All technical data refer to 25° C.

9.1.4. Sprinter S

Type	Nominal voltage [V]	C ₁₀ [Ah] U ₁ = 1.87 V per cell	Constant power [Watt per cell, U ₁ = 1.87 V per cell]					Length [mm]	Width [mm]	Height max. [mm]	Weight approx. [kg]	
			5 min	10 min	15 min	30 min	60 min	90 min				
S12V120F	12	24	242	151	117	72	41	29	173	167	166	12.1
S12V170F	12	40	323	215	167	102	58	41	188	167	189	16.4
S12V254F	12	70	543	365	285	169	96	60	260	174	235	27.8
S12V300F	12	69	654	415	368	180	105	78	260	174	235	28.7
S12V370F	12	87	723	484	373	230	131	92	306	174	235	33.4
S12V500F	12	131	864	619	503	310	176	126	344	172	288	48.1
S6V140F	6	173	1448	970	746	458	262	184	306	174	235	33.4

All technical data refer to 25° C.

9.1.5. Powerli S 300

Type	Nominal voltage [V]	C ₁₀ [Ah]	1.75 V per cell	C ₁₀ [Ah]	1.75 V per cell	C ₁₀ [Ah]	1.75 V per cell	C ₁₀ [Ah]	1.80 V per cell	Length [mm]	Width [mm]	Height max. [mm]	Weight approx. [kg]
S300/1.2 S	6	1.2	1.2	1.13	1.13	1.13	1.13	1.13	1.13	97	25	56	0.3
S306/4 S	6	4.0	4.0	3.80	3.80	3.80	3.80	3.80	3.80	70	47	106	0.9
S306/7 S	6	7.0	7.0	6.55	6.55	6.55	6.55	6.55	6.55	151	34	100	1.3
S306/12 S	6	12	11.4	11.4	11.4	11.4	11.4	11.4	11.4	161	50	100	2.1
S312/1.2 S	12	1.2	1.2	1.13	1.13	1.13	1.13	1.13	1.13	97	45	59	0.6
S312/2.3 S	12	2.3	2.3	2.18	2.18	2.18	2.18	2.18	2.18	178	34	85	0.8
S312/2.3 S	12	3.2	3.2	3.00	3.00	3.00	3.00	3.00	3.00	134	67	66	1.3
S312/4 S	12	4.0	4.0	3.80	3.80	3.80	3.80	3.80	3.80	100	70	106	1.7
S312/7 S	12	7.0	7.0	6.64	6.64	6.64	6.64	6.64	6.64	151	65	98	2.8
S312/12 S	12	12	11.4	11.4	11.4	11.4	11.4	11.4	11.4	181	98	98	4.0
S312/18 OS	12	18	18	16.1	16.1	16.1	16.1	16.1	16.1	181	76	165	6.2
S312/26 OS	12	26	26	24.7	24.7	24.7	24.7	24.7	24.7	168	175	125	9.4
S312/40 OS	12	40	40	37.9	37.9	37.9	37.9	37.9	37.9	196	166	171	14.3

All technical data refer to 20° C.

9.1.6. Powerli S 600

Type	Nominal voltage [V]	C ₁₀ [Ah]	1.75 V per cell	C ₁₀ [Ah]	1.75 V per cell	C ₁₀ [Ah]	1.75 V per cell	C ₁₀ [Ah]	1.80 V per cell	Length [mm]	Width [mm]	Height max. [mm]	Weight approx. [kg]
S512/25	12	25.0	25.0	24.0	24.0	24.0	24.0	24.0	24.0	168	127	174	9.5
S512/38	12	38.0	38.0	36.0	36.0	36.0	36.0	36.0	36.0	188	169	175	13.5
S512/50	12	51.0	51.0	48.0	48.0	48.0	48.0	48.0	48.0	234	189	180	18.5
S512/60	12	61.0	61.0	58.0	58.0	58.0	58.0	58.0	58.0	272	188	190	23.0
S512/80	12	82.0	82.0	81.0	81.0	81.0	81.0	81.0	81.0	359	172	226	30.0
S506/130	6	130	130	121	121	121	121	121	121	272	166	180	23.0
S506/185	6	185	185	174	174	174	174	174	174	359	171	226	31.5

All technical data refer to 20° C.

9.2 GEL - Type

9.2.1. A 400

Discharge time t_d	Capacity C_d [Ah]	10 min	30 min	1 h	3 h	5 h	10 h	Length [mm]	Width [mm]	Height max. [mm]	Weight approx. [kg]
Capacity C_d [Ah]	C_{10}	C_{30}	C_1	C_3	C_5	C_{10}	C_{30}				
A400/165	53.0	80.0	96.0	132	143.5	165	165	244	190	282	31.5
A412/5.5	1.83	2.80	3.40	4.80	5.00	5.00	5.00	152	66	98	2.5
A412/6.5	2.67	3.90	4.70	6.60	7.50	8.00	8.00	152	66	98	3.6
A412/12	3.83	5.50	6.80	9.70	10.0	12.0	12.0	181	76	156	5.6
A412/20	7.00	9.50	12.0	15.0	16.5	20.0	20.0	167	176	126	8.5
A412/30	11.3	16.5	20.0	25.7	29.0	32.0	32.0	210	175	181	14.1
A412/50	16.8	23.5	31.0	40.8	44.5	50.0	50.0	278	175	196	19.0
A412/65	19.3	28.0	42.0	51.9	57.5	65.0	65.0	353	175	220	23.5
A412/85	27.6	42.5	52.0	68.4	74.5	85.0	85.0	204	244	276	32.0
A412/90	29.5	44.5	52.0	72.9	81.5	90.0	90.0	284	267	237	35.0
A412/100	30.5	45.5	54.0	75.3	85.0	100	100	513	189	223	40.0
A412/120	38.0	56.0	71.0	87.9	96.0	120	120	513	223	223	49.0
A412/160	53.8	81.0	96.0	138	152	180	180	518	274	244	64.5
A412/200 FT	59.0	92.5	105.0	148.5	164.5	190	190	115	548	275	41.5
U_1 [V (5 V block)]	4.8	4.8	4.95	5.1	5.1	5.4	5.4				
U_2 [V (12 V block)]	9.6	9.6	9.9	10.2	10.2	10.8	10.8				

All technical data refer to 20° C.

9.2.2. A 500

Discharge time t_d	Capacity C_d [Ah]	10 min	30 min	1 h	3 h	5 h	10 h	30 h	Length [mm]	Width [mm]	Height max. [mm]	Weight approx. [kg]
Capacity C_d [Ah]	C_{10}	C_{30}	C_1	C_3	C_5	C_{10}	C_{30}	C_{30}				
A500/10	4.30	6.40	7.10	9.00	9.50	10.0	10.0	10.0	53	51	98	0.7
A500/12	1.40	1.95	2.30	3.00	3.00	3.00	3.00	3.50	91	35	64	0.5
A500/15	0.90	1.20	1.40	1.80	1.80	1.80	1.80	2.00	97	26	56	0.3
A500/18	1.40	1.95	2.30	3.00	3.00	3.00	3.00	3.50	135	35	64	0.7
A500/20	1.10	1.75	2.00	2.60	2.60	2.60	2.60	3.00	52	62	102	0.9
A500/25	2.60	3.50	4.00	4.80	5.50	6.00	6.00	6.50	152	35	98	1.3
A500/30	4.80	6.40	7.10	9.00	9.50	10.0	10.0	10.0	132	51	98	2.1
A500/35	1.40	1.95	2.30	3.00	3.00	3.00	3.00	3.50	178	34	64	1.0
A512/1	0.50	0.85	0.80	1.20	1.00	1.00	1.00	1.20	98	50	55	0.7
A512/2	0.80	1.10	1.50	1.80	2.00	2.00	2.00	2.00	178	34	64	1.0
A512/3	1.40	1.95	2.30	3.00	3.00	3.00	3.00	3.50	135	67	64	1.5
A512/5	2.60	3.50	4.00	4.80	5.50	6.00	6.00	6.50	152	66	98	2.5
A512/10	4.80	6.40	7.10	9.00	9.50	10.0	10.0	10.0	132	98	98	4.0
A512/15	7.00	9.00	10.6	13.8	14.5	15.0	15.0	16.0	181	76	167	6.0
A512/20	11.4	16.3	20.1	24.6	26.5	27.0	27.0	30.0	210	175	175	14.6
A512/25	14.1	19.5	24.0	28.5	34.0	36.0	36.0	40.0	210	175	175	17.5
A512/30	16.3	27.6	33.7	42.8	46.5	50.0	50.0	55.0	261	135	230	18.8
A512/35	22.1	30.9	37.1	48.6	52.0	56.0	56.0	60.0	278	175	190	20.8
A512/40	22.5	33.8	40.9	53.7	58.5	62.0	62.0	66.0	353	175	190	24.0
A512/45	33.1	47.5	59.0	69.0	75.3	80.0	80.0	85.0	330	236	300	30.0
A512/50	37.8	58.5	67.0	84.0	95.0	104	115	126	286	268	230	40.0
A512/60	44.5	62.0	74.0	88.7	96.0	102	120	140	513	189	223	41.0
A512/70	50.5	71.5	85.4	105	113	119	140	160	513	223	223	48.0
A512/80	60.5	81.5	120	151	164	173	200	210	518	274	238	67.0
U_1 [V (5 V block)]	1.6	1.6	1.65	1.70	1.70	1.80	1.80	1.75				
U_2 [V (12 V block)]	3.2	3.2	3.3	3.4	3.4	3.6	3.5	3.5				
U_3 [V (6 V block)]	4.8	4.8	4.95	5.1	5.1	5.4	5.25	5.25				
U_4 [V (12 V block)]	9.6	9.6	9.9	10.2	10.2	10.8	10.8	10.8				

All technical data refer to 20° C.

9.2.3. A 600

Type	DIN type designation	Nominal voltage [V]	C_1 [Ah]	C_3 [Ah]	C_5 [Ah]	C_{10} [Ah]	Length [mm]	Width [mm]	Height max. [mm]	Weight approx. [kg]
A612/100	12 V 2 OPzV 100	12	58.9	76.5	82.5	91.0	273	204	319	43
A612/150	12 V 3 OPzV 150	12	86.9	114.6	124.0	137.0	391	204	319	63
A600/200	6 V 4 OPzV 200	6	114.0	152.7	165.5	182.0	273	204	319	43
A600/300	6 V 6 OPzV 300	6	166.0	228.2	248.0	274.0	391	204	319	62
A602/200	4 OPzV 200	2	123.8	163.6	201.5	224.0	105	208	360	18
A602/250	5 OPzV 250	2	154.7	229.5	251.5	280.0	126	208	360	22
A602/300	6 OPzV 300	2	185.6	275.4	302.0	337.0	147	208	360	25
A602/350	5 OPzV 350	2	229.9	348.5	406.0	418.0	156	208	475	32
A602/400	6 OPzV 400	2	287.9	418.4	487.5	499.0	147	208	475	37
A602/450	7 OPzV 450	2	334.9	490.3	568.5	582.0	168	208	475	42
A602/500	8 OPzV 500	2	437.8	596.5	676.0	748.0	147	208	650	50
A602/600	10 OPzV 600	2	563.4	780.0	898.5	998.0	212	181	650	68
A602/700	12 OPzV 700	2	720.0	979.8	1123.0	1248.0	212	235	650	82
A602/800	15 OPzV 800	2	874.6	1176.3	1347.0	1487.0	212	277	650	96
A602/900	18 OPzV 900	2	958.9	1335.3	1445.5	1643.0	212	277	800	112
A602/1000	20 OPzV 1000	2	1278.5	1780.5	1927.5	2100.0	216	400	775	153
A602/1200	24 OPzV 1200	2	1598.1	2225.7	2409.5	2708.0	215	490	775	196
A602/1500	30 OPzV 1500	2	1917.8	2670.6	2891.0	3288.0	216	580	775	225
U_1 [V (2 V cell)]		--	1.60	1.70	1.75	1.80				
U_2 [V (6 V block)]		--	4.80	5.10	5.25	5.40				
U_3 [V (12 V block)]		--	9.60	10.20	10.50	10.80				

All technical data refer to 20° C.

9.2.4. A 700

Discharge time t_d	Capacity C_d [Ah]	10 min	30 min	1 h	3 h	5 h	10 h	Length [mm]	Width [mm]	Height max. [mm]	Weight approx. [kg]
Capacity C_d [Ah]	C_{10}	C_{30}	C_1	C_3	C_5	C_{10}	C_{30}				
A700/21	7.00	10.2	10.2	12.2	18.5	18.0	21.0	115	178	259	8.5
A700/42	14.1	20.5	24.4	33.0	38.0	42.0	42.0	115	178	269	10.1
A700/63	21.1	31.7	36.6	49.5	57.0	63.0	63.0	198	178	272	16.3
A700/84	28.3	41.0	48.8	66.0	76.5	84.0	84.0	198	178	272	18.3
A700/105	35.3	51.0	61.0	82.8	95.5	105.0	105.0	282	178	272	25.3
A700/126	42.3	61.5	73.2	99.3	114.5	126.0	126.0	282	178	272	28.2
A700/147	49.3	69.5	83.2	117.0	131.0	140.0	140.0	285	232	327	36.3
A700/168	56.3	86.5	105.0	146.4	163.5	175.0	175.0	285	232	327	39.7
A700/189	63.3	93.5	112.0	163.5	188.0	201.0	201.0	285	232	327	42.9
A700/210	70.3	104.0	124.0	188.0	204.8	218.0	218.0	250	232	327	45.9
A700/231	77.3	115.0	136.0	204.8	224.0	240.0	240.0	250	232	327	48.9
U_1 [V (2 V cell)]		3.2	3.2	3.3	3.4	3.4	3.6				
U_2 [V (6 V block)]		4.8	4.8	4.95	5.1	5.1	5.4				

All technical data refer to 20° C.

ВЯРНО С



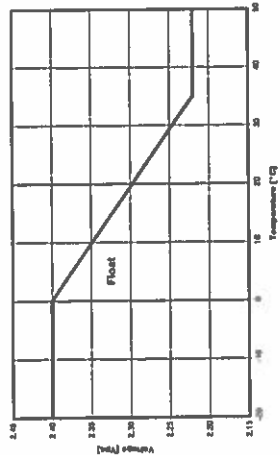


Fig. 2: Marathon M/M-FT, Sprinter P/P, Sprinter S, charging voltage vs. temperature

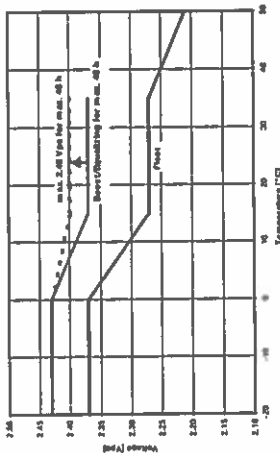


Fig. 2: A 400/FT, charging voltage vs. temperature

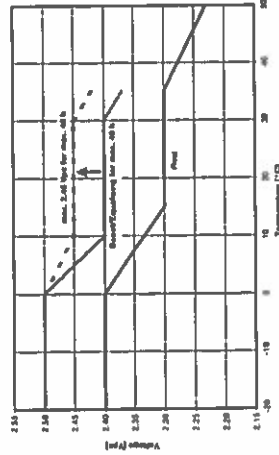


Fig. 4: A 600, charging voltage vs. temperature

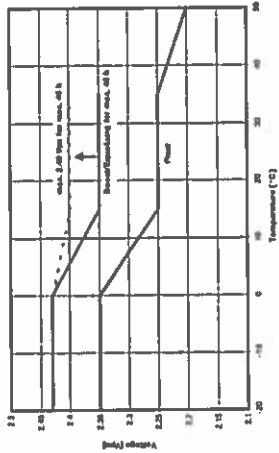


Fig. 5: A 600, A 700, charging voltage vs. temperature

2.9. Electrolyte

The electrolyte is diluted sulphuric acid and is fixed in a glass jar for AGM products or in a gel for Sonnenschein products.

3. Battery maintenance and control

- Keep the battery clean and dry to avoid creeping currents. The cleaning should be carried out acc. to the information leaflet. 'Cleaning of batteries' published by ZVEI (German Electrical and Electronic Manufacturer Association, Working Group 'Industrial Batteries'). Plastic parts of the battery, especially containers, must be cleaned with pure water without additives.
- At least every 6 months measure and record:
 - Battery voltage
 - Float voltage of several cells/blocks
 - Surface temperature of several cells/blocks
 - Battery-room temperature
- Visual measurement and recording:
 - Battery status of all cells / blocks
 - Float voltage of all cells/blocks
 - Battery-room temperature
 - Insulation-resistance acc. to DIN 43538 part 1

Deviations of the battery voltage from the value given in table 2 (acc. to the number of cells) must be corrected.

Annual visual check:

- Screw-connections
- Screw-connections without locking devices have to be checked for tightness
- Battery installation and arrangement
- Ventilation

If the cell or block voltage differ from the average float charge voltage by more than the values given in table 7, or if the surface temperature difference between cells / blocks exceeds 5K, the service agent should be contacted.

Capacity test

In order to make sure the battery is fully charged IU-charge methods as shown in table 8 can be applied depending on the different battery types. The current available to the battery must be between 10 A / 100 Ah C₁₀ and 35 A / 100 Ah C₁₀.

Table 8: Preparation for capacity test (voltage values refer to the nominal temperature. In case of temperatures others than the nominal values see item 2.8)

	2V	4V	6V	12V
Marathon L	+0.29/-0.1	-	+0.35/-0.17	+0.49/-0.24
Marathon XL	-	-	+0.35/-0.17	+0.49/-0.24
Marathon M/M-FT	-	-	+0.35/-0.17	+0.49/-0.24
Sprinter P/P	-	-	+0.35/-0.17	+0.49/-0.24
Sprinter S	-	-	+0.35/-0.17	+0.49/-0.24
Powerfit S 200/S 300	-	-	+0.35/-0.17	+0.49/-0.24
Powerfit S 500	-	-	+0.35/-0.17	+0.49/-0.24
A 400/FT	-	-	+0.35/-0.17	+0.49/-0.24
A 500	-	-	+0.35/-0.17	+0.49/-0.24
A 600	-	-	+0.35/-0.17	+0.49/-0.24
A 700	-	-	+0.35/-0.17	+0.49/-0.24

Table 7: Criteria for voltage measurements

5. Faults

Call the service agents immediately if faults in the battery or the charging unit are found. Recorded data as described in item 3. must be made available to the service agent. It is recommended that a service contract is taken out with our agent.

6. Storage and taking out of operation
To store or decommission the battery, a longer period of time is required. The battery must be fully charged and stored in a cool, dry, frost-free room. No acid damage to the following charging methods can be chosen:

- Annual refreshing charge acc. to item 2.4.
- Get-batteries A400, A500, A600 and A700. Get-batteries can be stored without refreshing charge for a maximum 24 months at 5 20°C. At average ambient temperatures of more than the nominal temperature shorter intervals can be necessary.

2. Float charging as detailed in 2.3.

7. Transport

Cells and blocks must be transported in an upright position. Batteries without any visible damage are not defined as dangerous goods

under the regulations for transport of dangerous goods by road (ADR) or by railway (RID). They must be protected against short circuits, slipping, upsetting or changing. Cells/blocks must be suitable stacked and secured on pallets (ADR and RID, special provision 550). It is prohibited to ship pallets.

No corrosive traces of acid shall be found on the exterior of the packaging unit. Cells/blocks whose containers leak or are damaged must be packed and transported as class 8 dangerous goods under UN no. 2794.

In case of air transport, batteries which are part of any equipment must be disconnected at their terminals, and the terminals must be protected against short-circuits. This is in order to avoid the risk of any incidents like fire etc.

8. Central degassing

The ventilation of battery rooms and cabinets, respectively, must be carried out acc. to EN 50272-2 always. Battery rooms are to be considered as safe from explosions, when by natural or technical ventilation the concentration of hydrogen is kept below 4% in air. This standard contains also notes and calculations regarding safety distance of battery operation.

9. Technical Data

The following tables contain values of either capacities (C₁₀) or discharge rates (constant current or constant power) at different discharge times (t_d) and to different final voltages (U_f).

All technical data refer to either 20° C or 25° C (depends on battery type).

9.1 AGM - Types

9.1.1. Marathon L/XL

Capacity C ₁₀ [Ah]	10 min	30 min	1 h	3 h	5 h	10 h	Length [mm]	Width [mm]	Height* [mm]	Weight approx. [kg]
L12V15	8.5	8.5	9.9	13.2	13.0	14.0	161	76	167	6.5
L12V24	10.6	10.6	12.9	17.0	17.0	18.0	181	127	174	10.0
L12V32	14.1	14.1	16.7	21.4	21.5	22.0	198	168	175	13.5
L12V42	19.6	19.6	23.7	29.4	29.5	30.0	234	169	190	18.5
L12V55	21.6	21.6	26.5	36.0	36.1	37.0	272	166	190	22.0
L12V60	30.3	30.3	36.5	47.0	47.0	48.0	359	172	226	30.0
L12V70	48.4	48.4	57.5	71.0	71.0	72.0	359	172	226	30.0
L12V80	68.6	68.6	83.5	102.3	102.3	104.0	359	172	226	31.5
L2V220	87.4	87.4	107.0	133.5	133.5	136.0	209	136	265	18.0
L2V270	108.3	108.3	132.0	166.0	166.0	169.0	209	136	265	18.3
L2V320	135.8	135.8	165.0	208.0	208.0	211.0	209	202	265	24.2
L2V375	155.8	155.8	190.0	240.0	240.0	243.0	209	202	265	26.5
L2V425	169.9	169.9	205.0	260.0	260.0	263.0	209	202	265	28.8
L2V475	186.6	186.6	227.0	284.0	284.0	287.0	209	202	265	32.8
L2V520	204.1	204.1	249.0	310.0	310.0	313.0	209	202	265	35.0
L2V575	220.8	220.8	271.0	336.0	336.0	339.0	209	202	265	37.3
L2V650	240.1	240.1	294.0	368.0	368.0	371.0	209	202	265	40.0
XL12V70	28.6	28.6	34.5	45.6	45.6	46.0	262	172	239	25.0
XL12V85	34.6	34.6	42.1	55.5	55.5	56.0	262	172	239	28.7
XL6V160	74.3	74.3	90.0	117.0	117.0	119.0	309	172	241	30.5
U _f [V] (2 V cell)	1.60	1.60	1.60	1.70	1.75	1.80				
U _f [V] (6 V block)	4.80	4.80	4.80	5.10	5.25	5.40				
U _f [V] (12 V block)	9.60	9.60	9.60	10.2	10.5	10.8				

* Includes installed connector

All technical data refer to 20° C.

