

*Advanced charging technology  
for variable applications*



**Fiamm Motive Power  
50 Hz chargers  
Tension Wa  
Tension WoWa  
Tension Wsa 12  
Tension Wsa 8 puls  
Tension Wsa air**

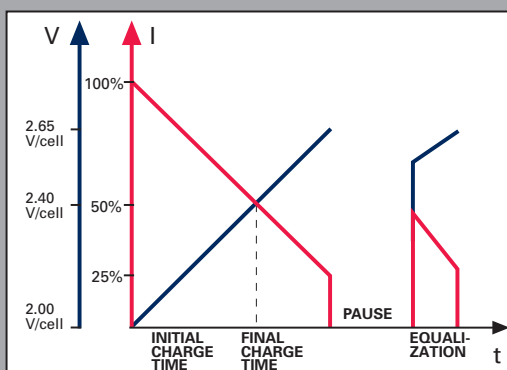
# High added value product

## Fiamm Motive Power 50 Hz chargers

### Optimised charging technology for all applications

In today's market the range of traction batteries on offer for the industrial truck sector is very extensive. Many motive power batteries are designed to meet specific needs and form a coordinated system when paired with a matching charger. To achieve this, charge specifications must also comply with a set of specific requirements. The charging process must take the characteristics and application of the battery into account. This process is a decisive factor for the economic use of the battery. Fiamm Motive Power offers extremely modern charging system for all applications. All chargers are equipped with microprocessor control of the charge cycle. They are protected with a tough outer casing and are of course CE compliant.

Vehicle +  
Battery +  
Charger = 1 System



Wa curve

## Tension Wa

The Fiamm Motive Power charger, Tension Wa (1-phase or 3-phase) is a high added value product at a competitive price. It is especially suitable for basic requirements and single shift operations, i.e. where charging times of 10 hours and more are sufficient.

### Technical specifications

- Power requirements:  
230 V - 50/60 Hz (1-phase); 230/400 V - 50/60 Hz (3-phase)
- Adaptation to mains voltage:  
-4%; +4% (1-phase); -5%; +5% (3-phase)
- Battery voltage:  
12, 24, 36, 48, 72, 80 V (1-phase); 24, 36, 48, 72, 80, 96 V (3-phase)
- Battery capacity range:  
60÷1000 Ah (1-phase); 90÷1050 Ah (3-phase)
- Charging time: 10 - 12 h
- Adjustable final charge time
- Mains and battery cables: supplied, 2.5 m long; optional plugs supplied (specify type when ordering)
- Stray-flux transformer, copper windings with double enamel insulation, class H, impregnated with non-toxic resins, kiln-dried
- EMC protection
- Cables marked in compliance with safety standards

### Safety features

- Mains input (1-phase and 3-phase) and DC output (1-phase and 3-phase) protected by fuses to prevent polarity reversals and/or power surges
- Thermal protection inside the transformer
- Safety cut-out
- Microprocessor control
- Cabinet protection: IP20



# ct at a competitive price

## LED display

- Battery connected
- Indication of state of charge
- Charge completed
- Indication of equalization charge (3-phase)

## Fault information

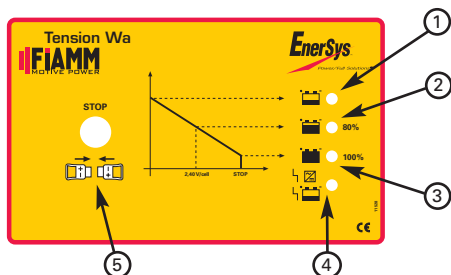
- Charger faults
- Battery faults: the battery has been charged for 10 hours (1-phase) or 9 hours (3-phase) without reaching the gas point. The charger stops automatically

## Features and advantages

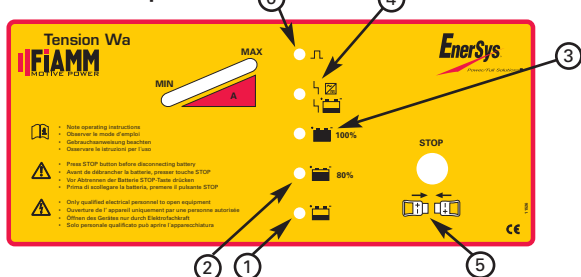
- Proven, non-regulated Wa charge profile for one-shift applications
- LED display for the fast state of charge recognition
- Start of charge, 80% and 100% charge levels and faults are displayed
- Automatic equalization charge programmable at weekend to minimize differences in power within individual cells
- Reliable and fully automatic auto start of the charging process with 5 seconds delay
- Safety cut-out circuit preventing overcharging in the event of a fault
- Fault diagnosis and display via LED
- STOP button enabling interruption of the charge cycle at any stage

