BENNING
World Class Power Solutions

Excellent Technology, Efficiency and Quality

THYROTRONIC

Rectifier for stationary battery systems
Safe, reliable & powerful

Robust and reliable, tried and tested

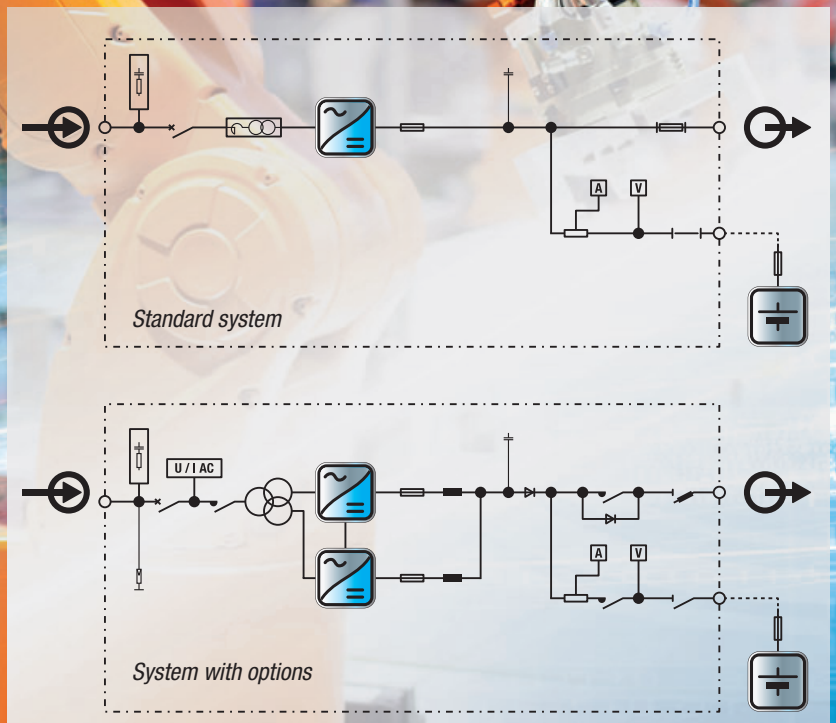


Figure 1: THYROTRONIC circuit diagrammes

Figure 2: THYROTRONIC Rectifier with interior view

Overview

Battery-supported DC power supply systems have proven to be extraordinarily reliable and very economical back-up power supplies for many decades.
The reliability of a battery-supported backup power supply depends on the quality of the battery used and the operational reliability of the rectifier device.

BENNING has developed the THYROTRONIC rectifier series to be particularly suitable for use with battery-supported DC power supplies (see Fig. 2). In addition to great reliability, it offers a comprehensive signalling and monitoring concept.

These backup power supplies are used in the following fields

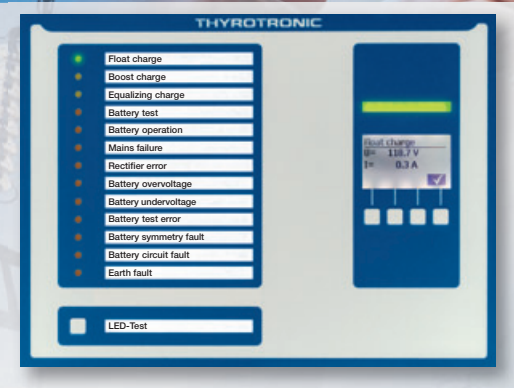
- **Power plants**
- **Transformer substations**
- **Oil and gas industry**
- **Railway systems**
- **Airports**
- **Hospitals**
- **Mining installations**
- **Industrial plants**