9.1.2. Marathon M/M-FT

Type	Nominal voltage [V]	C ₁₀ [Ah] 1.75 V per cell	Constant current discharge [A], U _t = 1.75 V per cell					Length max. [mm]	Width max. [mm]	Height max. [mm]	Weight approx. [kg]	
			0.5 h	1 h	1.5 h	3 h	5 h	10 h				
M12V30T	12	30	36.9	21.2	15.1	8.40	5.50	2.90	171	130	186	10.7
M12V40F	12	40	51.3	30.5	21.5	11.9	7.60	4.10	196	167	189	17.8
M12V45F	12	45	57.8	33.2	24.0	13.5	8.70	4.70	220	121	254	17.5
M12V70F	12	70	90.8	51.6	36.8	20.8	13.4	7.40	290	174	235	27.8
M12V90F	12	90	107	65.7	46.6	25.9	16.7	9.20	306	174	235	32.8
M6V190F	6	190	246	144	102	58.0	35.9	19.5	306	174	235	33.5
M6V200F	6	200	220	135	100	55.2	36.3	20.2	361	132	250	34.0
M12V35F	12	35	44.0	26.5	14.0	10.2	6.60	3.50	200	107	189	14.0
M12V50F	12	47	61.0	34.3	20.0	13.5	8.80	4.70	280	107	231	18.0
M12V60F	12	59	68.8	40.1	25.0	16.6	11.0	6.00	290	107	233	23.0
M12V90FT	12	86	108	64.0	46.4	24.9	15.9	8.70	395	105	270	31.0
M12V105FT	12	100	115	70.0	51.6	28.5	18.7	10.3	511	110	238	35.6
M12V125FT	12	121	141	88.1	65.3	37.2	23.4	12.4	559	124	263	47.6
M12V155FT	12	150	174	103	77.7	43.2	28.1	15.4	559	124	263	53.8
M12V180FT	12	180	202	119	87.5	50.8	33.1	18.1	559	125	318	60.3

All technical data refer to 25° C.

9.1.3. Sprinter P/XP

Type	Nominal voltage [V]	15 min. power [W], U _t = 1.80 V per cell	Capacity C ₁₀ [Ah], U _t = 1.80 V per cell	Length max. [mm]	Width max. [mm]	Height ^a max. [mm]	Weight approx. [kg]
P12V600	12	600	24	169	128	175	9.50
P12V875	12	875	41	200	169	176	14.5
P12V1270	12	1270	51	233	169	191	19.5
P12V1575	12	1575	61	273	167	191	24.0
P12V2130	12	2130	86	360	173	227	33.0
P 6V1700	6	1700	122	273	167	191	25.0
P 6V2030	6	2030	178	360	172	227	32.5
XP 12V1600	12	1370	58.4	220	172	235	22.5
XP 12V2500	12	1870	89.5	262	172	239	27.7
XP 12V3000	12	2350	92.8	309	172	239	32.8
XP 6V2800	6	2270	195	309	172	241	32.6

These batteries are especially designed for high rate discharges. Further details depending on the discharge time and cut off voltage must be taken from the actual product brochure.

All technical data refer to 25° C.

^a Includes installed connector

9.1.4. Sprinter S

Type	Nominal voltage [V]	C ₁₀ [Ah] U _t = 1.80 V per cell	Constant power [Watt per cell], U _t = 1.87 V per cell				Length max. [mm]	Width max. [mm]	Height max. [mm]	Weight approx. [kg]		
			5 min	10 min	15 min	30 min	60 min	90 min				
S12V120F	12	24	242	151	117	72	41	29	173	167	161	12.1
S18V170F	12	40	323	215	167	102	59	41	198	187	189	16.4
S12V285F	12	70	543	365	285	169	96	69	260	174	235	27.8
S12V300F	12	69	654	415	308	180	105	76	260	174	235	28.7
S12V370F	12	87	723	484	373	230	131	92	306	174	235	33.4
S18V500F	12	131	864	615	505	310	178	126	344	172	268	48.1
S18V740F	6	175	1446	970	746	458	262	164	306	174	235	33.4

All technical data refer to 25° C.

9.1.5. Powerfit S 200

Type	Nominal voltage [V]	C ₁₀ [Ah] 1.75 V per cell	C ₂₀ [Ah] 1.75 V per cell	C ₃₀ [Ah] 1.60 V per cell	Length ^a [mm]	Width ^a [mm]	Height ^a [mm]	Weight approx. [kg]
S206/1.2 S	6	1.17	4.40	1.11	97	24	57.5	0.28
S206/4 S	6	4.40	4.17	2.69	70	47	106	0.99
S206/7 S	6	6.55	6.48	4.18	151	34	100	1.28
S206/12 S	6	11.7	11.1	7.16	151	51	100	1.85
S212/1.2 S	12	1.17	1.11	0.71	97	43	58	0.57
S212/2.3 S	12	2.25	2.13	1.37	178	35	66	1.0
S212/4 S	12	3.14	2.96	1.91	134	67	66.5	1.3
S212/7 S	12	3.91	3.70	2.38	90	70	107	1.6
S212/12 S	12	7.62	7.15	5.61	151	65	100	2.45
S212/18 GS	12	11.7	11.1	7.16	151	98	101	3.8
S212/26 GS	12	17.8	16.6	10.4	181.5	77	167.5	5.7
S212/40 F6	12	25.4	24.0	15.4	164.5	175	125	8.7
S212/40 F6	12	38.8	37.2	22.0	197	185	170	13.2

All technical data refer to 20° C. Figures are also valid for other terminals.

^a ± 1mm ^{**} ± 2mm

9.1.6. Powerfit S 300

Type	Nominal voltage [V]	C ₁₀ [Ah] 1.75 V per cell	C ₂₀ [Ah] 1.75 V per cell	C ₃₀ [Ah] 1.60 V per cell	Length ^a [mm]	Width ^a [mm]	Height ^a [mm]	Weight approx. [kg]
S306/1.2 S	6	1.2	1.13	0.78	97	25	56	0.30
S306/4 S	6	4.0	3.80	2.62	70	47	106	0.85
S306/7 S	6	7.0	6.55	4.58	151	34	100	1.30
S306/12 S	6	12	11.4	7.86	151	50	100	2.05
S312/1.2 S	12	1.2	1.13	0.78	97	45	59	0.59
S312/2.3 S	12	2.3	2.19	1.50	178	34	65	0.94
S312/4 S	12	3.2	3.00	1.96	134	67	66	1.30
S312/7 S	12	4.0	3.80	2.62	90	70	106	1.67
S312/12 S	12	7.0	6.64	4.58	151	65	96	2.60
S312/18 GS	12	12	11.4	7.86	151	98	98	4.03
S312/26 GS	12	18	16.1	11.1	181	76	166	6.15
S312/40 GS	12	28	24.7	17.0	166	125	125	8.40
S312/40 GS	12	40	37.9	26.2	196	185	171	14.3

All technical data refer to 20° C. Figures are also valid for other terminals.

^a ± 2mm ^{**} ± 3mm

9.1.7. Powerfit S 500

Type	Nominal voltage [V]	C ₁₀ [Ah] 1.75 V per cell	C ₂₀ [Ah] 1.75 V per cell	C ₃₀ [Ah] 1.60 V per cell	Length max. [mm]	Width max. [mm]	Height max. [mm]	Weight approx. [kg]
S512/25	12	25.0	24.0	15.8	168	127	174	9.50
S512/28	12	38.0	36.0	23.2	198	168	175	13.5
S512/50	12	51.0	48.0	32.5	234	169	190	18.5
S512/80	12	61.0	58.0	40.8	272	166	190	23.0
S512/92	12	92.0	87.0	54.4	359	172	226	30.0
S506/130	6	128	121	80.0	272	188	190	23.0
S506/185	6	185	174	116	359	171	226	31.5

All technical data refer to 20° C.



9.2 GEL - Types
9.2.1 A 400/FT

Discharge time t_d	10 min	30 min	1 h	3 h	5 h	10 h	Length max. [mm]	Width max. [mm]	Height max. [mm]	Weight approx. [kg]
Capacity C_p [Ah]	C_p	C_p	C_p	C_p	C_p	C_p				
A400/165	53.0	80.0	98.0	132	143.5	165	244	190	282	28.5
A412/5.5	1.83	2.80	3.40	4.80	5.00	5.00	152	65.5	98.4	2.50
A412/12	2.67	3.90	4.70	6.60	7.50	8.00	152	98.0	98.4	3.60
A412/18	3.83	5.50	6.80	9.70	10.0	12.0	181	76.0	157	5.00
A412/20	7.00	9.50	12.0	15.0	16.5	20.0	167	176	126	9.00
A412/22	11.3	16.5	20.0	24.7	29.0	32.0	210	175	181	14.1
A412/25	16.8	25.5	31.0	40.8	44.5	50.0	278	175	196	19.0
A412/26	19.3	29.0	42.0	51.9	57.5	65.0	353	175	196	23.5
A412/28	27.6	42.5	52.0	68.4	74.5	85.0	204	244	276	32.0
A412/30	29.5	44.5	53.0	72.9	81.5	90.0	284	267	237	37.0
A412/100	30.5	45.5	54.0	75.3	85.0	100	513	189	223	46.0
A412/120	36.0	54.0	71.0	87.9	98.0	120	513	223	223	54.0
A412/180	53.6	81.0	96.0	138	152	180	518	274	244	64.5
A412/170 FT	57.1	85.5	102	143	155	164	569	128	321	58.4

All technical data refer to 20° C.

9.2.2 A 500

Discharge time t_d	10 min	30 min	1 h	3 h	5 h	10 h	20 h	Length max. [mm]	Width max. [mm]	Height max. [mm]	Weight approx. [kg]
Capacity C_p [Ah]	C_p	C_p	C_p	C_p	C_p	C_p	C_p				
A502/10	4.80	6.40	7.10	9.00	9.50	10.0	10.0	52.9	50.5	98.4	0.70
A504/2.5	1.40	1.95	2.30	3.00	3.15	3.3	3.50	90.5	34.5	64.4	0.50
A506/1.2	0.50	0.68	0.80	1.05	1.1	1.00	1.20	97.3	25.5	55.6	0.33
A508/2.5	1.40	1.95	2.30	3.00	3.15	3.3	3.50	135	34.8	64.4	0.70
A508/4.2	1.10	1.75	2.50	3.78	3.95	4.00	4.20	52.0	62.3	102	0.80
A508/6.5	2.80	3.50	4.00	4.80	5.30	5.50	6.50	152	34.5	98.4	1.30
A508/10	4.80	6.40	7.10	9.00	9.50	10.0	10.0	152	50.5	98.4	2.10
A508/2.5	1.40	1.95	2.30	3.00	3.15	3.3	3.50	179	34.1	64.4	1.0
A512/1.2	0.50	0.68	0.80	1.05	1.1	1.00	1.20	97.5	49.5	54.9	0.65
A512/2	0.80	1.10	1.50	1.80	1.85	1.9	2.00	179	34.1	64.4	1.00
A512/2.5	1.40	1.95	2.30	3.00	3.15	3.3	3.50	135	66.6	64.4	1.50
A512/6.5	2.80	3.50	4.00	4.80	5.50	6.3	6.50	152	65.5	98.4	2.90
A512/10	4.80	6.40	7.10	9.00	9.50	10.0	10.0	152	98.0	98.4	4.00
A512/16	7.00	9.00	10.6	13.8	14.5	15.0	16.0	181	78	167	6.00
A512/25	7.80	11.45	14.4	18.6	20.5	22.0	25.0	167	176	128	9.60
A512/30	11.4	16.3	20.1	24.6	26.5	27.0	30.0	197	132	180	11.1
A512/40	14.1	19.5	24.0	28.5	34.0	36.0	40.0	210	175	175	14.6
A512/65	19.3	27.6	35.7	42.9	48.5	50.0	55.0	261	135	200	18.8
A512/80	22.1	30.9	37.1	48.6	52.0	56.0	60.0	278	175	190	20.8
A512/85	22.5	33.8	40.9	53.7	58.5	62.0	65.0	353	175	190	24.0
A512/85	33.1	47.5	59.0	69.0	75.5	80.0	85.0	330	171	238	30.0
A512/115	37.8	54.5	67.0	84.0	95.0	104	115	286	169	230	40.0
A512/120	44.5	62.0	74.0	89.7	96.0	102	120	513	269	223	41.0
A512/140	50.5	71.5	85.4	105.3	113	119	140	513	223	223	47.0
A512/200	68.5	101	120	151.8	164	173	200	518	274	238	67.0
U_1 [V] (2 V cell)	1.6	1.6	1.65	1.70	1.70	1.80	1.75				
U_1 [V] (4 V block)	3.2	3.2	3.3	3.4	3.4	3.6	3.5				
U_1 [V] (8 V block)	4.8	4.8	4.9	5.1	5.1	5.4	5.25				
U_1 [V] (8 V block)	6.4	6.4	6.6	6.8	6.8	7.2	7.0				
U_1 [V] (12 V block)	9.6	9.6	9.8	10.2	10.2	10.8	10.5				

All technical data refer to 20° C.

9.2.3 A 600

Type	DN type designation	Nominal voltage [V]	C_1 [Ah]	C_2 [Ah]	C_3 [Ah]	C_4 [Ah]	Length max. [mm]	Width max. [mm]	Height max. [mm]	Weight approx. [kg]
A612/100	12 V 2 OP-V 100**	12	58.9	76.5	82.5	91.0	273	204	358	43.0
A612/150	12 V 3 OP-V 150**	6	96.9	114	124	137	381	204	358	63.0
A606/200	6 V 4 OP-V 200**	6	114	152	165	182	273	204	358	43.0
A606/300	6 V 6 OP-V 300**	6	168	229	248	274	381	204	358	62.0
A602/225	4 OP-V 200*	2	123	182	199	224	105	208	359	19.0
A602/280	5 OP-V 250*	2	154	228	249	280	126	208	369	23.0
A602/315	6 OP-V 300*	2	185	274	298	337	147	208	359	27.0
A602/415	5 OP-V 350*	2	238	332	363	416	128	208	359	30.0
A602/500	7 OP-V 400*	2	286	398	460	499	147	208	359	35.0
A602/580	8 OP-V 480*	2	333	464	536	562	168	208	359	38.0
A602/750	10 OP-V 600*	2	429	585	674	748	147	208	359	49.0
A602/1010	12 OP-V 800*	2	572	780	898	998	212	183	690	60.0
A602/1250	10 OP-V 1000*	2	715	975	1122	1248	212	235	690	60.0
A602/1510	12 OP-V 1200*	2	858	1170	1347	1497	212	277	690	65.0
A602/1650C	12 OP-V 1500 C*	2	992	1437	1543	1843	216	277	759	115
A602/1850C	12 OP-V 1500*	2	950	1305	1489	1643	212	277	840	117
A602/2200	16 OP-V 2000*	2	1267	1740	1985	2190	216	400	816	160
A602/2740	20 OP-V 2500*	2	1563	2175	2492	2738	214	480	818	198
A602/3300	24 OP-V 3000*	2	1900	2610	2978	3286	214	578	816	238
U_1 [V] (2 V cell)			1.60	1.70	1.75	1.80				
U_1 [V] (6 V block)			4.95	5.10	5.25	5.40				
U_1 [V] (12 V block)			9.90	10.20	10.50	10.80				

All technical data refer to 20° C.

* Includes installed connector

** DIN 40 742

*** DIN 40 744

9.2.4 A 700

Discharge time t_d	10 min	30 min	1 h	3 h	5 h	10 h	Length max. [mm]	Width max. [mm]	Height max. [mm]	Weight approx. [kg]
Capacity C_p [Ah]	C_p	C_p	C_p	C_p	C_p	C_p				
A706/21	7.00	10.2	12.2	16.5	19.0	21.0	115	176	268	8.2
A706/42	14.1	20.5	24.4	33.0	38.0	42.0	115	178	268	10.1
A706/63	21.1	31.7	36.6	49.5	57.0	63.0	198	178	272	16.3
A706/84	28.5	41.0	48.8	66.0	76.5	84.0	198	178	272	18.3
A706/105	35.3	51.0	61.0	82.8	95.5	105.0	282	178	272	24.5
A706/128	42.5	61.5	73.2	99.3	114.5	128.0	282	178	272	26.2
A706/140	42.1	69.5	85.3	117.0	131.0	140.0	285	232	327	36.3
A706/175	52.8	88.5	108.0	146.4	163.5	175.0	285	232	327	38.7
A706/210	63.3	104.0	128.0	175.5	196.0	210.0	285	232	327	42.9
A706/245	74.0	121.5	149.0	204.9	229.0	245.0	250	232	327	35.5
A706/280	84.5	139.0	170.0	234.0	261.5	280.0	250	232	327	37.5
U_1 [V] (4 V block)	3.2	3.2	3.3	3.4	3.4	3.6				
U_1 [V] (6 V block)	4.8	4.8	4.95	5.1	5.1	5.4				

All technical data refer to 20° C.

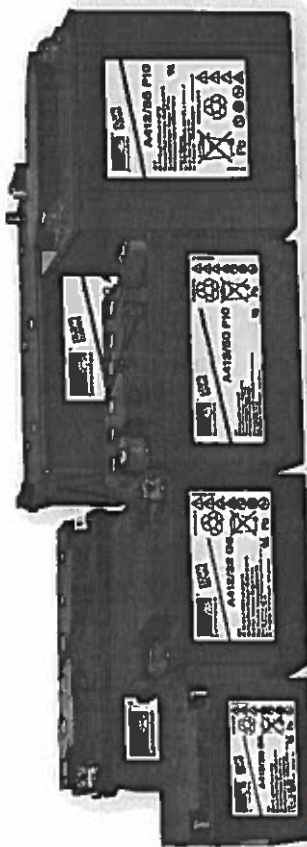
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Industrial Batteries / Network Power
Sonnenschein A400

„Outstanding price/quality ratio
for long-term energy storage“



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Industrial Batteries
The powerful range of Network Power

Energy storage solutions for critical systems that require uninterrupted power supply. GNB® Industrial Power offers powerful batteries for your individual needs. The below table is only indicative and depends on customers' specific applications. For more information please ask a GNB sales representative.

Applications	Battery ranges											
	Sonnenschein			Marathon			Sprinter			Classic		
	A400	A700	A1200	RA1	RA2	RA3	S	5	10	CP-15	CP-25	RA1
Telecom	•	•	•	•	•	•	•	•	•	•	•	•
UPS	•	•	•	•	•	•	•	•	•	•	•	•
Emergency lighting	•	•	•	•	•	•	•	•	•	•	•	•
Security	•	•	•	•	•	•	•	•	•	•	•	•
Energy	•	•	•	•	•	•	•	•	•	•	•	•
Advertising	•	•	•	•	•	•	•	•	•	•	•	•
Medical	•	•	•	•	•	•	•	•	•	•	•	•
Producible	•	•	•	•	•	•	•	•	•	•	•	•
Industrial	•	•	•	•	•	•	•	•	•	•	•	•

The GNB Network Power brand overview

ABSOLYTE **MARATHON**
Sprinter **Powerfit**

- > VRLA batteries (Valve Regulated Lead Acid) in which the electrolyte is fixed in an absorbent glass mat (AGM)
- > Excellent high current capability
- > Very economical
- > Maintenance-free (no topping up)
- > VRLA batteries (Valve Regulated Lead Acid) in which the electrolyte is fixed in a gel (dryfit technology)
- > Inventor of Gel technology
- > Highest reliability, even in non-optimal conditions
- > Particularly suitable for cyclic applications
- > Maintenance-free (no topping up)
- > Conventional lead-acid batteries with liquid electrolyte
- > Extreme reliability, proven over decades
- > Low maintenance



Classic



Further information about service is available on page 11

Sonnenschein A400

Unmatched, high reliability dryfit Gel technology

The Sonnenschein A400 range is a reference for energy storage, with proven reliability in many installations worldwide. The success of A400 batteries comes from the superior dryfit technology, available in a wide range of models to provide a solution for every power need.