## Control panel

Tension Wa (1-phase)



Tension Wa (3-phase)



## Cabinet

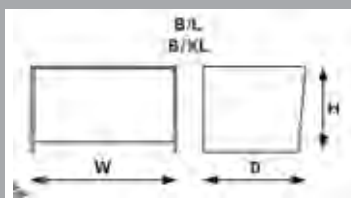
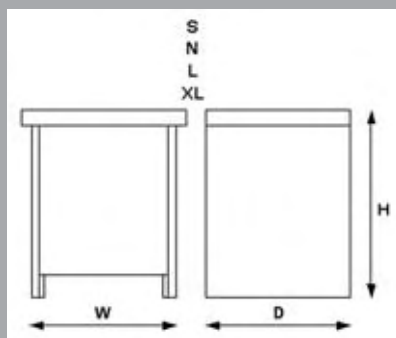
- Epoxy powder coating
- Standard RAL 9005B black and RAL 9010L white

Ref.	Function	Ref.	Function
①	Battery connected / charging	④	Fault
②	Charging final stage (80% of charge)	⑤	ON / OFF button
③	Charge complete	⑥	Equalization charge

## Use

### Fiamm Motive Power energy plus

- For one-shift applications



CABINET TYPE	DIMENSIONS IN mm.		
	Height (H)	Width (W)	Depth (D)
B/L	280	425	270
B/XL	300	500	300
S	800	500	400
N	1000	500	400
L	1100	600	480

# A development of proven technology

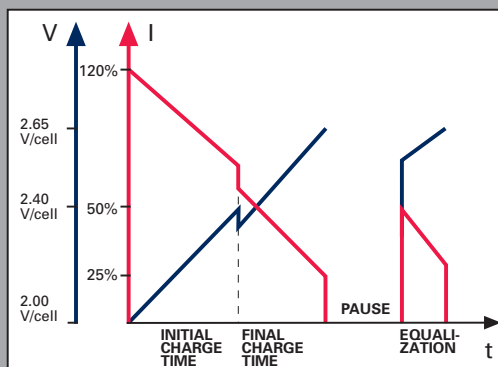
## Tension WoWa

Tension WoWa type chargers from the Fiamm Motive Power range are equipped with an alphanumeric display to indicate various settings and features during the charging process (charge current, battery voltage, returned Ah, diagnostic messages) and offer all the advantages of a powerful microprocessor control combined with intelligent recharge technology. The quantity of energy returned to the battery is displayed. These chargers have an extensive range of programme settings (full charge voltage, charging time, safety cut-out time).

Tension WoWa chargers can recharge a battery in 8 hours with a WoWa profile, enabling the intensive use of the battery.

### Technical specifications

- Power requirements:  
230 V – 50/60 Hz (1-phase); 230/400 V - 50/60 Hz (3-phase)
- Adaptation to mains voltage:  
-4%; +4% (1-phase); -5%; +5% (3-phase)
- Battery voltage:  
24, 36, 48, 72, 80 V (1-phase );  
24, 36, 48, 72, 80, 96 V (3-phase)
- Battery capacity range:  
250÷770 Ah (1-phase); 250÷1650 Ah (3-phase)
- Charging time: 8 h
- Mains and battery cables: supplied, 2.5 m long; optional plugs supplied (specify type when ordering)
- Stray-flux transformer, copper windings with double enamel insulation, class H, impregnated with non-toxic resins, kiln-dried
- EMC protection
- Cables marked in compliance with safety standards



WoWa curve

### Safety features

- Mains input and DC output protected by fuses to prevent polarity reversals and/or power surges
- Thermal protection inside the transformer
- Safety cut-out circuit: after 10 hours (1-phase) or 9 hours (3-phase) without reaching the gas point
- Adjustable final charge time
- Microprocessor control
- Data feedback control
- Cabinet protection: IP20

### Display (LED and LCD)

- Battery connected (LED)
- State of charge (LED)
- Charge completed (LED)
- Equalization charge (LED)
- AC input fault (LCD)
- Thermal protection fault (LCD)
- Safety cut-out time (LCD)
- Faulty rectifier bridge (LCD)
- Battery at maximum end voltage (LCD)