Significant advantages

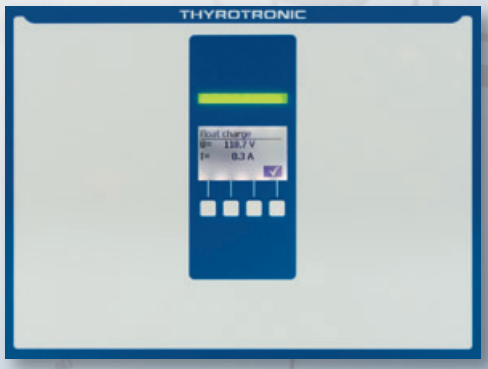
- **Constructed from few but reliable components**
  - **Mechanically and electronically resistant, designed for harsh environmental conditions**
- **Wiring concept**
  - **State-of-the-art DSP technology**
- **Automatic temperature-controlled charging characteristic**
- **Galvanic isolation**
- **High quality output power**
  - **Fully controlled thyristor three-phase bridge, 6 pulse (standard), 12 pulse (optional)**
- **Suitable for all battery technologies**

- **safe & reliable**
- **powerful & economical**
- **for harsh environmental conditions**

THYROTRONIC 10” touch display (figure 3)
Modern touch display with intuitive guidance through a user interface optimized by BENNING



Extended THYROTRONIC basic display (figure 4)
Equipped with a display and control unit (LCD and pushbuttons) and a freely configurable status display



THYROTRONIC
Basic display (figure 5)
Display and control unit with LCD and push buttons

Signalling and monitoring module

All available measurement channels can be provided with measurement and error thresholds. Freely definable limit values can be set to trigger the error or warning messages. The display and control unit built into the front door of the rectifier housing is used to enter the limit values and to confirm and visualise the messages (see figure 4 / 5). Optionally, the system can be equipped with a 10” touch display, which sets completely new standards in terms of ease of use and comprehensibility (see figure 3).

Supported monitoring types:
- Network monitoring
- Battery and DC voltage monitoring
- Temperature monitoring
- Over- and undervoltage monitoring