Your benefits:

- > dryfit Gel – VRLA technology
- > Lowest energy consumption – saving costs
- > Robust design – resilient in harsh conditions
- > Proof against deep discharge – greater long-term energy delivery
- > Completely recyclable – low CO₂ footprint



Specifications:

- Nominal capacity 5.50 - 180 Ah C₂₀
- Exceptional energy storage capacity combined with long life
- Thick grid plates with high quality lead calcium alloy, for enhanced corrosion resistance and stability
- Very low gassing due to the internal gas recombination
- Design life: *12 years and longer – Long Life* according to IEC 60896-21/22
- UL94V-0 fire rating
- Designed in accordance with IEC 60896-21/22
- Trouble-free transport of operational blocks, no restrictions for rail, road, sea and air transportation (ATA, DGR, clause A67)
- Approval: UL (Underwriter Laboratories)
- Manufactured in Europe in our ISO 9001 certified production plants



Sonnenschein A400 Technical data

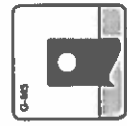
Technical characteristics and data

Type	Part number	Nom. voltage V	Nom. capacity C ₂₀ 100 °C	Max. load current A	Length mm	Width mm	Height up to 100 °C (H ₁₀₀)	Height cleared terminals (H ₂)	Weight approx. kg	Internal resistance mΩ	Short circuit current A	Terminal
A406/16S A	NGA406016SHSOCA	6	165	770	246	192	254	275	26.0	2.10	2800	A-Terminal
A406/16S F10	NGA406016SHSOFA	6	165	770	246	192	254	282	28.5	2.10	2800	F-M10
A412/5LS SR	NGA412050SHSOORA	12	5.50	80.0	152	65.5	94.5	98.4	2.50	138	93.0	SR-6.3
A412/5LS SR	NGA412050SHSOORA	12	8.50	80.0	152	98.0	94.5	98.4	3.60	96.0	150	SR-6.3
A412/12 SR	NGA412012SHSOORA	12	12.0	100	181	76	152	157	5.60	47.0	260	SR-6.3
A412/20 G5	NGA4120020SHSOBA	12	20.0	200	167	176	126	126	9.00	25.0	460	G-M5
A412/32 G6	NGA4120032SHSOBA	12	32.0	400	210	175	175	175	13.6	15.0	704	G-M6
A412/32 F10	NGA4120032SHSOFA	12	32.0	400	210	175	175	181	14.1	15.0	704	F-M10
A412/50 A	NGA4120050SHSOCA	12	50.0	440	278	175	190	190	18.5	10.0	1220	A-Terminal
A412/50 F10	NGA4120050SHSOFA	12	50.0	440	278	175	190	196	19.0	10.0	1220	F-M10
A412/50 G6	NGA4120050SHSOBA	12	50.0	440	278	175	190	190	18.5	10.0	1220	G-M6
A412/65 F10	NGA4120065SHSOFA	12	65.0	440	353	175	190	196	23.5	9.90	1414	F-M10
A412/65 G6	NGA4120065SHSOBA	12	65.0	440	353	175	190	190	23.0	9.90	1414	G-M6
A412/85 F10	NGA4120085SHSOFA	12	85.0	770	204	244	250	276	32.0	8.00	1472	F-M10
A412/90 A	NGA4120090SHSOCA	12	90.0	770	284	267	208	237	33.5	7.00	1733	A-Terminal
A412/90 F10	NGA4120090SHSOFA	12	90.0	770	284	267	208	237	33.5	7.00	1733	F-M10
A412/100 F10	NGA4120100SHSOFA	12	100	770	513	189	195	223	36.5	6.90	1777	A-Terminal
A412/100 F10	NGA4120100SHSOFA	12	100	770	513	189	195	223	37.0	6.90	1777	F-M10
A412/120 A	NGA4120120SHSOCA	12	120	770	513	223	195	223	45.5	5.70	2116	A-Terminal
A412/120 F10	NGA4120120SHSOFA	12	120	770	513	223	195	223	46.0	5.70	2116	F-M10
A412/180 A	NGA4120180SHSOCA	12	180	770	518	274	216	238	64.0	3.80	3227	A-Terminal
A412/180 F10	NGA4120180SHSOFA	12	180	770	518	274	216	244	64.5	3.80	3227	F-M10

Max. load with suitable matching contacts. A412/85 F10 with central discharging. *12 for F10 terminals plus max. 2.4 mm for connector/cover.

Container, approval, terminal and torque

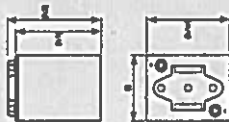
- > Container: - 5.5 - 12 Ah = ABS
- 20 - 180 Ah = Polypropylene (PP)
- > Approval: - Underwriters Laboratories (UL), USA
- DIN/Gost/TUV, Russia



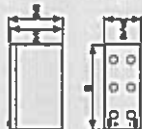
Sonnenschein A400

Drawings

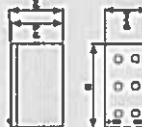
A406/165 A
(A406/165 F10)*



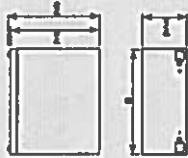
A412/5.5 SR



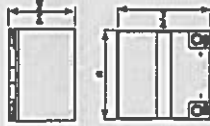
A412/8.5 SR



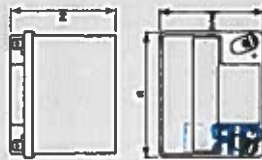
A412/12 SR



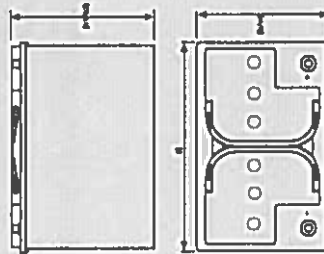
A412/20 G5



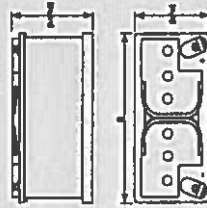
A412/32 F10
(A412/32 G6)*



A412/50 A
(A412/50 G6,
A412/50 F10)*



A412/65 F10
(A412/65 G6)*



* Dimensions are also valid for other terminals.

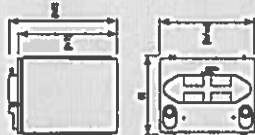


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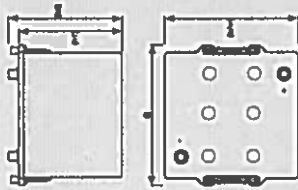
Sonnenschein A400

Drawings

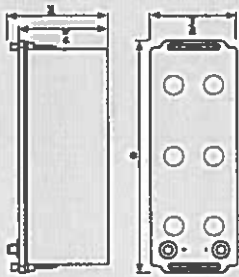
A412/85 F10



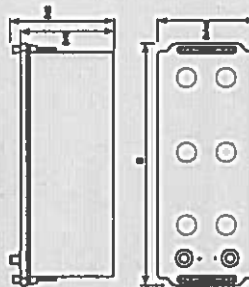
A412/90 A
(A412/90 F10)*



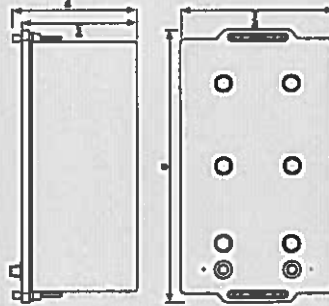
A412/100 A
(A412/100 F10)*



A412/120 A
(A412/120 F10)*



A412/180 A
(A412/180 F10)*



* Dimensions are also valid for other terminals.

Sonnenschein A400
Constant current discharge

1.85 Vpc – Discharge in A at 20 °C

Type	Full power	5 min	10 min	15 min	20 min	30 min	45 min	1 h	2 h	3 h	4 h	5 h	6 h	8 h	10 h
A406/16SA	NGA4060165HSDCA	198	163	143	131	115	98.0	82.0	53.0	41.0	32.4	27.0	23.1	18.1	15.9
A412/5SSR	NGA4120505HSDRA	9.94	8.34	6.97	5.96	4.85	3.76	3.00	2.00	1.44	1.14	0.96	0.84	0.53	0.50
A412/5SSR	NGA4120505HSDRA	15.0	12.0	10.0	8.00	6.50	5.30	4.30	2.83	2.07	1.66	1.39	0.96	0.82	0.82
A412/2SSR	NGA4120012HSDRA	18.0	15.0	12.0	11.0	8.00	7.00	5.50	3.34	2.50	2.04	1.74	1.24	1.12	1.12
A412/2SSR	NGA4120012HSDRA	33.0	25.0	22.0	20.0	17.0	14.0	11.0	6.00	4.71	3.76	3.16	2.31	1.83	1.83
A412/2SSR	NGA4120012HSDRA	53.0	43.0	36.0	32.0	28.0	21.0	17.0	11.0	8.11	6.45	5.44	3.68	3.03	3.03
A412/50A	NGA4120050HSDCA	81.0	68.0	57.0	51.0	42.0	34.0	28.0	18.0	12.8	10.1	8.51	5.71	4.80	4.80
A412/50A	NGA4120050HSDCA	102	77.0	63.0	56.0	46.0	42.0	36.0	22.0	15.9	12.8	10.8	7.31	6.20	6.20
A412/50A	NGA4120050HSDCA	121	103	85.0	80.0	71.0	55.0	45.0	29.0	21.3	16.9	14.1	9.50	8.20	8.20
A412/90A	NGA4120090HSDCA	106	117	100	89.0	77.0	65.0	55.0	34.0	24.8	17.6	14.8	10.4	8.90	8.90
A412/100A	NGA4120100HSDCA	144	124	105	93.0	77.0	66.0	56.0	48.0	31.0	23.5	17.9	15.2	10.7	9.50
A412/120A	NGA4120120HSDCA	175	138	120	108	95.0	78.0	61.0	37.0	27.5	22.2	18.9	12.9	11.3	11.3
A412/180A	NGA4120180HSDCA	240	197	170	155	130	103	84.0	59.0	42.6	34.0	28.6	19.1	16.5	16.5

1.80 Vpc – Discharge in A at 20 °C

Type	Full power	5 min	10 min	15 min	20 min	30 min	45 min	1 h	2 h	3 h	4 h	5 h	6 h	8 h	10 h
A406/16SA	NGA4060165HSDCA	243	211	180	158	132	109	88.0	56.0	43.0	33.9	28.2	23.8	18.8	16.5
A412/5SSR	NGA4120505HSDRA	11.2	9.30	7.77	6.54	5.12	4.03	3.18	2.09	1.50	1.19	0.99	0.87	0.50	0.50
A412/5SSR	NGA4120505HSDRA	17.0	14.0	11.0	9.00	7.38	5.88	4.51	2.93	2.13	1.70	1.43	0.99	0.80	0.80
A412/2SSR	NGA4120012HSDRA	21.0	18.0	14.0	12.0	10.0	8.00	6.20	3.72	2.75	2.22	1.84	1.32	1.20	1.20
A412/2SSR	NGA4120012HSDRA	38.0	27.0	23.0	21.0	18.0	15.0	12.0	7.00	4.89	3.88	3.25	2.19	2.00	2.00
A412/2SSR	NGA4120012HSDRA	63.0	51.0	42.0	38.0	30.0	23.0	19.0	12.0	8.60	6.80	5.70	3.90	3.20	3.20
A412/50A	NGA4120050HSDCA	97.0	81.0	66.0	57.0	46.0	37.0	29.0	19.0	13.3	10.5	8.78	5.83	5.00	5.00
A412/50A	NGA4120050HSDCA	120	95.0	78.0	64.0	52.0	43.0	35.0	23.0	16.7	13.3	11.2	7.58	6.50	6.50
A412/50A	NGA4120050HSDCA	147	125	105	91.0	75.0	60.0	49.0	31.0	22.3	17.5	14.6	9.95	8.50	8.50
A412/90A	NGA4120090HSDCA	165	142	117	100	79.0	61.0	50.0	32.0	23.4	18.3	15.4	10.8	9.00	9.00
A412/100A	NGA4120100HSDCA	176	150	125	104	81.0	62.0	50.0	32.0	24.1	18.7	15.8	11.2	9.0	9.0
A412/120A	NGA4120120HSDCA	201	155	133	119	102	85.0	67.0	39.0	28.7	23.0	19.4	13.1	12.0	12.0
A412/180A	NGA4120180HSDCA	260	235	194	171	144	112	90.0	62.0	44.8	35.5	29.7	19.8	18.0	18.0

1.75 Vpc – Discharge in A at 20 °C

Type	Full power	5 min	10 min	15 min	20 min	30 min	45 min	1 h	2 h	3 h	4 h	5 h	6 h	8 h	10 h
A406/16SA	NGA4060165HSDCA	280	246	210	180	143	115	92.0	58.0	43.7	34.4	28.5	19.1	16.6	16.6
A412/5SSR	NGA4120505HSDRA	12.9	8.78	8.22	6.97	5.34	4.17	3.29	2.15	1.54	1.22	1.01	0.68	0.50	0.50
A412/5SSR	NGA4120505HSDRA	18.0	15.0	12.0	10.0	7.54	5.82	4.62	2.98	2.16	1.73	1.45	1.00	0.80	0.80
A412/2SSR	NGA4120012HSDRA	24.0	20.0	16.0	13.0	10.0	8.00	6.52	3.92	2.87	2.31	1.95	1.36	1.20	1.20
A412/2SSR	NGA4120012HSDRA	45.0	34.0	27.0	23.0	18.0	15.0	12.0	7.00	5.00	3.90	3.30	2.20	2.00	2.00
A412/2SSR	NGA4120012HSDRA	73.0	57.0	46.0	38.0	31.0	24.0	19.0	12.0	8.78	6.94	5.78	3.93	3.23	3.23
A412/50A	NGA4120050HSDCA	109	90.0	73.0	61.0	48.0	38.0	30.0	19.0	13.5	10.8	8.88	5.95	5.00	5.00
A412/50A	NGA4120050HSDCA	134	107	84.0	70.0	56.0	44.0	41.0	24.0	17.0	13.8	11.4	7.67	6.50	6.50
A412/90A	NGA4120090HSDCA	170	140	118	100	79.0	63.0	51.0	32.0	22.7	17.9	14.9	10.0	8.50	8.50
A412/90A	NGA4120090HSDCA	186	154	128	108	84.0	64.0	52.0	33.0	24.0	18.7	15.7	10.9	9.00	9.00
A412/100A	NGA4120100HSDCA	194	160	134	112	86.0	65.0	52.0	33.0	24.8	19.2	16.2	11.4	9.0	9.0
A412/120A	NGA4120120HSDCA	233	174	145	127	106	86.0	69.0	40.0	29.1	23.2	19.5	13.2	12.0	12.0
A412/180A	NGA4120180HSDCA	308	256	216	185	152	117	94.0	63.0	45.5	36.1	30.1	20.1	18.0	18.0

Discharge data are also valid for other terminals.

Sonnenschein A400
Constant current discharge

1.70 Vpc – Discharge in A at 20 °C

Type	Full power	5 min	10 min	15 min	20 min	30 min	45 min	1 h	2 h	3 h	4 h	5 h	6 h	8 h	10 h
A406/16SA	NGA4060165HSDCA	332	273	233	203	152	119	93.0	58.0	43.9	34.6	28.7	19.1	16.6	16.6
A412/5SSR	NGA4120505HSDRA	14.2	10.2	8.56	7.17	5.48	4.26	3.35	2.18	1.58	1.23	1.02	0.70	0.50	0.50
A412/5SSR	NGA4120505HSDRA	21.0	15.0	12.0	10.0	7.63	5.92	4.68	3.00	2.16	1.74	1.46	1.00	0.80	0.80
A412/2SSR	NGA4120012HSDRA	28.0	21.0	18.0	15.0	10.0	8.00	6.77	3.99	2.91	2.33	1.96	1.40	1.20	1.20
A412/2SSR	NGA4120012HSDRA	51.0	37.9	29.0	24.0	19.0	15.0	12.0	7.00	5.00	3.96	3.30	2.20	2.00	2.00
A412/2SSR	NGA4120012HSDRA	84.0	61.0	50.0	42.0	32.0	25.0	20.0	12.0	8.90	7.00	5.80	3.90	3.20	3.20
A412/50A	NGA4120050HSDCA	122	94.0	77.0	64.0	49.0	39.0	31.0	18.9	13.5	10.7	8.92	6.00	5.00	5.00
A412/50A	NGA4120050HSDCA	148	111	89.0	73.0	57.0	43.0	41.0	24.0	17.2	13.7	11.4	7.70	6.50	6.50
A412/50A	NGA4120050HSDCA	182	151	127	106	82.0	64.0	52.0	32.0	22.8	17.9	14.9	10.0	8.50	8.50
A412/90A	NGA4120090HSDCA	206	164	137	113	87.0	66.0	53.0	33.0	24.3	18.9	16.2	11.0	9.00	9.00
A412/100A	NGA4120100HSDCA	213	171	141	117	89.0	67.0	53.0	34.0	25.1	19.3	17.0	11.4	10.0	10.0
A412/120A	NGA4120120HSDCA	250	200	160	136	109	90.0	70.0	40.0	29.3	23.3	19.5	13.2	12.0	12.0
A412/180A	NGA4120180HSDCA	336	287	234	199	156	120	95.0	64.0	45.9	36.3	30.3	20.2	18.0	18.0

1.65 Vpc – Discharge in A at 20 °C

Type	Full power	5 min	10 min	15 min	20 min	30 min	45 min	1 h	2 h	3 h	4 h	5 h	6 h	8 h	10 h
A406/16SA	NGA4060165HSDCA	369	301	248	210	157	121	95.0	59.0	43.9	34.6	28.7	19.1	16.6	16.6
A412/5SSR	NGA4120505HSDRA	15.5	10.8	8.71	7.33	5.57	4.34	3.40	2.19	1.56	1.23	1.00	0.70	0.50	0.50
A412/5SSR	NGA4120505HSDRA	23.0	16.0	13.0	10.0	7.70	5.98	4.73	3.01	2.19	1.74	1.53	1.00	0.80	0.80
A412/2SSR	NGA4120012HSDRA	30.0	22.0	17.0	14.0	11.0	9.00	6.80	4.00	2.92	2.34	2.00	1.40	1.20	1.20
A412/2SSR	NGA4120012HSDRA	56.0	40.0	31.0	25.0	19.0	12.0	7.00	5.01	3.87	3.30	2.20	2.00	2.00	2.00
A412/2SSR	NGA4120012HSDRA	94.0	65.0	52.0	43.0	33.0	25.0	20.0	12.0	8.90	7.01	5.80	3.90	3.20	3.20
A412/50A	NGA4120050HSDCA	133	99.0	79.0	66.0	50.0	39.0	31.0	19.0	13.6	10.7	8.90	6.00	5.00	5.00
A412/50A	NGA4120050HSDCA	161	114	91.0	75.0	57.0	42.0	42.0	24.0	17.3	13.7	11.5	7.70	6.50	6.50
A412/50A	NGA4120050HSDCA	210	159	134	110	84.0	65.0	52.0	32.0	22.8	17.9	14.9	10.0	8.50	8.50
A412/90A	NGA4120090HSDCA	225	172	142	118	88.0	67.0	53.0	33.0	24.4	18.9	16.3	11.0	9.00	9.00
A412/100A	NGA4120100HSDCA	232	178	146	120	90.0	68.0	54.0	34.0	25.3	19.5	17.0	11.4	10.0	10.0
A412/120A	NGA4120120HSDCA	311	217	169	142	111	91.0	71.0	41.0	29.4	23.4	19.6	13.2	12.0	12.0
A412/180A	NGA4120180HSDCA	399	305	250	212	159	122	98.0	63.9	46.0	36.4	30.4	20.2	18.0	18.0

1.60 Vpc – Discharge in A at 20 °C

Type	Full power	5 min	10 min	15 min	20 min	30 min	45 min	1 h	2 h	3 h	4 h	5 h	6 h	8 h	10 h
A406/16SA	NGA4060165HSDCA	422	318	256	215	160	122	96.0	59.0	43.0	34.6	28.7	19.1	16.6	16.6
A412/5SSR	NGA4120505HSDRA	16.1	10.9	8.88	7.45	5.64	4.37	3.42	2.19	1.56	1.23	1.00	0.70	0.50	0.50
A412/5SSR	NGA4120505HSDRA	24.0	16.0	13.0	10.0	7.79	6.03	4.76	3.02	2.19	1.74	1.50	1.00	0.80	0.80
A412/7SSR	NGA412007HSDRA	33.0	22.0	17.0	14.0	11.0	9.00	6.62	4.01	2.92	2.24	2.00	1.40	1.20	1.20
A412/70C5	NGA41200207HSDBA	50.0	42.0	31.0	26.0	19.0	15.0	12.0	7.00	5.02	3.97	3.30	2.20	2.00	2.00
A412/7266	NGA4120027HSDBA	101	68.0	54.0	44.0	33.0	25.0	20.0	12.0	8.91	7.01	5.80	3.90	3.20	3.20
A412/5SA	NGA412005HSDCA	144	101	81.0	67.0	51.0	40.0	31.0	19.0	13.6	10.7	8.90	5.90	5.00	5.00
A412/5S66	NGA412006HSDCA	170	116	92.0	76.0	58.0	46.0	42.0	23.9	17.3	13.7	11.5	7.70	6.50	6.50
A412/SF10	NGA41200134SDFB	229	166	137	113	85.0	66.0	52.0	32.0	22.8	17.9	14.9	10.0	8.50	8.50
A412/9SA	NGA412009HSDCA	245	177	145	118	89.0	69.0	54.0	34.0	24.5	19.0	16.3	11.0	9.00	9.00
A412/100A	NGA4120170HSDCA	253	183	149	121	91.0	69.0	54.0	34.0	25.4	19.5	17.0	11.4	10.0	10.0
A412/120A	NGA4120120HSDCA	333	228	175	144	112	91.0	71.0	41.0	29.4	23.4	19.6	13.2	12.0	12.0
A412/120A	NGA4120120HSDCA	439	322	258	217	162	123	96.0	64.0	46.0	36.4	30.4	20.2	18.0	18.0