## Features and advantages

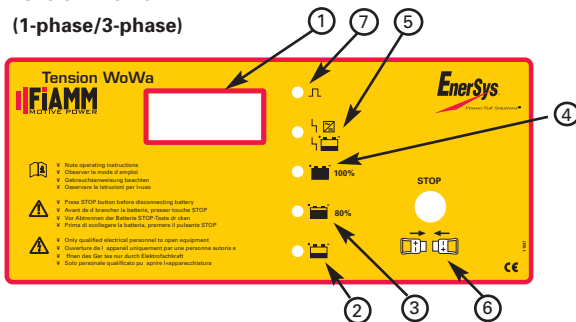
- Proven, non-regulated WoWa charge profile for one-shift and two-shift applications
- LED display for the fast state of charge recognition
- Start of charge, 80% and 100% charge levels, current charging status, equalization charge and faults are displayed via LED
- Automatic equalization charge programmable at weekend to minimize differences in power within individual cells
- Reliable and fully automatic auto start of the charging process with 5 seconds delay
- Safety cut-out circuit preventing overcharging in the event of a fault
- Fault diagnosis via LED and display via LCD
- STOP button enabling interruption of the charge cycle at any stage
- Automatic limit control at 2.40 V/cell
- Recharge adjusted in accordance with the quantity of Ah returned to the battery
- Automatic equalization charge
- Charge setting display:
  - Ah returned to the battery (Ah)
  - total charge time (hr:min)
  - maximum battery voltage (V)
  - maximum initial current (A)

## Cabinet

- Epoxy powder coating
- Standard RAL 9005B black and RAL 9010L white

## Control panel

Tension WoWa  
(1-phase/3-phase)

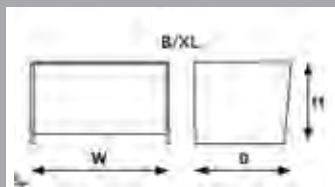
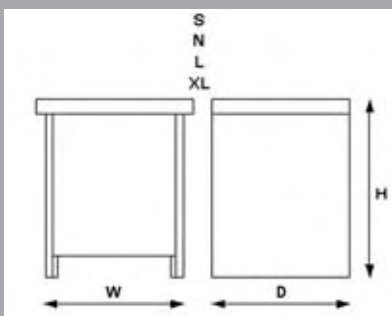


Ref.	Function	Ref.	Function
①	Charger type (voltage / current)	⑤	Fault
②	Battery connected / charging	⑥	ON / OFF button
③	Charging final stage (80% of charge)	⑦	Equalization charge
④	Charge complete		

## Use

### Fiamm Motive Power energy plus

- For one-shift and two-shift applications



CABINET TYPE	DIMENSIONS IN mm.		
	Height (H)	Width (W)	Depth (D)
B/XL	300	500	300
S	800	500	400
N	1000	500	400
L	1100	600	480
XL	1200	700	550

# Effective charging technology for basic applic

## ■ Tension Wsa 12 ■ Tension Wsa 8 puls

Fiamm Motive Power charger Tension Wsa 12, equipped with a Wsa charge profile, is suitable for basic requirements and 1-shift applications, i.e. where a minimum charging time of 10 hours is sufficient. The Fiamm Motive Power charger Tension Wsa 8 puls provides high value technical features. The Wsa-pulse charge profile makes the charger appropriate for 1-shift and 2-shift applications. Charging time assignments range between 7.5 and 10 hours.

### Technical specifications

- Power requirements: 230 V – 50/60 Hz (1-phase); 230/400 V - 50/60 Hz (3-phase)
- Adaptation to mains voltage: - 6%; +6%; +10%
- Battery capacity: 121÷1500 Ah (Wsa 12); 176÷1200 Ah (Wsa 8 puls)
- Charging time: 10 - 14 h (Wsa 12); 7.5 - 10 h (Wsa 8 puls)
- Mains and battery cables: supplied, 3.0 m long, with AC input (Schuko or EEC) and charger plugs
- Stray-flux transformer, copper windings with double enamel insulation, class F, impregnated with non-toxic resins, kiln-dried
- Conformity to EMC directive and EN standard
- Cables according to ZVEI standard

### Applications

- **Tension Wsa 12:**
  - Wsa proven charging characteristics
  - Charging times 10 - 14 hours
  - Applicable in one-shift operations
  - Diffusion pulses at the end of the charge: always an optimised capacity is available
- **Tension Wsa 8 puls:**
  - Wsa puls charging characteristics
  - Charging times 7.5 - 10 hours
  - Applicable also for two shift operations
  - Current pulses during the gassing state: provide a fast and energy saving battery charge