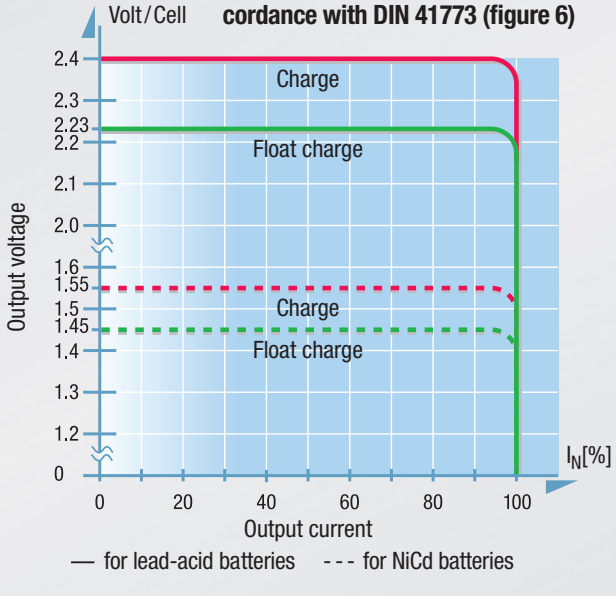
THYROTRONIC – additional functions

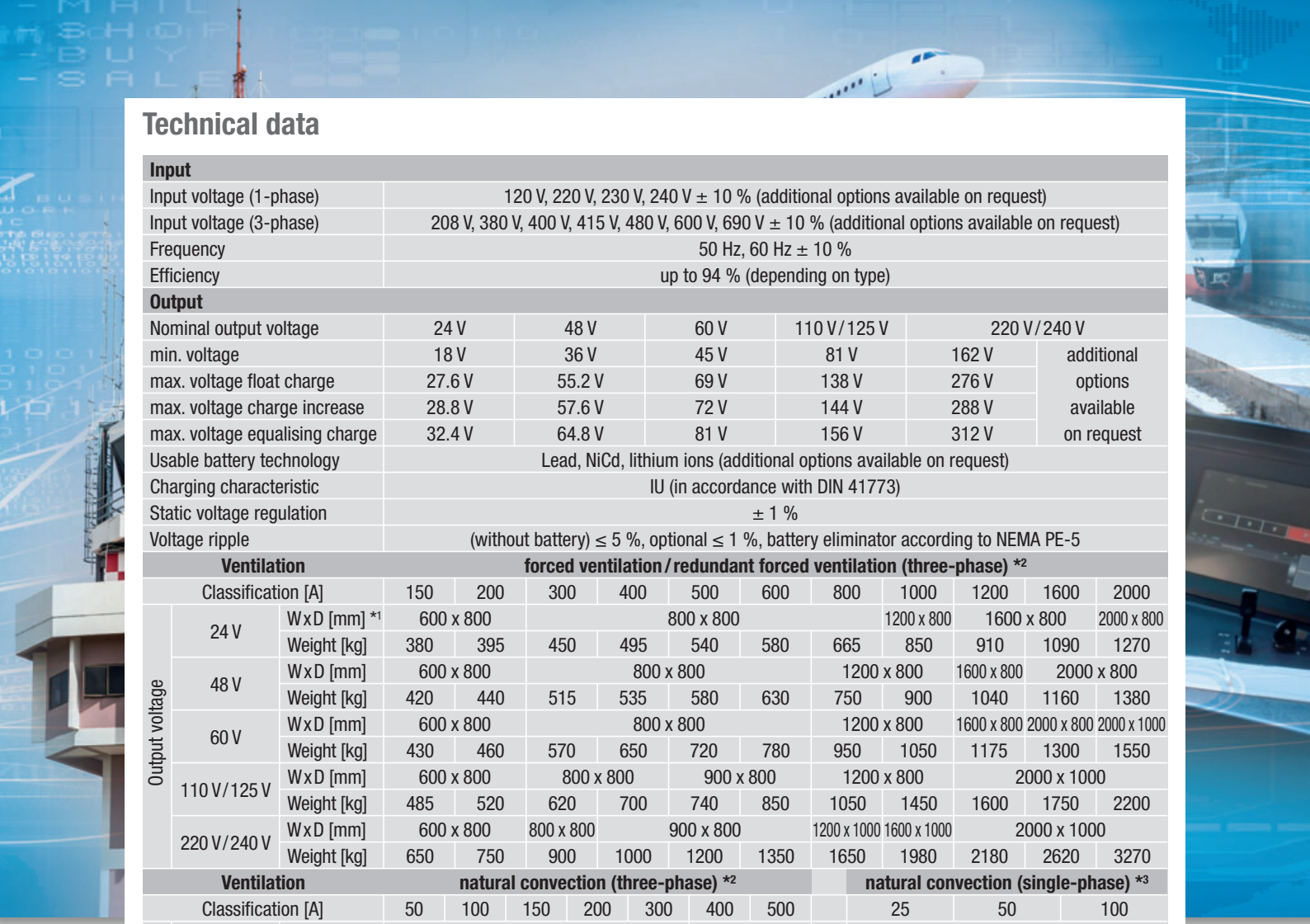
- **Programmable automatic boost charge**
- **Equalising and initial charge**
- **Parallel operation of several rectifiers with active or passive load sharing**
- **Automatic and programmable battery circuit test**
- **Automatic battery capacity test**
- **Compensation of line resistance**
- **Display of the remaining battery life**

Suitable for all battery technologies

THYROTRONIC rectifier devices work with an electronically controlled output characteristic (IU characteristic according to DIN 41773) (see Fig. 6) and are suitable for use with lead and NiCd batteries as well as other modern battery technologies.

Course of the IU characteristics in accordance with DIN 41773 (figure 6)





Technical data

Input												
Input voltage (1-phase)	120 V, 220 V, 230 V, 240 V ± 10 % (additional options available on request)											
Input voltage (3-phase)	208 V, 380 V, 400 V, 415 V, 480 V, 600 V, 690 V ± 10 % (additional options available on request)											
Frequency	50 Hz, 60 Hz ± 10 %											
Efficiency	up to 94 % (depending on type)											
Output												
Nominal output voltage	24 V		48 V		60 V		110 V/125 V		220 V/240 V			
min. voltage	18 V		36 V		45 V		81 V		162 V		additional	
max. voltage float charge	27.6 V		55.2 V		69 V		138 V		276 V		options	
max. voltage charge increase	28.8 V		57.6 V		72 V		144 V		288 V		available	
max. voltage equalising charge	32.4 V		64.8 V		81 V		156 V		312 V		on request	
Usable battery technology	Lead, NiCd, lithium ions (additional options available on request)											
Charging characteristic	IU (in accordance with DIN 41773)											
Static voltage regulation	± 1 %											
Voltage ripple	(without battery) ≤ 5 %, optional ≤ 1 %, battery eliminator according to NEMA PE-5											