Sonnenschein A400
Constant power discharge

1.85 Vpc – Discharge in W/block at 20 °C

Type	Full charge	2 min	5 min	10 min	15 min	30 min	45 min	1 h	2 h	3 h
A406/16SA	NGA4120016SHSOCA	1310	1282	1171	1098	1005	975	797	689	543
A412/5SSR	NGA412005SHSOCA	153	149	120	106	95.0	79.5	63.7	53.4	44.3
A412/8SSR	NGA412008SHSOCA	216	200	175	159	141	117	101	84.8	53.7
A412/12SSR	NGA412012SHSOCA	251	239	219	203	184	156	140	114	89.4
A412/20SSR	NGA412020SHSOCA	437	414	378	348	302	257	229	195	151
A412/25SSR	NGA412025SHSOCA	679	633	560	532	483	413	366	303	233
A412/35SSR	NGA412035SHSOCA	1119	1074	1002	949	878	785	699	590	458
A412/50SSR	NGA412050SHSOCA	1440	1341	1221	1137	1025	867	759	635	481
A412/75SSR	NGA412075SHSOCA	1311	1275	1230	1158	1071	952	865	761	591
A412/100A	NGA4120100HSDCA	1645	1619	1493	1374	1243	1090	987	827	648
A412/120A	NGA4120120HSDCA	1873	1792	1625	1482	1329	1144	1047	860	674
A412/150A	NGA4120150HSDCA	2417	2253	1982	1773	1574	1384	1272	1109	914
A412/180A	NGA4120180HSDCA	3474	3323	3112	2959	2679	2284	2010	1562	1214

1.80 Vpc – Discharge in W/block at 20 °C

Type	Full charge	2 min	5 min	10 min	15 min	30 min	45 min	1 h	2 h	3 h
A406/16SA	NGA4120016SHSOCA	1622	1548	1414	1315	1184	1020	900	788	535
A412/5SSR	NGA412005SHSOCA	174	160	140	122	106	97.8	74.4	62.1	47.1
A412/8SSR	NGA412008SHSOCA	246	232	203	180	156	129	110	90.4	68.5
A412/12SSR	NGA412012SHSOCA	314	291	258	235	208	177	153	125	98.8
A412/20SSR	NGA412020SHSOCA	565	520	457	421	358	291	251	208	159
A412/25SSR	NGA412025SHSOCA	828	764	677	621	542	467	403	332	252
A412/35SSR	NGA412035SHSOCA	1385	1289	1134	1040	969	862	769	625	492
A412/50SSR	NGA412050SHSOCA	1701	1601	1429	1295	1158	976	824	690	516
A412/75SSR	NGA412075SHSOCA	1667	1572	1463	1375	1276	1082	960	837	637
A412/100A	NGA4120100HSDCA	1839	1746	1554	1394	1184	1061	899	691	573
A412/120A	NGA4120120HSDCA	2076	1956	1728	1644	1454	1235	1112	931	779
A412/150A	NGA4120150HSDCA	2958	2667	2286	2026	1769	1496	1348	1146	971
A412/180A	NGA4120180HSDCA	4109	3898	3559	3336	3012	2594	2241	1756	1339

1.65 Vpc – Discharge in W/block at 20 °C

Type	Full charge	2 min	5 min	10 min	15 min	30 min	45 min	1 h	2 h	3 h
A406/16SA	NGA4120016SHSOCA	1650	1528	1403	1356	1146	980	796	622	454
A412/5SSR	NGA412005SHSOCA	196	178	155	134	114	93.1	78.3	63.4	48.8
A412/8SSR	NGA412008SHSOCA	278	258	226	198	171	138	116	93.6	70.5
A412/12SSR	NGA412012SHSOCA	354	331	295	262	233	192	163	131	98.3
A412/20SSR	NGA412020SHSOCA	658	595	518	467	397	315	267	213	164
A412/25SSR	NGA412025SHSOCA	959	881	776	691	612	508	431	350	262
A412/35SSR	NGA412035SHSOCA	1591	1480	1293	1146	1027	925	819	653	510
A412/50SSR	NGA412050SHSOCA	1968	1830	1620	1447	1267	1054	846	714	533
A412/75SSR	NGA412075SHSOCA	1908	1826	1674	1532	1421	1230	1033	838	664
A412/100A	NGA4120100HSDCA	2201	2184	1984	1796	1564	1298	1128	927	716
A412/120A	NGA4120120HSDCA	2498	2354	2139	1928	1635	1348	1173	972	742
A412/150A	NGA4120150HSDCA	3453	3044	2563	2262	1940	1609	1387	1178	987
A412/180A	NGA4120180HSDCA	4555	4007	3459	3118	2821	2398	1878	1413	1136

Discharge data are also valid for other terminals.

Sonnenschein A400
Constant power discharge

1.70 Vpc – Discharge in W/block at 20 °C

Type	Full charge	2 min	5 min	10 min	15 min	30 min	45 min	1 h	2 h	3 h
A406/16SA	NGA4120016SHSOCA	1993	1913	1778	1636	1455	1230	1036	814	637
A412/5SSR	NGA412005SHSOCA	219	193	172	143	119	96.6	80.7	64.2	49.8
A412/8SSR	NGA412008SHSOCA	306	282	246	212	177	143	119	96.2	71.5
A412/12SSR	NGA412012SHSOCA	394	365	323	285	247	203	170	134	101
A412/20SSR	NGA412020SHSOCA	741	657	555	494	423	320	277	216	166
A412/25SSR	NGA412025SHSOCA	1084	990	881	751	638	450	358	289	218
A412/35SSR	NGA412035SHSOCA	1734	1544	1406	1234	1079	956	848	688	519
A412/50SSR	NGA412050SHSOCA	2191	2008	1762	1570	1322	1093	916	722	541
A412/75SSR	NGA412075SHSOCA	2076	1987	1817	1671	1519	1375	1204	862	679
A412/100A	NGA4120100HSDCA	2533	2388	2137	1950	1668	1367	1171	945	727
A412/120A	NGA4120120HSDCA	2792	2604	2316	2090	1749	1413	1215	985	751
A412/150A	NGA4120150HSDCA	3621	3201	2908	2497	2083	1690	1441	1190	1008
A412/180A	NGA4120180HSDCA	4990	4742	4394	3929	3477	2975	2502	1944	1455

1.65 Vpc – Discharge in W/block at 20 °C

Type	Full charge	2 min	5 min	10 min	15 min	30 min	45 min	1 h	2 h	3 h
A406/16SA	NGA4120016SHSOCA	2162	2055	1879	1724	1528	1278	1087	827	642
A412/5SSR	NGA412005SHSOCA	235	208	189	149	122	98.8	82.3	64.7	50.5
A412/8SSR	NGA412008SHSOCA	331	305	258	222	183	146	121	96.1	72.0
A412/12SSR	NGA412012SHSOCA	436	399	348	304	255	209	174	135	101
A412/20SSR	NGA412020SHSOCA	799	709	583	511	438	338	282	218	167
A412/25SSR	NGA412025SHSOCA	1161	1068	916	801	668	554	461	381	272
A412/35SSR	NGA412035SHSOCA	1931	1747	1483	1308	1170	991	865	677	523
A412/50SSR	NGA412050SHSOCA	2419	2213	1874	1657	1371	1124	932	726	544
A412/75SSR	NGA412075SHSOCA	2255	2159	1963	1770	1563	1325	1116	876	685
A412/100A	NGA4120100HSDCA	2823	2597	2304	2067	1743	1414	1200	954	732
A412/120A	NGA4120120HSDCA	3108	2827	2475	2216	1831	1459	1241	993	755
A412/150A	NGA4120150HSDCA	4111	3798	3170	2582	2183	1756	1474	1205	1012
A412/180A	NGA4120180HSDCA	5419	5099	4624	4162	3583	3073	2585	1974	1475

1.60 Vpc – Discharge in W/block at 20 °C

Type	Full charge	2 min	5 min	10 min	15 min	30 min	45 min	1 h	2 h	3 h
A406/16SA	NGA4120016SHSOCA	2351	2202	1987	1828	1598	1307	1085	835	616
A412/5SSR	NGA412005SHSOCA	248	220	175	153	125	100	83.3	65.0	51.0
A412/8SSR	NGA412008SHSOCA	354	321	267	228	186	147	122	96.7	72.3
A412/12SSR	NGA412012SHSOCA	474	423	358	317	262	212	186	136	102
A412/20SSR	NGA412020SHSOCA	874	760	610	521	446	343	285	219	167
A412/25SSR	NGA412025SHSOCA	1245	1143	992	835	697	565	469	366	276
A412/35SSR	NGA412035SHSOCA	2218	1949	1543	1382	1151	1000	875	681	528
A412/50SSR	NGA412050SHSOCA	2803	2491	1961	1712	1399	1137	949	728	546
A412/75SSR	NGA412075SHSOCA	2311	2200	2058	1867	1603	1357	1106	884	689
A412/100A	NGA4120100HSDCA	3045	2754	2357	2156	1792	1444	1217	980	735
A412/120A	NGA4120120HSDCA	4296	3842	3330	2779	2260	1791	1494	1210	1014
A412/150A	NGA4120150HSDCA	5825	5395	4822	4380	3701	3130	2599	1993	1494

Discharge data are also valid for other terminals.

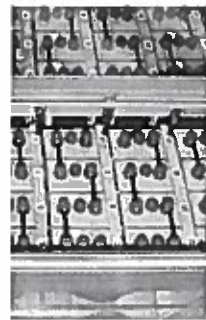
Battery Service – Energy Solutions

Keeping your business on the move

GNB® is the Expert

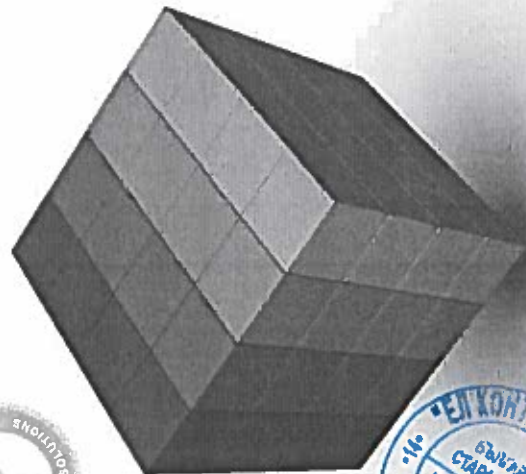
Who could do this job better than the professionals of a company with more than 100 years of experience in battery development, production and application?

Leave the responsibility for the maintenance of your batteries and chargers to the professionals: a GNB service contract provides you with exceptional economic advantages through time savings, cost savings and safety!



Installation of Batteries and Systems for Network Power

- > Development of complete turnkey solutions from the design concept to installation and commissioning.
- > Installation according to legal and safety regulations including CE certification by approved installation technicians.
- > Training and certification of external installation technicians according to CE regulations.



АЛАНТИД
ДЯРНО С



„GNB Service –
individualized, professional
and all over Europe!“



Exide Technologies, with operations in more than 80 countries, is one of the world's largest producers and recyclers of lead-acid batteries. Exide Technologies provides a comprehensive and customized range of stored electrical energy solutions. Based on over 100 years of experience in the development of innovative technologies, Exide Technologies is an esteemed partner of OEMs and serves the spare parts market for industrial and transportation applications.

GNB® INDUSTRIAL POWER – A division of Exide Technologies – offers an extensive range of storage products and services, including solutions for telecommunication systems, railway applications, mining, photovoltaic (solar energy), uninterrupted power supply (UPS), electrical power generation and distribution, fork lifts and electric vehicles.

Exide Technologies takes pride in its commitment to a better environment. Its Total Battery Management programme, (an integrated approach to manufacturing, distributing and recycling of lead-acid batteries), has been developed to ensure a safe and responsible life cycle for all of its products.



„The next Level of
Energy Management“

GNB® INDUSTRIAL POWER provides long lasting energy concepts that combine efficiency with flexibility.



Marpex БАТАРИИ ЕНЕРГОЗАХРАНВАЩИ СИСТЕМИ, СИЛОВА ЕЛЕКТРОНИКА	ОД 07.02.06. - 3	Версия	02
	ISO 9001:2000	Стр.	1/2

ТЕХНИЧЕСКО ОПИСАНИЕ**I. ОСНОВНИ ТЕХНИЧЕСКИ ХАРАКТЕРИСТИКИ**
НА ИНДУСТРИАЛНА АКУМУЛАТОРНА БАТЕРИЯ С ГЕЛ ЕЛЕКТРОЛИТ 220V/100Ah- СЕРИЯ DRYFIT A412/100A

№	СПЕЦИФИКАЦИЯ	ТЕХНИЧЕСКИ ХАРАКТЕРИСТИКИ
1.	Производител:	Sonnenschein GmbH- Германия, една от фирмите в EXIDE Technologies
2.	Технология на производство:	dryfit GEL технология / VRLA (оловнио- киселинен с вентилно регулиране), газ- рекомбинационна система с клапанно регулиране за 99% рекомбинация
3.	Електролит:	свързан в гел структура
4.	Конструктивно изпълнение:	херметизирани 12V-блокове, по 6 клетки, предпазни работни вентили, решетъчни гравитационно отляти плочи от безантимонов Pb-Ca-Sn сплав
5.	Клас по EUROBAT:	Long Life- над 12 г. срок на експлоатация при 20°C (80% капацитет в края)
6.	Степен на обслужване по DIN:	Напълно необслужваема акумулаторна батерия през целия експлоатационен срок, включително междueleментните кабелни конектори и аксесоари
7.	Предназначение:	Осигуряват поддържането на напрежение $\geq 1,80V/к\text{л.}$ към DC консуматорите при номин. товар ≥ 10 часа, аварийен товар ≥ 5 часа /16A за 5 часа; 32A за 2 часа
8.	Номинално напрежение на батерията:	220V
9.	Тип на батерията:	Sonnenschein A412/100 A
10.	Номинален капацитет (C ₁₀)	100Ah
11.	Номинално напрежение на блок:	12V
12.	Брой блокове в 220V- батерия:	18 блока (108 клетки)
13.	Вътрешно съпротивление:	6,9 mΩ / блок (съгл. IEC 896-2)
14.	Ток на късо съединение:	1800 (измерен съгл. IEC 896-2)
15.	2-часов разряден ток до 1,80V/клетка:	$\geq 32A$
16.	Габаритни размери / тегло на блок:	L513 × W189 × H195 (H223) мм / 39 кг

Стр. 1/3

17.	Полюсни изводи:	A тип (конусни) с трайна маркировка на поляритет (+/-) и номер на блока
18.	Кабелни мостове и аксесоари за монтаж :	Електрически изолирани, с подходящо сечение за провеждане на I _{nom} и I _{k.c} (10s), необслужваема през целия експл. срок, защитни капачки
19.	Зарядни характеристики:	IU по DIN 41773
20.	Подзарядно напрежение при 20°C:	2,27V/клетка в стенд-бай режим (13,62V/блок)
21.	Допустимо отклонение на U _{подз.} :	+0,50V/ -0,25V на блок
22.	Вътрешна рекомбинация на H ₂ и O ₂ до H ₂ O	Газ-рекомбинационна клапанно- регулирана система за 99% рекомбинация
23.	Газоотделяне (съгл. IEC 896-2, DIN 43539):	2ml/ клетка/ Ah за 30 дни (дължи се на почти 100% вътр. рекомбинация)
24.	Защита срещу дълбок разряд:	Съгл. DIN 43 539 T5
25.	Устойчивост на дълбок разряд:	До 0V в продължение на 4 седмици, без опасност от необратими увреждания
26.	Работен температурен диапазон:	Нормален: от -15 до +40 °C / Екстремален: от -30 до +50 °C
27.	Степен на саморазряд при 20 °C:	Изключително нисък (50% остатъчен капацитет след 24 мес. Съхранение)
28.	Корпус на акумулаторите:	Полипропилен (PP), негорим съгл. UL 94 VO
29.	Степен на рециклируемост:	100% рециклируеми
30.	Сертификат за качество:	ISO 9001
31.	Сертификат за екологично производство:	ISO 14001
32.	Европейски норми и стандарти за АБ:	EN 50272-2, IEC 896-2 DIN VDE 0510- ч. 2, IEC 60364-4-41, DIN 43539-1 T5
33.	Основни приложения:	Електрически централи, Подстанции, Телекомуникации, Аварийно осветление, UPS, Алармени и Пожарозвестителни системи и мн. др.
34.	Обем на доставката:	2 компл. АБ × 220V/100Ah (36 бр. акумулатори A412/100A); 2 компл. кабелни конектори и аксесоари за монтаж; сертификати за съответствие; сертификати за качество; 2 комплекта техническа документация- на бълг. и англ. език;
35.	Изисквания към акумулаторното помещение:	Няма специални изисквания към акумулаторното по отношение на: - пожаро и взривообезопасност; - киселинноустойчиви под и стени; - принудителна вентилация (естествената е достатъчна). Препоръчителна околна температура- около 20°C±5°C (високите температури понижават експлоатационния срок, а ниските- капацитета на батерията).

ОПЯРНО

ОРИГИНАЛ

Стр. 2/3

СТЕЛАЖ ЗА АКУМУЛАТОРНА БАТЕРИЯ 220V/100Ah

СТЕЛАЖИТЕ са МЕТАЛНИ, СГЛОБЯЕМИ- производство на ALPHA GmbH – Италия.

ПОКРИТИЕ:

- полнетиленово РЕ, нанесено чрез синтероване;
- min. 400µm дебелина на покритието;
- киселинно и алкално устойчиво;
- висока механична здравина;
- повърхностно съпротивление 10^{14} Ohm;
- специфично обемно съпротивление 10^{13} Ohm.cm;
- издържа на електрически пробив от 600kV/cm;
- постоянна работна температура от $-40^{\circ}\text{C}/+80^{\circ}\text{C}$;
- кратковременна работна температура до $+120^{\circ}\text{C}$;

МАТЕРИАЛ:

- профилирана стомана;

ЦВЯТ:

- черен

КОНФИГУРАЦИЯ:

- двутажен, едноредов, сглобяем стелаж (възможни са и други конфигурации според размерите на акумулаторното помещение)

СЕРТИФИЦИРАНИ ПО:

- DIN и ISO 9001

ТИП НА СТЕЛАЖА:

- 2E-PGU 1-18 H (за 18 блока- тип A412/100,0 A) / L 1800 x W 715 x H 632 (HВ 855) mm

22.04.2015 год.

гр. София

Изготвил:

Иван Иванов

/Р-л Проект/

I.

Стр. 3/3



CERTIFICATE

ISO 9001:2008

DEKRA Certification GmbH hereby certifies that the company

EXIDE Technologies GmbH

Scope of certification:

Development, production and distribution of lead accumulators
and batteries with system equipment

Certified location:

D-63654 Büdingen, Im Thiergarten
D-37431 Bad Lauterberg, Odertal 35

has established and maintains a quality management system according to the above mentioned
standard. The conformity was adduced with audit report no. A12081368.

This certificate is valid from 2012-12-05 to 2015-10-27

Certificate registration no.: 51109714/1
Duplicate

Uibof

DEKRA Certification GmbH
Stuttgart, 2012-12-05



DAkKS

Deutsche
Akkreditierungsstelle
D-ZM-16029-01-01

Lack of fulfillment on conditions as set out in the Certification Agreement may render this certificate

DEKRA Certification GmbH * Handwerksstraße 15 * D-70565 Stuttgart * www.dekra-certification.de

ВРНО С
ПРИНЦИПА



Uibof

CERTIFICATE

ISO 14001:2004

DEKRA Certification GmbH hereby certifies that the company

EXIDE Technologies GmbH

Scope of certification:

Development, production and distribution of lead accumulators
and batteries with system equipment

Certified location:

D-63654 Büdingen, Im Thiergarten
D-37431 Bad Lauterberg, Odertal 35

has established and maintains an environmental management system according to the above
mentioned standard. The conformity was adduced with audit report no. A12081368.