### Features and advantages

- High quality chargers for 1-shift (Wsa 12) and 1- and 2-shift (Wsa 8 puls) applications with effective investment
- Fully automatic charge process: the charge starts automatically 8 seconds after the connection of the battery and a charger's self test. Switching off cannot be forgotten and a charged battery is always available
- Automatic equalization charge: equalization of differences in power inside individual cells to optimise the battery's service life
- Automatic refresh charge: also after long rest times batteries are always fully usable
- Fault diagnosis and safety cut-outs: provide timely detection of faults and protect the battery from damages
- LED display for the fast state of charge recognition
- Automatic charger function test: by pressing the STOP key before the start of the charge an active function test, which will automatically switch over to the battery charge, can be initiated
- Diffusion pulses: an optimised capacity is always available

### Cabinet

- Epoxy powder coating
- Standard RAL 9005B black and RAL 9010L white

Ref.	Function	Ref.	Function
①	Default indication charger/battery	③	Charge complete
②	Battery connected/charging	④	Current pulses/diffusion pulses

### Use

#### Fiamm Motive Power energy plus

- Tension Wsa 12: for one-shift applications
- Tension Wsa 8 puls: for one-shift and two-shift applications

### Control panel

#### Tension Wsa 12



#### Tension Wsa 8 puls





## ■ Tension Wsa air

The Fiamm Motive Power Tension Wsa air charger unifies basic charging technology with the technical features of sophisticated chargers. The proven Fiamm Motive Power Ah – balancing with the special algorithm for the state of charge optimisation warrants a safe full charge for all depths of discharge independent from input voltage fluctuations. Charging times from 6 to 10 hours for 1-and multiple shift operations, as well as opportunity charge and short charging times with airmix for enhanced economy are available.

### ■ Technical specifications

- Power requirements:  
230 V – 50/60 Hz (1-phase); 230/400 V - 50/60 Hz (3-phase)
- Adaptation to mains voltage: - 6% ; +6% ; +10%
- Battery capacity range: 170 ÷ 1200 Ah
- Charging time: 6 - 10 h
- Air pump module for airmix
- Mains and battery cables: supplied, 3.0 m long, with AC input (Schuko or EEC) and charger plugs.
- Stray-flux transformer, copper windings with double enamel insulation, class F, impregnated with non-toxic resins, kiln-dried
- Conformity to EMC directive and EN standard
- Cables according to ZVEI standard

### ■ Features and advantages

- High quality chargers, serially equipped with controls for airmix
- New charger controller, equipped with high quality components for a high reliability and precision
- Fully automatic charge process: the charge start automatically 8 seconds after the connection of the battery and a charger's self test. Switching off cannot be forgotten and a charged battery is always available

- Automatic equalization charge: equalization of differences in power inside individual cells to optimise the battery's service life
- Automatic refresh charge: also after long rest times batteries are always fully usable
- Control for airmix: for enhanced economy, i.e. shorter charging times, and linked with higher battery availability
- Fault diagnosis and safety cut-outs: provide timely detection of faults and protect the battery from damages
- LED display for the fast state of charge recognition
- Automatic charger function test: by pressing the STOP key before the start of the charge an active function test, which will automatically switch over to the battery charge, can be initiated
- Proven Wsa charge profile in compliance with ZVEI: charging times from 6 to 10 hours with airmix for 1-and multiple shift operations, as well as for opportunity charges and short charging times are available

### ■ Cabinet

- Epoxy powder coating
- Standard RAL 9005B black and RAL 9010L white

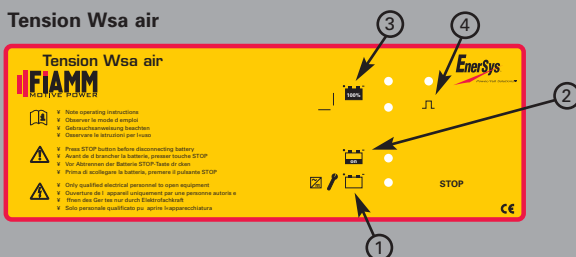
Ref.	Function	Ref.	Function
①	Default indication charger/battery	③	Charge complete
②	Battery connected/charging	④	Current pulses/ diffusion pulses

### ■ Use

#### Fiamm Motive Power energy plus with electrolyte mixing

- For one-shift and two-shift applications

### ■ Control panel



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