Ventilation			**forced ventilation / redundant forced ventilation (three-phase) *2**										
Classification [A]			150	200	300	400	500	600	800	1000	1200	1600	2000
Output voltage	24 V	W x D [mm] *1	600 x 800		800 x 800					1200 x 800	1600 x 800		2000 x 800
		Weight [kg]	380	395	450	495	540	580	665	850	910	1090	1270
	48 V	W x D [mm]	600 x 800		800 x 800				1200 x 800		1600 x 800	2000 x 800	
		Weight [kg]	420	440	515	535	580	630	750	900	1040	1160	1380
	60 V	W x D [mm]	600 x 800		800 x 800				1200 x 800		1600 x 800	2000 x 800	2000 x 1000
		Weight [kg]	430	460	570	650	720	780	950	1050	1175	1300	1550
	110 V/125 V	W x D [mm]	600 x 800		800 x 800		900 x 800		1200 x 800		2000 x 1000		
		Weight [kg]	485	520	620	700	740	850	1050	1450	1600	1750	2200
	220 V/240 V	W x D [mm]	600 x 800		800 x 800		900 x 800		1200 x 1000	1600 x 1000	2000 x 1000		
		Weight [kg]	650	750	900	1000	1200	1350	1650	1980	2180	2620	3270

Ventilation			**natural convection (three-phase) *2**							**natural convection (single-phase) *3**		
Classification [A]			50	100	150	200	300	400	500	25	50	100
Output voltage	24 V	W x D [mm]	600 x 800					800 x 800		600 x 600		
		Weight [kg]	345	365	380	395	450	495	540	250	275	300
	48 V	W x D [mm]	600 x 800				800 x 800			600 x 600		
		Weight [kg]	370	395	420	440	515	535	580	265	290	315
	60 V	W x D [mm]	600 x 800				800 x 800			600 x 600		
		Weight [kg]	380	405	430	460	570	650	720	275	300	325
	110 V/125 V	W x D [mm]	600 x 800				800 x 800		900 x 800	600 x 600		
		Weight [kg]	395	440	485	520	620	700	740	290	315	340
	220 V/240 V	W x D [mm]	600 x 800				800 x 800		900 x 800	600 x 600		-
		Weight [kg]	420	550	650	750	900	1000	1200	315	340	-

General data	
Protection class	IP20 ... IP52 (additional classes available on request)
Operating temperature	-10 … 40 °C (power reduction at higher temperatures)
Storage temperature	-40 … 85 °C
Relative humidity	5 ... 95 % (non-condensing)
Installation height	2000 m (without power reduction) (max. 5000 m)
Cable entry	from below (from above possible on request)
Colour	RAL 7035 (other colours on request)
Sound volume	normally < 65 dBA
Standards	
Safety	EN 62477-1
EMC	EN 61000-6-2; EN 61000-6-4; EN 61000-6-5
	EN 62040-2
Power	EN 60146-1-1; EN 62040-5-3

Options:

- 10” touch display
- Analogue display instruments
- MODBUS, IEC 61850 and many more
- Battery cabinets / distribution cabinets
- Internal and external counter cells
- External battery connection boxes (opt. Ex-d / Ex-de types)
- Decoupling diodes
- Ground fault monitoring
- Parallel operation with and without active load sharing

**1 Measurements *2 Cabinet height = 2000 mm, other dimensions on request. Higher classifications available on request. Subject to technical changes.*

**3 Cabinet height = 1300 mm, other dimensions on request. Subject to technical changes.*

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