This certificate is valid from 2012-12-18 to 2015-12-17

Certificate registration no.: 170912103/1

Duplicate

Unilag



DEKRA Certification GmbH
Stuttgart, 2012-12-05



DAKkS

Deutsche
Akkreditierungsstelle
D-ZM-16029-01-01

Lack of fulfillment on conditions as set out in the Certification Agreement may render this certificate invalid

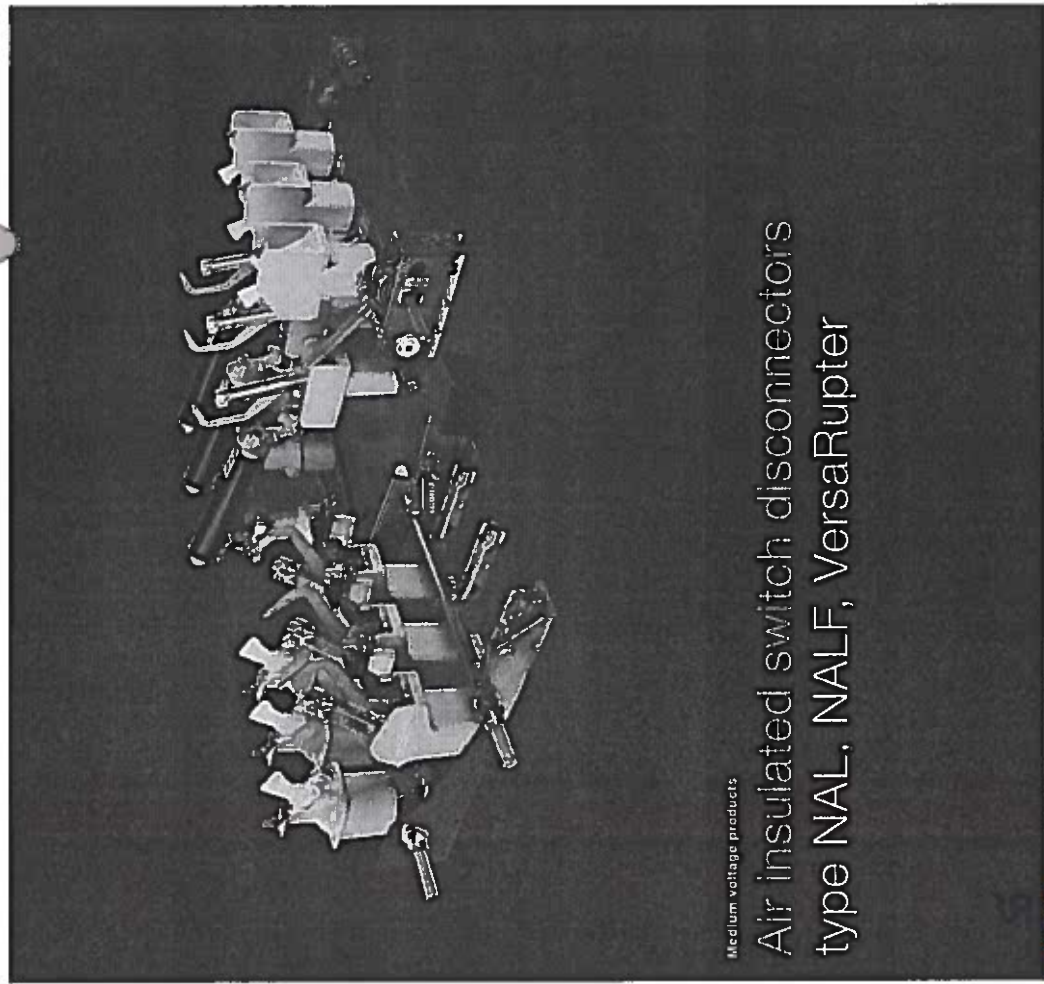
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page 1 of 1

ВЕРНО С
РИГИНАЛА



[Signature]



Medium voltage products

Air insulated switch disconnectors type NAL, NALF, VersaRupter

ОНО С
ТИНАЛА

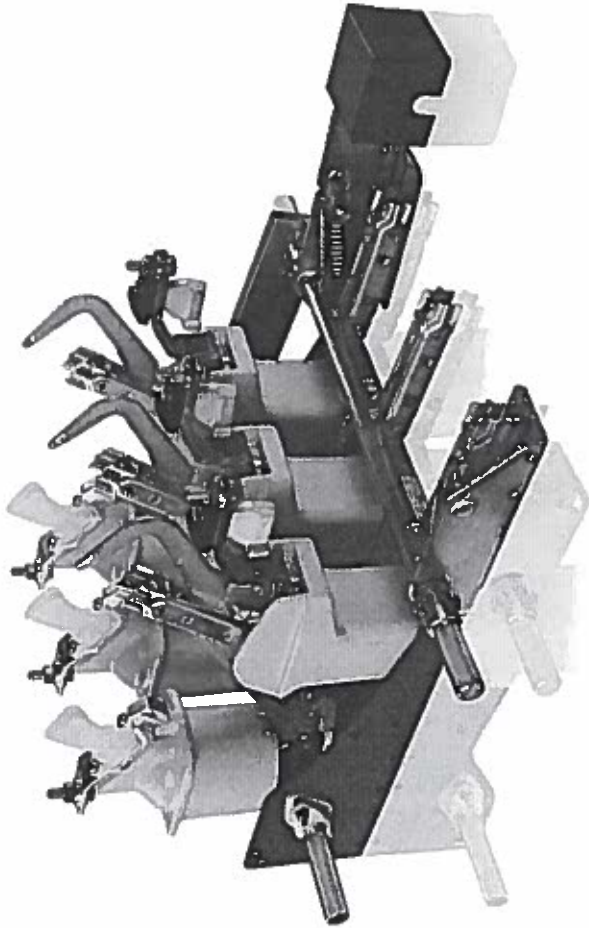


Power and productivity
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Indoor switch disconnector type NAL with earthing switch type E

2 Switch disconnector type NAL

Foreword

NAL switch disconnector production line



Switch disconnector type NAL 3

NAL-type switch disconnectors are based on a modular principle, which gives it a wide range of functionality. With a unique design that extinguishes electric arcs and enables high switching capacity, they represent an attractive solution as a key breaking element for applications in enclosed switchgear and transformer compact substations. In combination with type CEF current limiting fuses, NALF fuse switch disconnectors ensure control over the full range of overload and short-circuit currents.

The main areas of application of NAL/NALF switch disconnectors are as:

- Line switch disconnectors in medium-voltage networks,
- Switch disconnectors with fuses for the switching and protection of:
- Distribution transformers
- Motors

NAL/NALF switch disconnectors are manufactured according to global quality and environmental standards and confirmed by ISO 9001 and ISO 14001 certificates. In addition, they are 99.64 percent recyclable.

The NAL/NALF brand is well known around the world, and more than 600,000 switches have been produced so far. It has been undergoing continuous development to satisfy users' demands.

1. Introduction

The switch disconnector system NAL/NALF is based on a modular principle. The basic unit consists of a frame with insulators and current carrying parts. Two different types of operating mechanism

isms, snap action mechanism type K or stored spring energy mechanism type A, can be mounted on the frame. Fuse bases type F, with or without fuse tripping mechanism, and an earthing switch type E/FB, suitable for both direct mounting and free standing components, complete the basic equipment of a switch disconnector. These modules can be easily configured according to customer expectations.

Accessories, such as shunt trip, under-voltage release, auxiliary switches, motor operation and various systems for manual operation can easily be added.

2. Main product features

A NAL disconnector (which interrupts load currents up to 1,250 A) and a small fault-current circuit combined with a fuse base (F) and current limiting fuses (which break large short-circuit currents) create a NALF-type disconnector that provides protection against a majority of fault types in a modern electric network. Both NAL/NALF are designed in accordance with the requirements of the following standards: 60129, 60265, 60694, GOST 1516.3-96, GOST 17717-79, and CSA Standard No. C22.2, No. 193, and IEC 62271-105, all of which consider switches for general use and ensure there is safe switching coordination between a switch disconnector and a current limiting fuse.

Within the scope of the ANSI standard, NAL is known as VersaRupter and it meets the requirements of ANSI No. C37.20.4. The selected styles of NAL/NALF switch disconnector are listed as certified by the Canadian Standards Association (CSA). Some VersaRupter styles are UL listed prior to their release to comply with the relevant safety requirements required in regions of the United States.

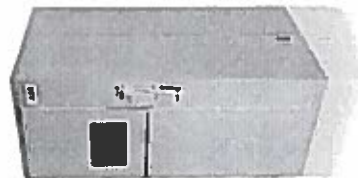


Fig. 1 Switchboard with NAL switch disconnector

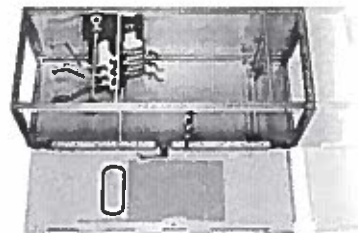


Fig. 2 Structure of panel with NAL switch disconnector

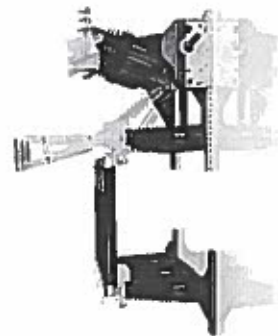


Fig. 3 NALF 38 KV fuse switch disconnector

Switches and main parts

3. Functional description

To ensure correct operation for all relevant currents, the switch disconnecter system NAL/NALF is equipped with a dual arc extinguishing system. As the current is being interrupted, the arc will be exposed to:

- A current independent air blast which automatically starts at the correct time during the interrupting process. This is achieved by designing the insulators on the opening side as cylinders with pistons. The pistons are connected to the mechanism in the same way as the moving contacts. The air blast therefore starts simultaneously with the contact movement (autopneumatic air blast).
- A current dependent gas blast which occurs when the walls of the arcing nozzles are exposed to the hot arc.

During this process, large volumes of gas are released and the arc is effectively cooled. The concentration of the developed gas increases with increasing current. The so-called Hart gas effect is therefore most important at high currents.

A well balanced utilization of these two effects has resulted in an arc extinguishing system with high reliability for all relevant currents. Because of the autopneumatic air blast it will only be necessary to utilize the Hart gas effect for high currents. This gives an arcing system which can withstand a large number of operations without excessive wear. Consequently the NAL switches comply with the highest electrical performance classes E3 of IEC 60265-1 (for selected nominal voltages only). In addition, voltage ratings are tested with a hundred operations under a load rated current of 630 A, which is a very important feature of the product, distinguishing it from other apparatus of this type on the market.

Efficiency of load current interruption in relation

Curve 1: Gas blast
Curve 2: Air blast
Curve 3: The resultant extinguishing effect = Curve 1 + Curve 2

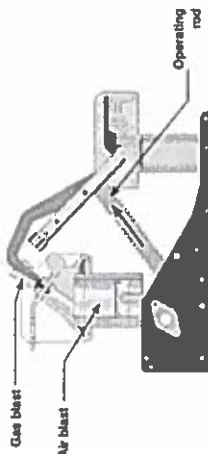


Fig. 4 Interruption

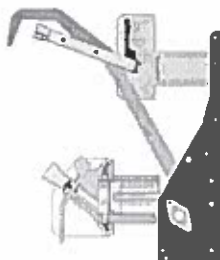


Fig. 5 Switch disconnecter in open position

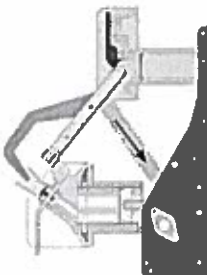


Fig. 6 Closing

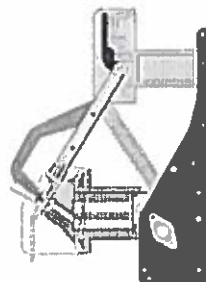


Fig. 7 Switch disconnecter in closed position

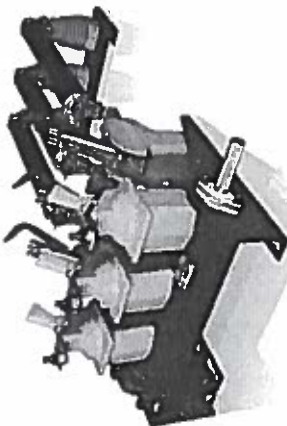


Fig. 8 NALF

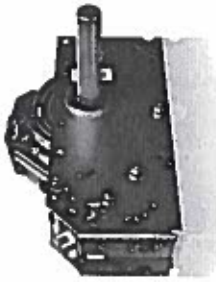


Fig. 9 Mechanism A



Fig. 10 Mechanism K



Fig. 11 Quick earthing switch type E

6 Switch disconnecter type NAL

Switch disconnecter type NAL 5

4. Basic designs

NAL

The standard feature consists of chassis, insulators and current carrying parts with the following pole distance:

- 12 kV - pole distance 150 mm, 170 mm and 210 mm
- 17.5 kV - pole distance 170 mm and 210 mm
- 24 kV - pole distance 170 mm*, 235 mm and 275 mm
- 36 kV - pole distance 360 mm

* - with insulating barriers

Rated currents are:

- 400, 630 and 1250 A up to 24 kV
- 630/800/1000 A for 36 kV

NALF

Is delivered with the same pole distances as the standard feature. Fuse base type F is delivered for installation on both the opening and pivot sides, with or without automatic tripping.

A fuse base with six insulators can also be delivered separately with some form of signal indication when a fuse blows or for installation on the pivot side of the switch.

5. Mechanisms

Type A with two springs

The opening spring is always charged before the switch can be closed by means of a closing spring. This means the opening spring is always charged in a closed switch, which in turn can be trapped immediately by hand, electrically or by a fuse-link striker system.

Type K with one spring

Closing or opening the switch is performed by charging the spring past the dead centre.

A and K mechanisms may cooperate with motor drives.

6. Earthing switch

Quick earthing switch type E

This type of earthing switch is equipped with a quick spring mechanism. It can be mounted on the pivot side of the switch disconnecter or on the fuse base when the latter is on the pivot side of the switch.

Quick earthing switch type EB

Designed to be an independent assembly for both sides of the disconnecter.

Earthing switch type LCES

This type of switch is not equipped with a quick spring mechanism. It can be mounted on the pivot side of the switch disconnecter or on the fuse base when the latter is on the pivot side of the switch.

Switch disconnector type NAL

The switch disconnect complies

TABLE 1. Main data!

[illegible]

* = iEC 420 1990-11
¹⁾ At $I_{in} = 630$ A, $100 \pm CO$, At $I_{in} = 1250$ A, $20 \pm CO$
²⁾ May have error as of time current characteristics for CEF
³⁾ Power factor = 0.1
⁴⁾ With insulating barriers
⁵⁾ At 8.2 kV

Everything switch type E for NAL/NALF and type EB

Un	kV	12	17.5	24	36
rated voltage		62/62	40/62	35/62	65
withstand current ¹⁾	kA peak	31.5	31.5	31.5	25
short-circuit current 1 sec.	kA eff	25	20	20	25
2 sec.		20	16		
3 sec.					
short-circuit making capacity	kA peak	62/67	40/62.5	35/50	40
power factor ²⁾ at rated voltage 50 Hz 1 min	kV	42	45	50	80
power factor ²⁾ at rated voltage 2/50 μs	kV	75	95	125	170
max	mm	150	170	210	275
					360

Unleashed legs will discover a leaping switch side.

PLCES earthing switch type E for NALNALF and type EB

	Un	kV	12	17.5	24	36
Rated voltage						
Peak withstand current 1)	I_{bm}	kA peak	50	50	50	50
Short time current 2 sec.	I_n	kA eff	20	20	20	20
3 sec.			16	16		16
Power frequency withstand voltage 50 Hz 1 min.		kV	28	38	50	70
Impulse withstand voltage 1.2/50 μ s		kV	75	95	125	170
Creepage distance		mm	150, 210	170, 210	235, 275	360

¹¹ When led from speech connectors/hearing switch side.

TABLE II. Technical data according to CSA C22.2 (NAL)

Type name	NAL12	NAL17	NAL24	NAL36
Rated voltage	kV	13.8	27.6	34.5
Rated maximum voltage	kV	15	29.6	38
Rated current	A	600/1200	600/1200	600/800
Impulse test voltage	kV	60	125	150
Power frequency withstand voltage	kV	28	60	70
Pole spacing	mm/ft	150/5.9	235/9.25	360/14.1
Momentary rating	kA eff	40	40	40
Fault-closing rated current	kA eff	40	40	30
Short time current	kA eff/sec	25/3	25/3	25/2

• Short time current limit 25/2 sec.

TABLE III. Technical data according to ANSI C 37.20.4 (VersaRupter)

Type name	VR8.25	VR15	VR15 (61 kA)	VR17	VR27	VR38
Rated voltage	kV	12-13.8	13.8			
Rated maximum voltage	kV	8.25	15	12-16.5	23.9-24.9	34.5
Rated current	A	200/600/1200	200/600/1200	17	27	38
Impulse test voltage	kV	7.5	9.5	110	125	150
Power frequency withstand voltage	kV	26	36	50	60	80
Pole spacing	mm/inch	210/8.25	170/6.69	235/9.25	275/10.8	360/14.1
Momentary rating	kA eff	40	40	40	40	
Fault-closing rated current	kA eff	40	40	40	40	30
asymmetrical	kA eff/acc	25/3	25/3	25/2	25/3	25/2
Short time withstand	kA eff/acc	25/3	25/3	25/2	25/3	25/2
Short time current	kA eff/acc	25/3	25/3	25/2	25/3	25/2

TABLE IV. VersaRupter styles UL listed

Type name	VR0.25	VR15	VR15	VR15 [61 kA]
Rated voltage	kV	4.75	13.8	13.8
Rated maximum voltage	kV	8.25	15	15
Rated current	A	200/600	200/600	600/1200
Impulse test voltage	kV	75	95	95
Power frequency withstand voltage	kV	26	36	36
Pole spacing	mm/inch	150/5.9	170/6.69	235/9.25
Momentary rating asymmetrical	kA eff	40	40	61
Fault-closing rated current asymmetrical	kA eff	40	40	61
Short time current asymmetrical	kA eff/sec	25/3	25/3	40/3

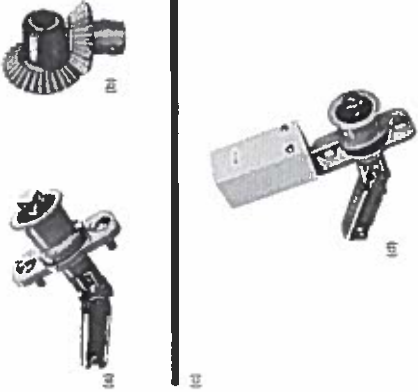


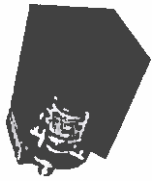
10 Switch disconnect type NAL

Switch disconnect type KAL 9

Accessories

10. Additional equipment for NAL/NALF switch disconnectors

<p>Fig. 13</p> <p>Auxiliary switch for blown fuse</p> 	
<p>Fig. 14</p> <p>Shaft extension with joint link, 380/470 mm consists of:</p> <p>a) Support bearing b) Connecting tube c) Extension bar d) Connecting kit</p> 	<p>Fig. 15</p> <p>Shaft extension for left hand operation of switch.</p>  <p>Fig. 16</p> <p>Fixed operating levers for switch operation.</p>  <p>Fig. 17</p> <p>Shaft extension for right hand operation of switch.</p> 

<p>Fig. 18</p> <p>Manual operation of HE consists of:</p> <p>a) lower part b) upper part c) connection rod</p> <p>Please observe!</p> <p>The mechanism shaft does not pass through the switch from the mechanism on the right hand side to the left side. Instead a special extension shaft is needed for operation of the mechanism from the left hand side</p> <p>d) lower part for HE can be equipped with blocking coil for all standard voltages</p> 	<p>Fig. 19</p> <p>Shunt trip coil can be mounted on all A mechanisms. This coil is available for the following voltages: 24, 48, 110, 220 V DC and 110, 220 V AC. It shall always be connected in series with an auxiliary switch, which disconnects the shunt trip coil when the switch is open.</p>  <p>Fig. 20</p> <p>Mechanical interlocking between switch disconnector and earthing switch. At the earthing switch on the fuse base, the interlocking type (length) depends on the length of the fuse. Therefore, the fuse size must be stated. Mechanical interlocking can also be used for switch disconnector and EB earthing switch.</p>  <p>Fig. 21</p> <p>Auxiliary switch can be mounted on all switch disconnectors, max. 6NO and 6NC and on all earthing switches except LCES, max. 4NO + 4NC + connection kit for assembling.</p> 
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11. Example of switch arrangement

Auxiliary contact
Shows position of switch/disconnector (open/close)

Spring mechanism
For operating switch/disconnector

Motor drive
NM
For automatic charge and operating switch/disconnector

Shunt trip
Release charged spring mechanism, opens the switch/disconnector

Mechanical interlocking
Interlocks switch/disconnector when cooperating with earthing

Earthing switch shaft
For operating earthing switch or for mechanical interlocking

Quick earthing switch type E
Earth main circuit of switch/disconnector

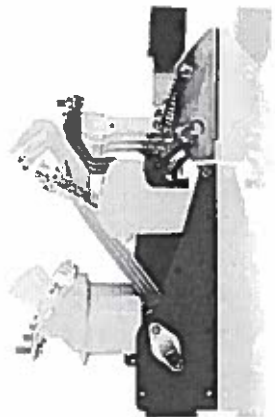
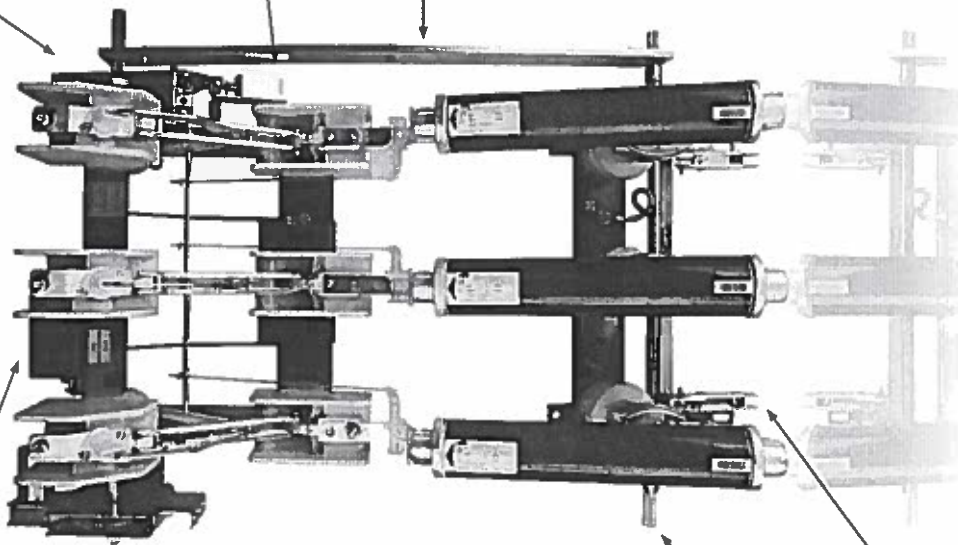


Fig. 22 VersaRupter switch disconnector for 8.25 kV

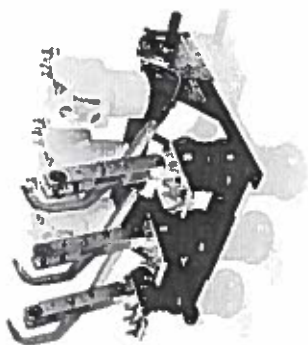


Fig. 23 VersaRupter switch disconnector VR15 (61 kA)

12. Ordering information

Switch disconnector without operating mechanism

Type	Rated volt- age [kV]	Rated cur- rent [A]	Pole spac- ing [mm]	Ordering number	Weight [kg]
NAL 12-4	12	400	150	1YMX054150M0001	25
NAL 12-4	12	400	170	1YMX064170M0001	25
NAL 12-4	12	400	210	1YMX054195M0001	25
NAL 12-6	12	630	150	1YMX054111M0001	25
NAL 12-6	12	630	170	1YMX064170M0002	25
NAL 12-6	12	630	210	1YMX054191M0001	25
NAL 12-12	12	1250	150	1YMX054152M0001	26
NAL 12-12	12	1250	170	1YMX064170M0003	26
NAL 12-12	12	1250	210	1YMX054852M0001	26
NAL 17-4	17.5	400	150	1YMX054153M0001	27
NAL 17-4	17.5	400	170	1YMX064210M0001	27
NAL 17-6	17.5	630	150	1YMX054144M0001	27
NAL 17-6	17.5	630	170	1YMX064210M0002	27
NAL 17-12	17.5	1250	150	1YMX054155M0001	28
NAL 17-12	17.5	1250	170	1YMX064210M0003	28
NAL 17-12	17.5	1250	210	1YMX064171M0001	28
NAL 24-4	24	400	170	1YMX054156M0001	35
NAL 24-4	24	400	235	1YMX054456M0001	35
NAL 24-6	24	630	170	1YMX054157M0001	35
NAL 24-6	24	630	235	1YMX054457M0001	35
NAL 24-12	24	1250	170	1YMX054458M0001	36
NAL 24-12	24	1250	235	1YMX054458M0001	36
NAL 36-6	36	630	360	1YMX054310M0001	62
NAL 36-8	36	800	360	1YMX054311M0001	62
NAL 36-10	36	1000	360	1YMX054312M0001	62

Switch disconnector with operating mechanism (K)

Type	Rated volt- age [kV]	Rated cur- rent [A]	Pole spac- ing [mm]	Ordering number	Weight [kg]
NAL 12-4K150R	12	400	150	1YMX054010M0001	30
NAL 12-4K170R	12	400	170	1YMX065170M0001	30
NAL 12-4K210R	12	400	210	1YMX054010M0001	30
NAL 12-6K150R	12	630	150	1YMX054011M0001	30
NAL 12-6K170R	12	630	170	1YMX065170M0002	30
NAL 12-6K210R	12	630	210	1YMX054011M0001	30
NAL 12-12K150R	12	1250	150	1YMX054012M0001	31
NAL 12-12K170R	12	1250	170	1YMX065170M0003	31
NAL 12-12K210R	12	1250	210	1YMX054012M0001	31
NAL 17-4K170R	17.5	400	170	1YMX054013M0001	32
NAL 17-4K210R	17.5	400	210	1YMX065210M0001	32
NAL 17-4K210R	17.5	400	210	1YMX065210M0002	32
NAL 17-6K210R	17.5	630	170	1YMX054014M0001	32
NAL 17-6K210R	17.5	630	210	1YMX065210M0006	32
NAL 17-6K210R	17.5	630	210	1YMX065210M0005	32
NAL 17-12K170R	17.5	1250	170	1YMX054015M0001	33
NAL 17-12K210R	17.5	1250	210	1YMX065210M0003	33
NAL 17-12K210R	17.5	1250	210	1YMX065210M0004	33
NAL 24-4K170R	24	400	170	1YMX065171M0001	40
NAL 24-4K235R	24	400	235	1YMX054016M0001	40
NAL 24-4K235R	24	400	275	1YMX054410M0001	40
NAL 24-6K170R	24	630	170	1YMX065171M0002	40
NAL 24-6K235R	24	630	235	1YMX054017M0001	40
NAL 24-6K235R	24	630	275	1YMX054411M0001	40
NAL 24-12K170R	24	1250	170	1YMX065171M0003	41
NAL 24-12K235R	24	1250	235	1YMX054018M0001	41
NAL 24-12K275R	24	1250	275	1YMX054412M0001	41
NAL 36-6K360R	36	630	360	1YMX054313M0001	67
NAL 36-8K360R	36	800	360	1YMX054314M0001	67
NAL 36-10K360R	36	1000	360	1YMX054315M0001	67



Fig. 24 NALF 12-6 kV fuse switch disconnector with mechanism A

Switch disconnector with operating mechanism (A)

Type	Rated voltage [kV]	Rated current [A]	Pole spacing [mm]	Ordering number	Weight [kg]
NAL 12-4A150R	12	400	150	YMX05404M0001	32
NAL 12-4A170R	12	400	170	YMX067170M0001	32
NAL 12-4A210R	12	400	210	YMX054920M0001	32
NAL 12-6A150R	12	630	150	YMX05404M0001	32
NAL 12-6A170R	12	630	170	YMX067170M0001	32
NAL 12-6A210R	12	630	210	YMX054920M0001	32
NAL 12-12A150R	12	1250	150	YMX05404M0001	33
NAL 12-12A170R	12	1250	170	YMX067170M0001	33
NAL 12-12A210R	12	1250	210	YMX054920M0001	33
NAL 17-4A170R	17.5	400	170	YMX05404M0001	34
NAL 17-4A210R	17.5	400	210	YMX067170M0001	34
NAL 17-4A250R	17.5	400	250	YMX05404M0001	34
NAL 17-6A170R	17.5	630	170	YMX067170M0001	34
NAL 17-6A210R	17.5	630	210	YMX054920M0001	34
NAL 17-6A250R	17.5	630	250	YMX05404M0001	34
NAL 17-12A170R	17.5	1250	170	YMX05404M0001	35
NAL 17-12A210R	17.5	1250	210	YMX067170M0001	35
NAL 17-12A250R	17.5	1250	250	YMX05404M0001	35
NAL 24-4A170R	24	400	170	YMX067170M0001	42
NAL 24-4A210R	24	400	210	YMX054920M0001	42
NAL 24-4A250R	24	400	250	YMX05404M0001	42
NAL 24-6A170R	24	630	170	YMX067170M0001	42
NAL 24-6A210R	24	630	210	YMX054920M0001	42
NAL 24-6A250R	24	630	250	YMX05404M0001	42
NAL 24-12A170R	24	1250	170	YMX05404M0001	43
NAL 24-12A210R	24	1250	210	YMX067170M0001	43
NAL 24-12A250R	24	1250	250	YMX05404M0001	43
NAL 36-6A360R	36	630	360	YMX054326M0001	68
NAL 36-8A360R	36	800	360	YMX054326M0001	68
NAL 36-10A360R	36	1000	360	YMX054326M0001	68



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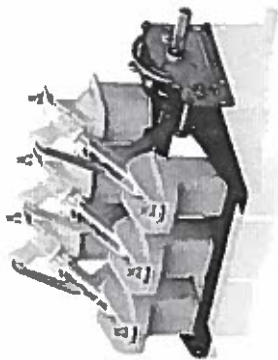


Fig. 25 NALF 12-6 kV switch disconnector with mechanism K

Switch disconnector with fuse base on opening side, operating mechanism K, without fuse tripping

Type	Rated voltage [kV]	Rated current [A]	Pole spacing [mm]	Ordering number	Weight [kg]
NALF 12-4K150R	12	400	150	YMX05407M0001	39
NALF 12-4K170R	12	400	170	YMX068170M0001	39
NALF 12-4K210R	12	400	210	YMX054925M0001	39
NALF 12-6K150R	12	630	150	YMX05407M0001	39
NALF 12-6K170R	12	630	170	YMX068170M0001	39
NALF 12-6K210R	12	630	210	YMX054925M0001	39
NALF 17-4K170R	17.5	400	170	YMX05407M0001	42
NALF 17-4K210R	17.5	400	210	YMX068170M0001	42
NALF 17-4K250R	17.5	400	250	YMX05407M0001	42
NALF 17-6K170R	17.5	630	170	YMX068170M0001	42
NALF 17-6K210R	17.5	630	210	YMX054925M0001	42
NALF 17-6K250R	17.5	630	250	YMX05407M0001	42
NALF 24-4K170R	24	400	170	YMX068170M0001	51
NALF 24-4K210R	24	400	210	YMX054925M0001	51
NALF 24-4K250R	24	400	250	YMX05407M0001	51
NALF 24-6K170R	24	630	170	YMX068170M0001	51
NALF 24-6K210R	24	630	210	YMX054925M0001	51
NALF 24-6K250R	24	630	250	YMX05407M0001	51
NALF 36-6K360R	36	630	360	YMX054326M0001	68
NALF 36-8K360R	36	800	360	YMX054326M0001	68
NALF 36-10K360R	36	1000	360	YMX054326M0001	68

Switch disconnector with fuse base on opening side, operating mechanism K, without fuse tripping

Type	Rated voltage [kV]	Rated current [A]	Pole spacing [mm]	Ordering number	Weight [kg]
NALF 12-4K150R	12	400	150	YMX05407M0001	39
NALF 12-4K170R	12	400	170	YMX068170M0001	39
NALF 12-4K210R	12	400	210	YMX054925M0001	39
NALF 12-6K150R	12	630	150	YMX05407M0001	39
NALF 12-6K170R	12	630	170	YMX068170M0001	39
NALF 12-6K210R	12	630	210	YMX054925M0001	39
NALF 17-4K170R	17.5	400	170	YMX05407M0001	42
NALF 17-4K210R	17.5	400	210	YMX068170M0001	42
NALF 17-4K250R	17.5	400	250	YMX05407M0001	42
NALF 17-6K170R	17.5	630	170	YMX068170M0001	42
NALF 17-6K210R	17.5	630	210	YMX054925M0001	42
NALF 17-6K250R	17.5	630	250	YMX05407M0001	42
NALF 24-4K170R	24	400	170	YMX068170M0001	51
NALF 24-4K210R	24	400	210	YMX054925M0001	51
NALF 24-4K250R	24	400	250	YMX05407M0001	51
NALF 24-6K170R	24	630	170	YMX068170M0001	51
NALF 24-6K210R	24	630	210	YMX054925M0001	51
NALF 24-6K250R	24	630	250	YMX05407M0001	51
NALF 36-6K360R	36	630	360	YMX054326M0001	68
NALF 36-8K360R	36	800	360	YMX054326M0001	68
NALF 36-10K360R	36	1000	360	YMX054326M0001	68

Switch disconnector with fuse base on pivot side, operating mechanism A, with fuse tripping

Type	Rated voltage [kV]	Rated current [A]	Pole spacing [mm]	Ordering number	Weight [kg]
NALF 12-4A150R	12	400	150	YMX05409M0001	41
NALF 12-4A170R	12	400	170	YMX070170M0001	41
NALF 12-4A210R	12	400	210	YMX054935M0001	41
NALF 12-6A150R	12	630	150	YMX05409M0001	41
NALF 12-6A170R	12	630	170	YMX070170M0001	41
NALF 12-6A210R	12	630	210	YMX054935M0001	41
NALF 17-4A170R	17.5	400	170	YMX05409M0001	44
NALF 17-4A210R	17.5	400	210	YMX054935M0001	44
NALF 17-4A250R	17.5	400	250	YMX05409M0001	44
NALF 17-6A170R	17.5	630	170	YMX05409M0001	44
NALF 17-6A210R	17.5	630	210	YMX070170M0001	44
NALF 17-6A250R	17.5	630	250	YMX05409M0001	44
NALF 24-4A170R	24	400	170	YMX070170M0001	53
NALF 24-4A210R	24	400	210	YMX054935M0001	53
NALF 24-4A250R	24	400	250	YMX05409M0001	53
NALF 24-6A170R	24	630	170	YMX05409M0001	53
NALF 24-6A210R	24	630	210	YMX070170M0001	53
NALF 24-6A250R	24	630	250	YMX05409M0001	53
NALF 36-6A360R	36	630	360	YMX054326M0001	70
NALF 36-8A360R	36	800	360	YMX054326M0001	70
NALF 36-10A360R	36	1000	360	YMX054326M0001	70

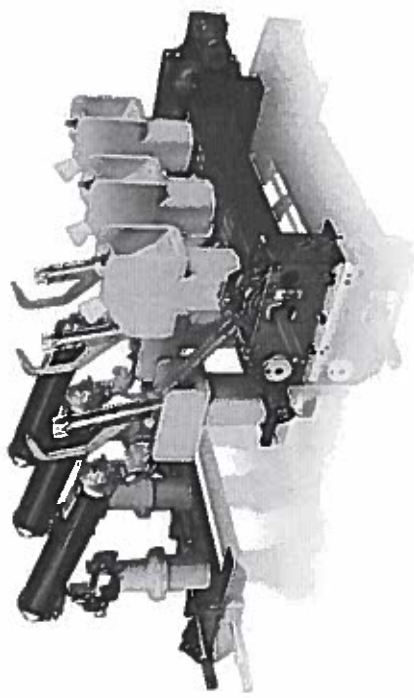


Fig. 26 NALF 36 kV fuse switch disconnector

Switch disconnector type NAL

Switch disconnector type NAL 15

Type	Rated voltage [kV]	Rated current [A]	Pole spacing [mm]	Ordering number	Weight [kg]
F 12	12	400/830	150	1YMX054195M0001	7
F 12	12	400/830	170	1YMX064197M0001	7
F 12	12	400/830	210	1YMX054476M0001	7
F 12	17	400/830	170	1YMX054196M0001	8
F 17 for LCEs	17	400/830	170	1YMX084363M0001	8
F 17 for LCEs	17	400/830	210	1YMX084196M0001	8
F 24	24	400/830	170	1YMX086339M0003	8
F 24	24	400/830	210	1YMX084197M0001	15
F 24 for LCEs	24	400/830	235	1YMX054197M0001	13
F 24	24	400/830	275	1YMX086338M0001	13
F 24 for LCEs	24	400/830	275	1YMX054476M0001	13
F 36	36	630/800	360	1YMX086335M0003	13
F 36	36	630/800	360	1YMX054325M0001	17

Type	Rated voltage [kV]	Rated current [A]	Pole spacing [mm]	Ordering number	Weight [kg]
F 12	12	400/630	150	1YMX054200M0001	7
F 12	12	400/630	170	1YMX064200M0001	7
F 12	12	400/630	210	1YMX054278M0001	7
F 17	17	400/630	210	1YMX054201M0001	8
F 17	17	400/630	210	1YMX064201M0001	8
F 24	24	400/630	235	1YMX054202M0001	15
F 24	24	400/630	235	1YMX064202M0001	15
F 24	24	400/630	275	1YMX054478M0001	13

Rated voltage [V]	Rated current [A]	Pole [mm]	Dedating number	Weight [kg]
12	4.00/3.07/2.50	150	1YWKX0534205M0001	18
12	4.00/3.07/2.50	170	1YWKX0684205M0001	16.5
12	4.00/3.07/2.50	210	1YWKX054974M0001	17
12	4.00/3.07/2.50	210	1YWKX054974M0001	17
17.5	4.00/3.07/2.50	170	1YWKX054207M0001	20
17.5	4.00/3.07/2.50	210	1YWKX064208M0001	21
24	4.00/3.07/2.50	170	1YWKX064207M0001	22
24	4.00/3.07/2.50	210	1YWKX054207M0001	22
24	4.00/3.07/2.50	235	1YWKX054474M0001	24
24	4.00/3.07/2.50	275	1YWKX054474M0001	24

Type	Rated voltage [kV]	Rated current [A]	Pole [mm]	Ordering number	Weight [kg]
FA 12	12	400/630/1250	150	1YMA3435551M2001	18
FA 17	17.5	400/630/1250	210	1YMA3435551M4004	22
FA 24	24	400/630/1250	275	1YMA3435551M0002	29
FA 35	35	400/630/1250	335	1YMA3435551M0003	36
FA 40	40	400/630/1250	375	1YMA3435551M0005	46

Type	Rated voltage [kV]	Rated current [A]	Pole spacing [mm]	Ordering number	Weight [kg]
F 12	12	400/630	150	YMX054181M0001	7
F 12	12	400/630	170	YMX064181M0001	7
F 12	12	400/630	210	YMX054182M0001	7
F 17	17.5	400/630	170	YMX054182M0001	8
F 17 for LCEs	17.5	400/630	170	YMX386336M0002	8
F 17 for LCEs	17.5	400/630	210	YMX064182M0001	8
F 17	17.5	400/630	210	YMX986338M0004	8
F 24	24	400/630	170	YMX064183M0001	13
F 24	24	400/630	235	YMX054183M0001	13
F 24 for LCEs	24	400/630	235	YMX986338M0002	13
F 24	24	400/630	275	YMX054186M0001	13
F 24 for LCEs	24	400/630	275	YMX986338M0004	13
F 38	38	630/800	265	YMX054187M0001	17

Type	Rated voltage [kV]	Rated current [A]	Pole spacing [mm]	Ordering number	Weight [kg]
F 12	12	400/630	150	YMAX054190X40001	7
F 12	12	400/630	170	YMAX054191X40001	7
F 12	12	400/630	210	YMAX054381X40001	7
F 17	17.5	400/630	170	YMAX054191X40001	8
F 17	17.5	400/630	210	YMAX064191X40001	8
F 24	24	400/630	235	YMAX054193X40001	13
F 24	24	400/630	275	YMAX054461X40001	13
F 36	36	630/800	360	YMAX054323X40001	17

	Rated voltage [kV]	Rated current [A]	Rated spacing [mm]	Pole	
F6 12	12	400/630/1250	150	1YXMK05185X0001	15.5
F6 12	12	400/630/1250	170	1YXMK06185X0001	16
F6 12	12	400/630/1250	170	1YXMK05497Z0001	16.5
F6 17	17.5	400/630/1250	170	1YXMK05418M0001	19.5
F6 17	17.5	400/630/1250	210	1YXMK06418M0001	18.5
F6 24	24	400/630/1250	210	1YXMK06418M0001	21.5
F6 24	24	400/630/1250	235	1YXMK054187M0001	21.5
F6 24	24	400/630/1250	275	1YXMK05447Z0001	23.5

Type	Rated voltage [kV]	Rated spacing [mm]	Pole	Ordering number	Weight [kg]
E 12	12	1250	150	YXAK0542235M001	7
E 12	12	1250	170	YXAK0642235M001	7
E 12	12	1250	190	YXAK054983M001	7
E 12	12	1250	210	YXAK054214M001	7
E 12	12	1250	210	YXAK0642235M002	7
E 12	12	1250	210	YXAK054983M001	7
E 12	12	1250	210	YXAK0542236M001	6
E 17	17.5	1250	210	YXAK0642236M001	6
E 17	17.5	1250	210	YXAK054216M001	6
E 17	17.5	1250	210	YXAK0642236M002	6
E 24	24	1250	210	YXAK0642236M001	9
E 24	24	1250	210	YXAK0642237M001	9
E 24	24	1250	235	YXAK0542237M001	9
E 24	24	1250	235	YXAK054983M001	9
E 24	24	1250	275	YXAK0642237M002	9
E 24	24	1250	275	YXAK0642237M001	9
E 24	24	1250	235	YXAK054219M001	9
E 24	24	1250	275	YXAK054989M001	9

Type	Rated voltage [kV]	Rated current [A]	Pole spacing [mm]	Ordering number	Weight [kg]
E 12	12/400/630	150	150	TYMX054225/M0001	7
E 12	12/400/630	170	170	TYMX064225/M0001	7
E 12	12/400/630	210	210	TYMX054226/M0001	7
E 17	17/5/400/630	210	210	TYMX054226/M0001	8
E 17	17/5/400/630	210	210	TYMX064226/M0001	8
E 24	24/400/630	210	210	TYMX064227/M0001	9
E 24	24/400/630	235	235	TYMX054227/M0001	9
E 24	24/400/630	275	275	TYMX054468/M0001	9

Type	Rated voltage [kV]	Rated current [A]	Rated spacing [mm]	Pole number	Ordering number	Weight [kg]
EB 12	12	1250	150	150	1YMX054270M0001	17.5
EB 12	12	1250	170	170	1YMX064270M0001	17.5
EB 12	12	1250	210	210	1YMX054271M0001	17.5
EB 17	17.5	1250	170	170	1YMX054272M0001	19
EB 17	17.5	1250	210	210	1YMX064272M0001	19
EB 24	24	1250	235	235	1YMX054273M0001	24
EB 24	24	1250	275	275	1YMX064273M0001	24
EB 24	24	1250	360	360	1YMX054274M0001	30
EB 36	36	800	360	360	1YMX054288M0001	30
EB 36 on phot side NAL	36	630/800	360	1YMX344033M0001		30
EB 36 on opening side NAL	36	630/800	360	1YMX344034M0001		30
EB 36 on phot side NALF	36	630/800	360	1YMX344035M0001		30
EB 36 on opening side NALF	36	630/800	360	1YMX344036M0001		30

Type	Rated voltage [kV]	Rated current [A]	Pole spacing [mm]	Ordering number	Weight [kg]
LCES E12	12	400/630	150	1YMXB68325MA001	7
LCES E12	12	400/630	210	1YMXB68325MA002	7
LCES E12	12	400/630	210	1YMXB68325MA003	7
LCES E12	12	1250	150	1YMXB68325MA011	7
LCES E12	12	1250	170	1YMXB68325MA012	7
LCES E12	12	1250	210	1YMXB68325MA013	7
LCES E17	17.5	400/630	150	1YMXB68325MA004	8
LCES E17	17.5	400/630	210	1YMXB68325MA005	8
LCES E17	17.5	1250	170	1YMXB68325MA014	8
LCES E17	17.5	1250	210	1YMXB68325MA015	8
LCES E24	24	400/630	235	1YMXB68325MA006	9
LCES E24	24	400/630	275	1YMXB68325MA007	9
LCES E24	24	1250	235	1YMXB68325MA016	9
LCES E24	24	1250	275	1YMXB68325MA017	9

Type	Rated voltage [kV]	Rated current [A]	Pole spacing [m]	Ordering number	Weight [kg]
LCES EF12	12	400/630	150	1YMX888325/M0021	7
LCES EF12	12	400/630	170	1YMX888325/M0022	7
LCES EF12	12	400/630	210	1YMX888325/M0023	7
LCES EF17	17	400/630	170	1YMX888325/M0024	8
LCES EF17	17	400/630	210	1YMX888325/M0025	8
LCES EF24	24	400/630	235	1YMX888325/M0026	9
LCES EF24	24	400/630	275	1YMX888325/M0027	9

Type	Rated voltage [kV]	Rated current [A]	Pole spacing [mm]	Ordering number	Weight [kg]
LCES EB12	12	1250	150	1YMXB88325M0031	17
LCES EB12	12	1250	170	1YMXB88325M0032	17
LCES EB12	12	1250	210	1YMXB88325M0033	17
LCES EB17	17	1250	170	1YMXB88325M0034	18
LCES EB17	17	1250	210	1YMXB88325M0035	18
LCES EB24	24	1250	235	1YMXB88325M0036	24
LCES EB24	24	1250	275	1YMXB88325M0037	24
LCES EB36	36	600	360	1YMXB88325M0038	30
LCES EB36 on pivot side	36	600	360	1YMXB88325M0039	30
LCES EB36 on pivot side	36	800	360	1YMXB88325M0040	30

13. Mechanisms and additional accessories for NAL and VersaRupter switch disconnectors

Description	Type	Ordering number	Weight [kg]
K-mechanism (Fig. 10)	K 12	1YMX054165M0001	5
K-mechanism	K 17	1YMX030865M0001	5
K-mechanism	K 24	1YMX054167M0001	5
Mechanism K	K 36	1YMX054340M0001	5
A-mechanism (Fig. 9)	A 12	1YMX054173M0001	7
A-mechanism	A 12	1YMX13975M0002	7
A-mechanism special version	A 17	1YMX054174M0001	7
A-mechanism	A 24	1YMX054175M0001	7
A-mechanism	A 36	1YMX051341M0001	7
Plastic cover for A mechanism		1YMX241351M0001	0.2

Hand operating mechanism type HE with accessories

Description/Type	Ordering number	Weight [kg]
Front bearing for HE, with cardanic pint (Fig. 18 a)	1YMX053233M0001	1.4
Front bearing for HE, without cardanic pint	1YMX053233M0002	0.8
Front bearing for HE for motor operation	1YMX042248M0004	1.8
Bevel gear for HE (Fig. 18 b)	1YMX053623M0002	2.1
Operating handle for HE	1YMX053233M0001	2.1
Operating handle for HE armoured	1YMX053233M0004	2.1
Operating handle for HE, with blocking coil, 230 VAC (Fig. 18 d)	1YMX053233M0001	2.1
Front bearing for HE, with blocking coil, 110 VAC	1YMX053394M0001	2.1
Front bearing for HE, with blocking coil, 220 V DC	1YMX053395M0001	2.1
Front bearing for HE, with blocking coil, 110 V DC	1YMX053396M0001	2.1
Front bearing for HE, with blocking coil, 48 V DC	1YMX053397M0001	2.1
Front bearing for HE, with blocking coil, 24 V DC	1YMX053398M0001	2.1
Spare coils for blocking coil, 230 VAC	1YMX018958M0015	0.8
Spare coils blocking coil, 110 VAC	1YMX018958M0014	0.8
Spare coils blocking coil, 220 V DC	1YMX018958M0009	0.8
Spare coils blocking coil, 110 V DC	1YMX018958M0007	0.8
Spare coils blocking coil, 48 V DC	1YMX018958M0016	0.8
Spare coils blocking coil, 24 V DC	1YMX018958M0017	0.8
Front extension for left hand side operation (Fig. 15)		
for pole distance 150 mm	1YMX054357M0001	1.9
for pole distance 210 mm	1YMX054358M0001	2.3
for pole distance 170 mm (12 kV)	1YMX054358M0002	2.1
for pole distance 170 mm (17 kV and 24 kV)	1YMX054358M0001	2.1
for pole distance 235 mm	1YMX054359M0001	2.6
for pole distance 275 mm	1YMX054359M0001	3.1
for pole distance 360 mm	1YMX054359M0001	4.0
for pole distance 490 mm	1YMX054359M0001	5.1
for pole distance 550 mm	1YMX055334M0008	0.8
for pole distance 570 mm	1YMX055334M0009	0.9
for pole distance 1300 mm	1YMX055334M00010	1.0
for pole distance 1700 mm	1YMX055334M0002	1.9
for pole distance 2000 mm	1YMX055334M0001	2.9

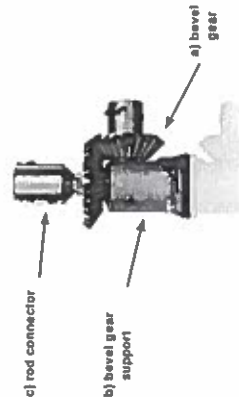


Fig. 27 Transmission 90° complete

8 switch disconnector type NAL 21

Mechanical interlocking for earthing switch¹⁾ (Fig. 20)

Description/Type	Ordering number	Weight [kg]
- on NAL 12	1YMX054276M0001	2.5
- on NAL 17/24	1YMX054276M0001	3.1
- on NALF 12, Fuse ø = 292 mm	1YMX054276M0001	5.7
- on NALF 12, Fuse ø = 192 mm	1YMX054276M0001	5.0
- on NALF 12, Fuse ø = 442 mm	1YMX054276M0001	6.4
- on NALF 12, Fuse ø = 464 mm	1YMX054276M0001	6.4
- on NALF 17, Fuse ø = 292 mm	1YMX054281M0001	6.3
- on NALF 17, Fuse ø = 442 mm	1YMX054281M0001	7.0
- on NALF 24, Fuse ø = 442 mm (bearing switch from switch side)	1YMX054283M0001	6.5
- on NALF 24, Fuse ø = 537 mm	1YMX054283M0001	7.3
- on NAL 36 EB	1YMX343986M0002	5.4
- on NAL 36 EB	1YMX343986M0001	3.3
- on NALF 36 EB	1YMX343986M0003	9.4
- on NALF 36 EB	1YMX343986M0004	7.6

¹⁾ Normally, interlocking is mounted on the left hand side of the switch and transverse shift for left hand operation is needed.

Aux. Switches for switch disconnectors and earthing switch (Fig. 21)

Description/Type	Ordering number	Weight [kg]
Auxiliary switch:		
- 2NO + 2NC for NAL(F) 12-24	1YMX054713M0001	0.9
- 4NO + 4NC for NAL(F) 12-24	1YMX054714M0002	1.0
- 8NO + 8NC for NAL(F) 12-24	1YMX054715M0001	1.1
- 2NO + 2NC for E/FEB 12-24	1YMX054716M0001	0.9
- 2NO + 2NC for E/FEB 36	1YMX054716M0002	0.9
- 4NO + 4NC for E/FEB 12-24	1YMX054717M0001	1.0
- 4NO + 4NC for E/FEB 36	1YMX054717M0002	1.0
- 2NO + 2NC for NAL(F) 36	1YMX240807M0005	0.9
- 4NO + 4NC for NAL(F) 36	1YMX240807M0006	1.0
- 8NO + 8NC for NAL(F) 36	1YMX054715M0001	1.1
Fusing materials for NAL(F) 36	1YMX240807M0004	0.1
Auxiliary contact for fuse interruption (Fig. 13)	1YMX053390M0001	0.1

14. Motor drives

Motor drives enable the remote opening and closing of switch disconnectors while at the same time they are prepared for the possibility of an emergency manual maneuver. A variety of models offers a selection of appropriate drive configurations. Drives type UEMC40A1 and A2 are designed to be installed on the front wall of the panel (left or right side). They can open and close switch disconnector mechanisms A and K, and are connected to the shaft of the switch disconnector by coupling ties

and bevel gears. The UEMC40A series is not recommended for NAL 36 – 36 kV with A mechanism. Standard drive for NAL/F (Fig. 29) can be mounted directly on the shaft or switch disconnector or on the side wall of the panel. It cooperates with spring mechanisms A and K. To mount the standard drive for NAL/F on the shaft of the disconnector, suitable supports brackets are needed (Fig. 28). The correct choice of brackets depends on the type of disconnector, drive and motor assembly as is shown in the table below.

22 Switch disconnector type NAL

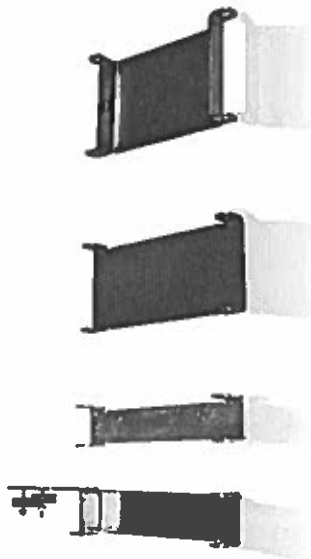


Fig. 28 Space brackets for mounting of standard motor drive for NAL/F

Spring mech. type A		12 17.5 24 36											
NAL/NALF		L P L P L P L P L P L P											
Part number	Part name												
1YMX000044M0001	Space bracket 39 mm												
1YMX000044M0002	Space bracket 55 mm	X											
1YMX000044M0003	Space bracket 85 mm												
1YMX000044M0004	Space bracket 105 mm												
1YMX000044M0005	Space bracket 139 mm												
1YMX000044M0001*	Space bracket 39*	X	X	X	X	X	X	X	X	X	X	X	X
1YMX000044M0004*	Space bracket 105*												

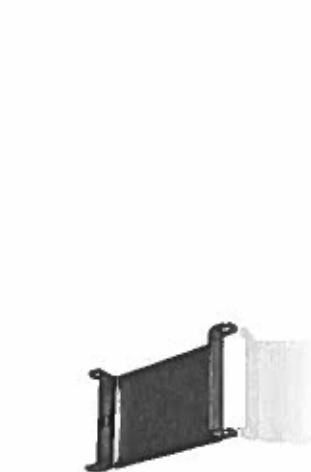


Fig. 31 Operating box

Spring mech. type K		12 17.5 24 36											
NAL/NALF		L P L P L P L P L P L P											
Part number	Part name												
1YMX000044M0001	Space bracket 39 mm												
1YMX000044M0002	Space bracket 55 mm	X											
1YMX000044M0003	Space bracket 85 mm												
1YMX000044M0004	Space bracket 105 mm												
1YMX000044M0001*	Space bracket 39*	X	X	X	X	X	X	X	X	X	X	X	X
1YMX000044M0004*	Space bracket 105*												

Fig. 32 Control unit

Spring mech. type K		12 17.5 24 36											
NAL/NALF		L P L P L P L P L P L P											
Part number	Part name												
1YMX000044M0001	Space bracket 39 mm												
1YMX000044M0002	Space bracket 55 mm	X											
1YMX000044M0003	Space bracket 85 mm												
1YMX000044M0004	Space bracket 105 mm												
1YMX000044M0001*	Space bracket 39*	X	X	X	X	X	X	X	X	X	X	X	X
1YMX000044M0004*	Space bracket 105*												

The motor unit is mechanically disconnected after each operation, which presents an opportunity to manually operate the switch disconnector. The drive can be operated locally via the buttons on the control box (Fig. 31) or remotely using radio control. The control unit (Fig. 32) delivered with the motor drive contains the necessary elements such as contactors, connections, etc. and is

also equipped with an automatic fuse. It can be placed in a panel with the switch disconnector or in a separate box. Connection with the drive is via a plug-ended cable. Instead of the NM motor drive, the UEMCAK3 type can be used (Fig. 30). The control system is then supplied in a separate order.



Fig. 30 K3 motor drive

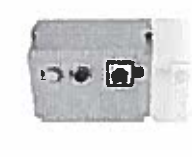


Fig. 31 Operating box



Fig. 32 Control unit

Fig. 30 K3 motor drive

Technical data of standard motor drive for NAL/F		12 17.5 24 36											
NAL/NALF		L P L P L P L P L P L P											
Ordering number	Part name												
1YMX000042M0001	Space bracket 39 mm												
1YMX000042M0002	Space bracket 55 mm	X											
1YMX000042M0003	Space bracket 85 mm												
1YMX000042M0004	Space bracket 105 mm												
1YMX000042M0001*	Space bracket 39*	X	X	X	X	X	X	X	X	X	X	X	X
1YMX000042M0004*	Space bracket 105*												

Fig. 30 K3 motor drive

Technical data of standard motor drive for NAL/F		12 17.5 24 36											
NAL/NALF		L P L P L P L P L P L P											
Ordering number	Part name												
1YMX000042M0001	Space bracket 39 mm												
1YMX000042M0002	Space bracket 55 mm	X											
1YMX000042M0003	Space bracket 85 mm												
1YMX000042M0004	Space bracket 105 mm												
1YMX000042M0001*	Space bracket 39*	X	X	X	X	X	X	X	X	X	X	X	X
1YMX000042M0004*	Space bracket 105*												

Fig. 30 K3 motor drive

Technical data of standard motor drive for NAL/F		12 17.5 24 36											
NAL/NALF		L P L P L P L P L P L P											
Ordering number	Part name												
1YMX000042M0001	Space bracket 39 mm												
1YMX000042M0002	Space bracket 55 mm	X											
1YMX000042M0003	Space bracket 85 mm												
1YMX000042M0004	Space bracket 105 mm												
1YMX000042M0001*	Space bracket 39*	X	X	X	X	X	X	X	X	X	X	X	X
1YMX000042M0004*	Space bracket 105*												

Fig. 30 K3 motor drive

Technical data of standard motor drive for NAL/F		12 17.5 24 36											
NAL/NALF		L P L P L P L P L P L P											
Ordering number	Part name												
1YMX000042M0001	Space bracket 39 mm												
1YMX000042M0002	Space bracket 55 mm	X											
1YMX000042M0003	Space bracket 85 mm												
1YMX000042M0004	Space bracket 105 mm												
1YMX000042M0001*	Space bracket 39*	X	X	X	X	X	X	X	X	X	X	X	X
1YMX000042M0004*	Space bracket 105*												

Fig. 30 K3 motor drive

Technical data of standard motor drive for NAL/F		12 17.5 24 36											
NAL/NALF		L P L P L P L P L P L P											
Ordering number	Part name												
1YMX000042M0001	Space bracket 39 mm												
1YMX000042M0002	Space bracket 55 mm	X											
1YMX000042M0003	Space bracket 85 mm												
1YMX000042M0004	Space bracket 105 mm												
1YMX000042M0001*	Space bracket 39*	X	X	X	X	X	X	X	X	X	X	X	X
1YMX000042M0004*	Space bracket 105*												

Fig. 30 K3 motor drive

Technical data of standard motor drive for NAL/F		12 17.5 24 36											
NAL/NALF		L P L P L P L P L P L P											
Ordering number	Part name												
1YMX000042M0001	Space bracket 39 mm												
1YMX000042M0002	Space bracket 55 mm	X											
1YMX000042M0003	Space bracket 85 mm												
1YMX000042M0004	Space bracket 105 mm												
1YMX000042M0001*	Space bracket 39*	X	X	X	X	X	X	X	X	X	X	X	X
1YMX000042M0004*	Space bracket 105*												

Fig. 30 K3 motor drive

Technical data of standard motor drive for NAL/F		12 17.5 24 36											
NAL/NALF		L P L P L P L P L P L P											
Ordering number	Part name												
1YMX000042M0001	Space bracket 39 mm												
1YMX000042M0002	Space bracket 55 mm	X											
1YMX000042M0003	Space bracket 85 mm												
1YMX000042M0004	Space bracket 105 mm												
1YMX000042M0001*	Space bracket 39*	X	X	X	X	X	X	X	X	X	X	X	X
1YMX000042M0004*	Space bracket 105*												

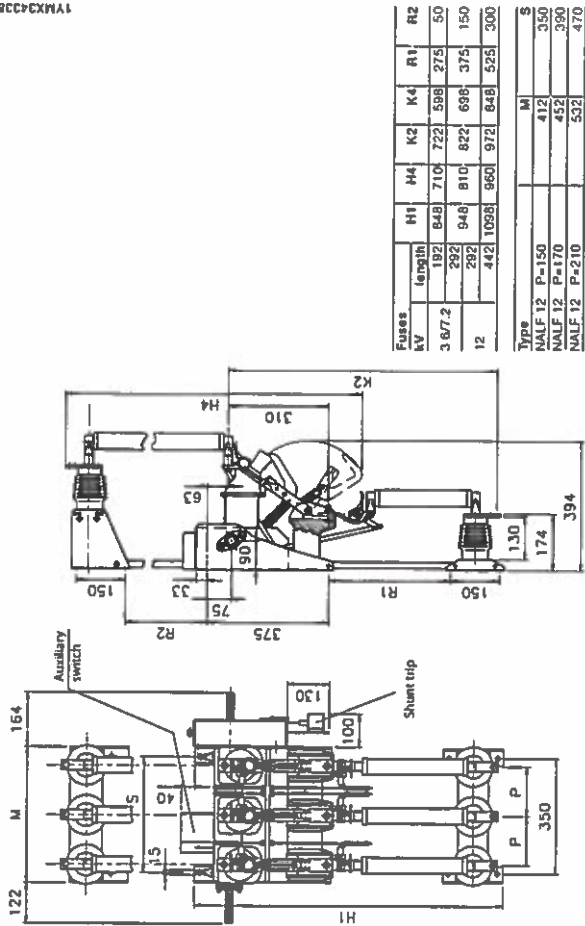
Fig. 30 K3 motor drive

Technical data of standard motor drive for NAL/F		12 17.5 24 36											
NAL/NALF		L P L P L P L P L P L P											
Ordering number	Part name												
1YMX000042M0001	Space bracket 39 mm												
1YMX000042M0002	Space bracket 55 mm	X											
1YMX000042M0003	Space bracket 85 mm												
1YMX000042M0004	Space bracket 105 mm												
1YMX000042M0001*	Space bracket 39*	X	X	X	X	X	X	X	X	X	X	X	X
1YMX000042M0004*	Space bracket 105*												

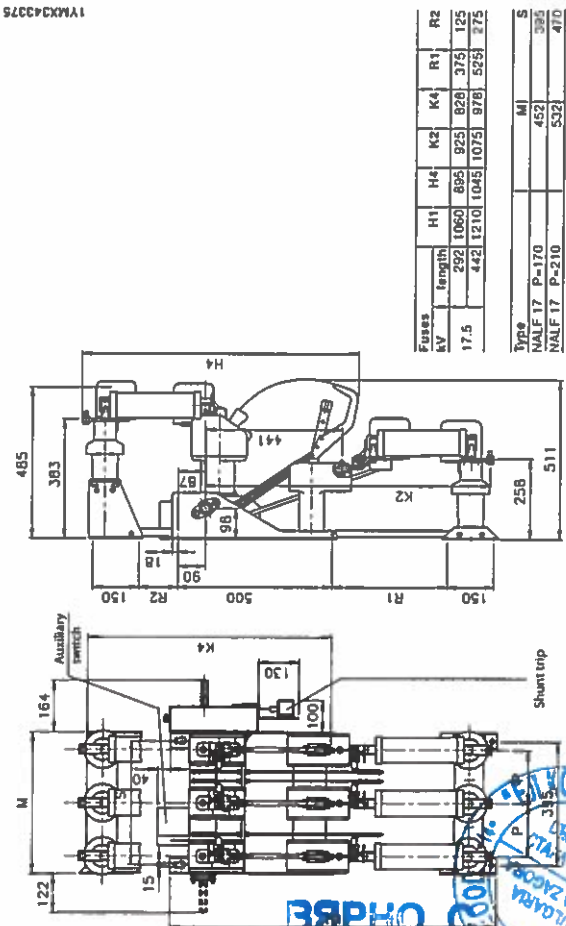
Fig. 30 K3 motor drive

Type		12 17.5 24 36											
Ordering number		1YM000042M0001	1YM000042M0002	1YM000042M0003	1YM000042M0004	1YM000042M0005							
[V]	Operating voltage, AC	17-26	34-52	42-66	77-137	154-242							
[V]	Operating voltage, DC	22-28	43-57	54-72	99-150	198-264							
[A]	Nominal current during operation	3	3	0.5	0.5	0.4							
[A]	Maximum current during operation	6	6	0.5	4	1.2							
[W]	Power consumption	70	70	70	70	70							
[sec]	Operating time	-4	-4	-8	-8	-4							
[sec]	Waiting time	0.5-2.0	0.5-2.0	1.0-4.0	0.5-2.0	0.5-2.0							
[°C]	Operating temperature	-40...+55	-40...+55	-40...+55	-40...+55	-40...+55							
[kg]	Weight	6	6	6	6	6							

Fuse switch disconnector type NALF 12 kV with mechanism

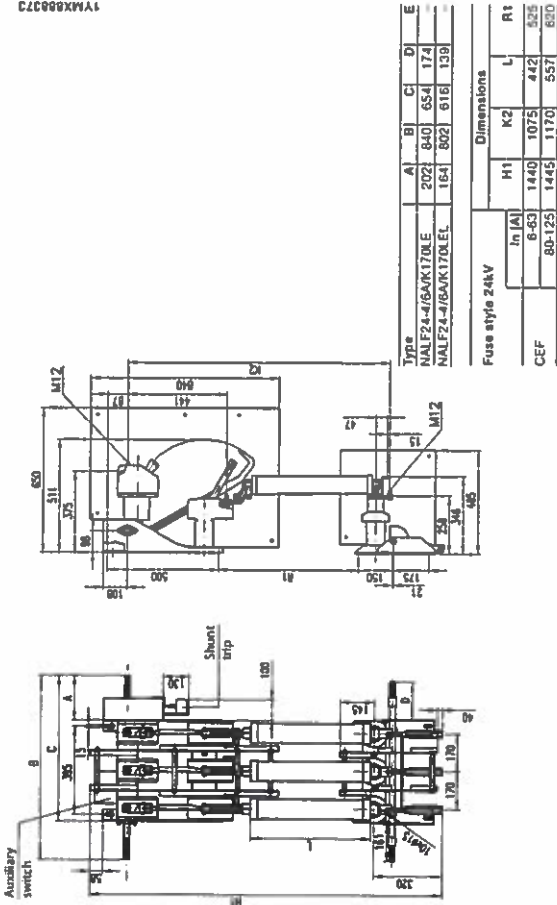


Fuse switch disconnector type NALF 17.5 kV with mechanism

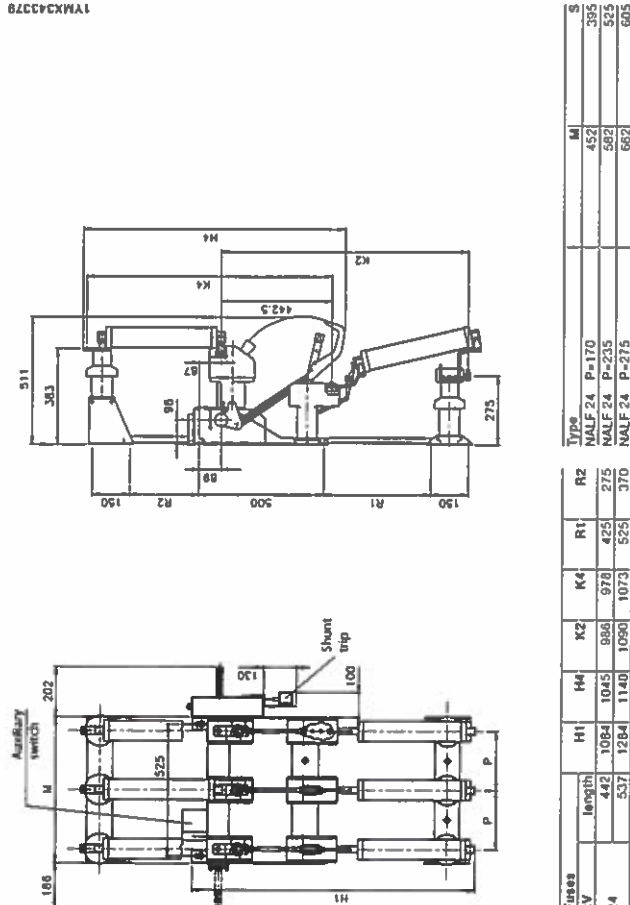


Switch disconnector type NAL 25

Fuse switch disconnector type NALF 24 kV with mechanism and insulation barriers



Fuse switch disconnector type NALF 24 kV with mechanism



25 Switch disconnector type NAL

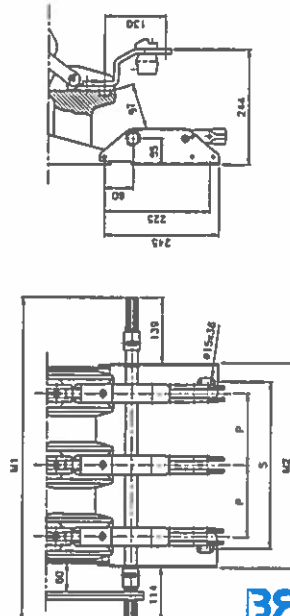
Earthing switch with making capacity type E17.5



Fuses	H5
AV	length
0.07 2	192
	292
12	292
	442
17 5	292
	563
	706
4	442
	706
	801

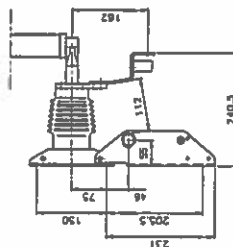
Type	AS	A7	P
NALF 12, P=150	173	430	150
NALF 12, P=170	173	430	170
NALF 12, P=210	173	430	210
NALF 17.5, P=210	243	500	170
NALF 17.5, P=210	243	500	210
NALF 24, P=170	243	500	170
NALF 24, P=235	243	500	235
NALF 24, P=275	243	500	275

Earthling switch with making capacity type E12



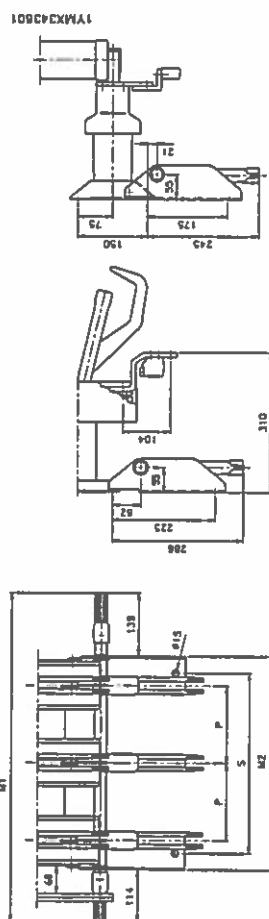
Type	M0	M2	S
9-150	681	428	350
15-170	721	468	380
20-210	801	548	470

Earthling switch with making capacity type E 12 mounted on HAL12



Earthling switch with making capacity type E 12 mounted on fuse base F 12

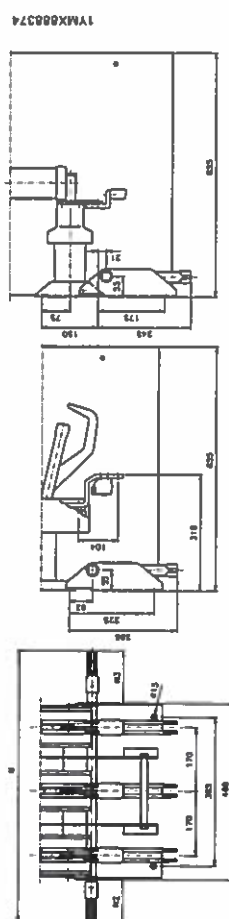
Switch disconnector type NAL 27



	M1	M2	S
E-17.5			
P-170	721	468	395
P-210	801	548	475

Earthling switch
with making type E17.5
mounted on HAL 17.5

Earthling switch
with marking type E17.5
mounted on base F17.5

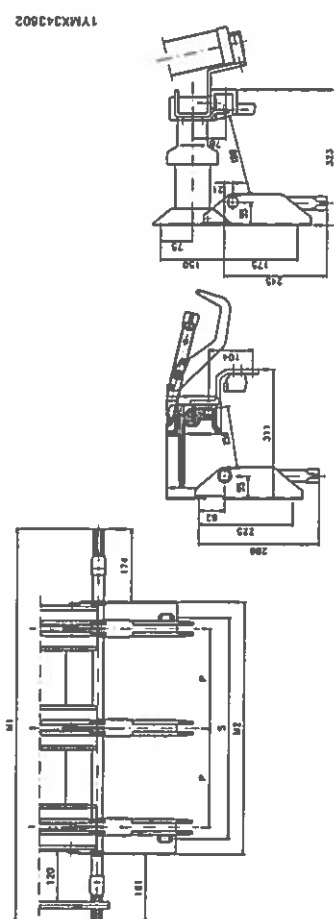


type	M	N2	N3
E24 P-170	808	156	174
E24 P-170	721	114	139

Earthling switch with making
type E24/EL24 mounted
on NAL24 P=170

Earthing switch with marking
type E24/EL24 mounted
on fuse base F24 P=170

Earthing switch with making capacity type E24



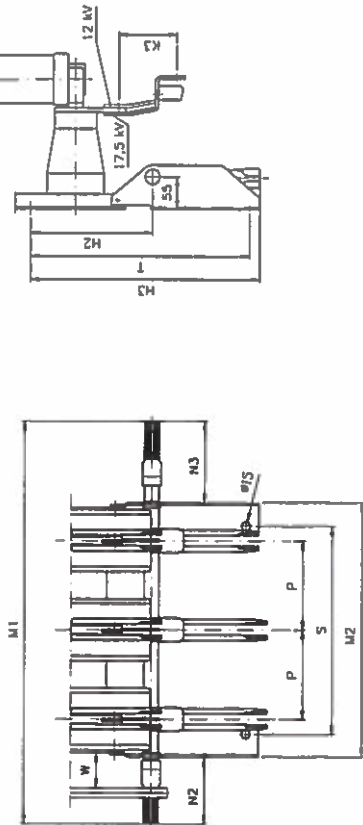
	M1	M2	S
E24			
-235	933	598	525
-275	1013	678	605

Earthling switch with mating capacity type E 24 mounted on NAL 24

Earthling switch with making capacity type E 24 mounted on base F 24

8 Switch disconnector type NAL

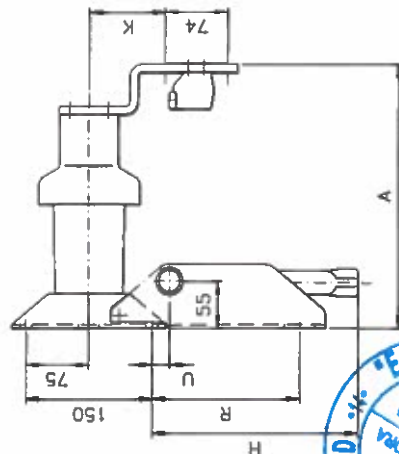
Earthing switch with making capacity type E 12, E 17.5 and E 24 mounted on fuse base with 6 insulators



1YMX43538

Type	P=150	P=170	P=210	P=235	P=275	M1	M2	N1	N2	N3	P	S	W
E12	100	100	100	100	100	208	208	393	393	393	150	350	375
E12	100	100	100	100	100	208	208	393	393	393	170	390	375
E12	100	100	100	100	100	208	208	393	393	393	210	470	375
E17.5	100	100	100	100	100	208	208	393	393	393	170	395	375
E17.5	100	100	100	100	100	208	208	393	393	393	210	395	375
E24	100	100	100	100	100	351	351	575	575	575	235	525	500
E24	100	100	100	100	100	351	351	575	575	575	275	605	500

Separately mounted earthing switch with making capacity type EB



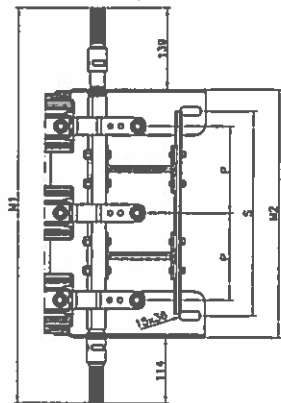
1YMX43611

Type	A	H	K	R	U
EB12	245	231	115	200	46
EB17.5	310	245	90	175	21

Other measurements see figure 1YMX43538 above

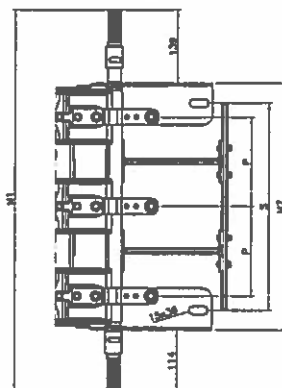
Switch disconnector type NAL 28

Earthing switch type LCES 12 kV



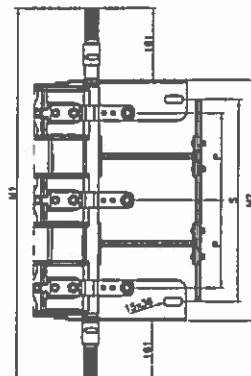
Type	M1	M2	S
E 12 P=150	691	426	350
E 12 P=170	721	468	390
E 12 P=210	801	548	470

Earthing switch type LCES 17.5 kV



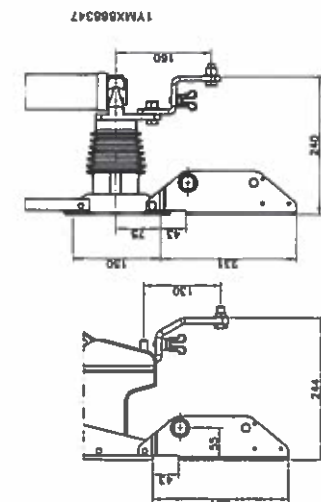
Type	M1	M2	S
E 17 P=170	721	468	395
E 17 P=210	801	548	475

Earthing switch type LCES 24 kV

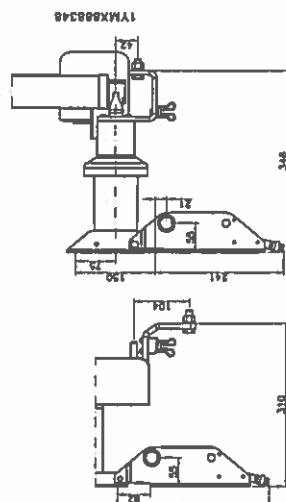


Type	M1	M2	S
E 24 P=235	933	598	525
E 24 P=275	1013	678	605

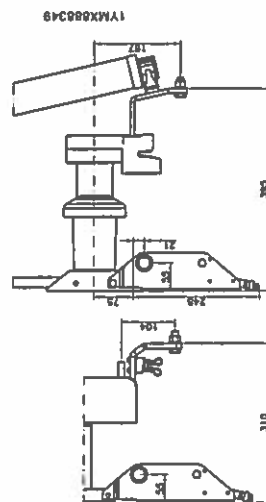
Switch disconnector type NAL



Earthing switch types LCES EF12 mounted on fuse base F12

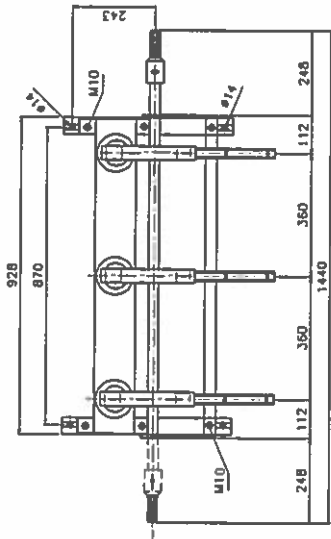


Earthing switch types LCES EF17 mounted on fuse base F17

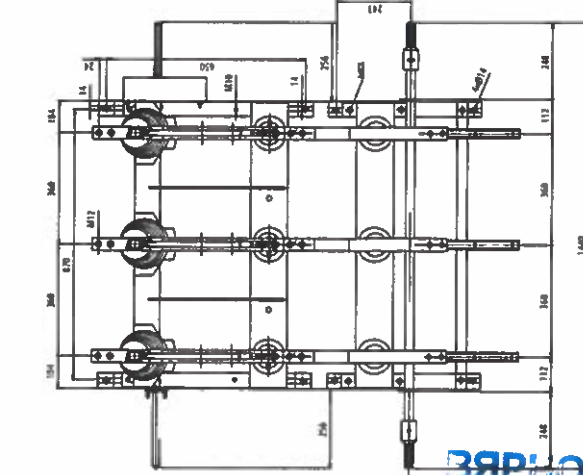


Earthing switch types LCES EF24 mounted on fuse base F24

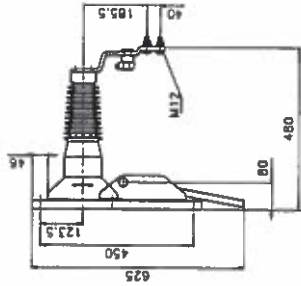
EB 36



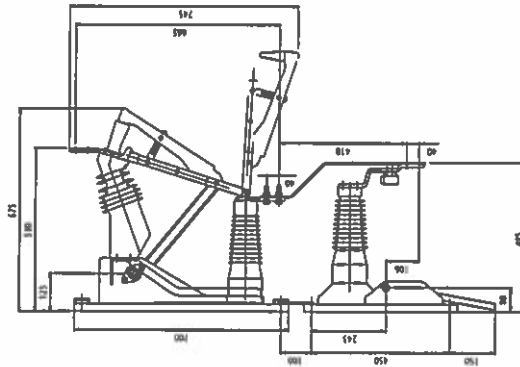
NAL 36 + EB 36



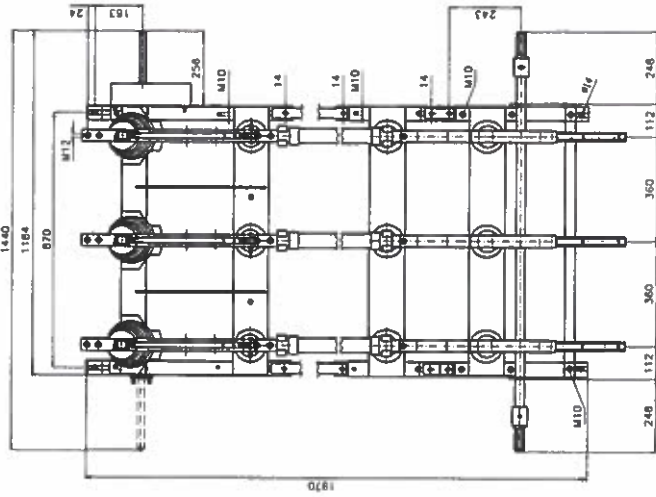
1YMX241288



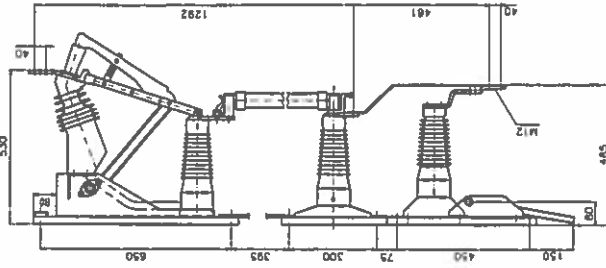
1YMX888395



NALF 36 + EB on pivot side

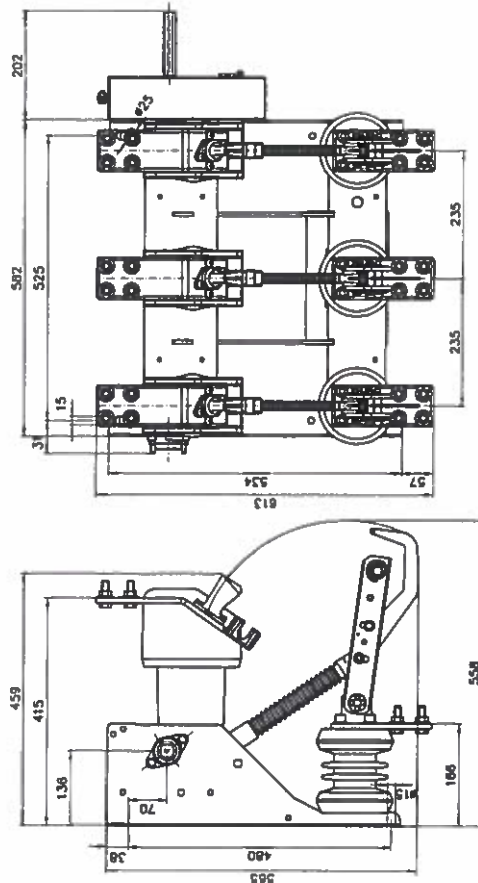


1YMX888351



Switch disconnector type VersaRupter 61 kA

1YMX888272



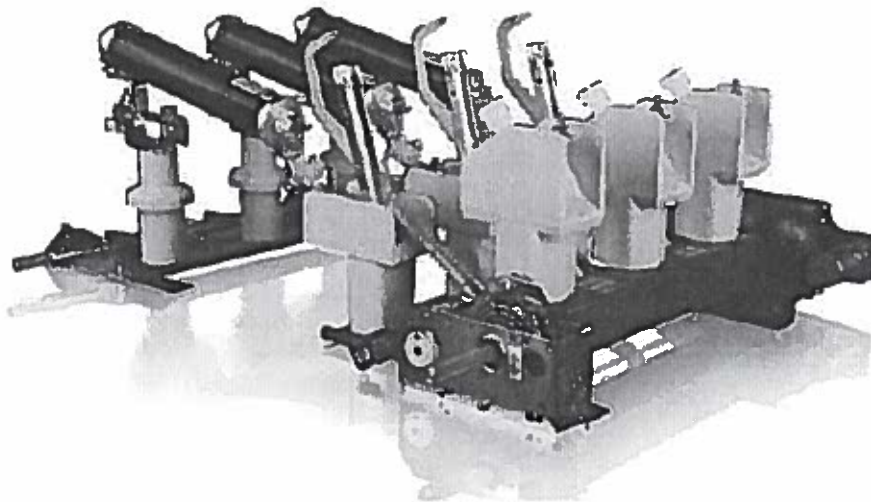
34 Switch disconnector type NAL

Switch disconnector type NAL 33



Handwritten signature.

Въздушно изолирани разединители тип NAL и NALF



Триполюсните мощностни разединители **NAL**, производство на ABB, са предназначени за изключване на веригата под товар. Комбинацията на **NAL** с предпазители (**NALF**) осигурява и защита от късо съединение. Всеки тип може да бъде доставен в три варианта, за номинален ток: 400 A, 630 A и 1250 A

Приложение:

- в разпределителните мрежи за комутиране на електропроводи и трансформатори
- за комутиране на двигатели
- за комутиране на кондензатори

Предимства:

- Облекчена кинематика
- Възможност за моторно задвижване и дистанционно командване
- Висока надеждност: основен ремонт на разединителя се прави чак след 1000 механични цикъла или след 500 изключвания под товар при работен ток равен на половината от обявения.
- Компактност и удобство за инсталиране в КТП, намалени междуфазни разстояния:
- При разединител за номинално напрежение $U_n=10$ kV разстоянието между полюсите е 150 mm, 170 mm или 210 mm
- При разединител за номинално напрежение $U_n=20$ kV разстоянието между полюсите е 170 mm, 235 mm или 275 mm
- Мощностните разединители тип NAL и NALF са оборудвани с двойна дъгогасителна система

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ОРИГИНАЛ

