Industrial Motors

Commercial & Appliance Motors

Automation

Digital & Systems

Energy

Transmission & Distribution

Coatings

TTW01
Low Voltage Switchgear and Controlgear System

Flexibility and **safety** in electrical distribution and electric motor starters

Driving efficiency and sustainability

SUMMARY


CFW-11
VECTRUS INVERTER
DEFEITO
LIGADO
PAINEL ENERGIZADO
EMERGÊNCIA
DESLIGA LOCAL
LIGA LOCAL

FLEXIBILITY AND SAFETY
IN ELECTRICAL DISTRIBUTION AND ELECTRIC MOTOR STARTERS

Designed for all types of necessities, the TTW01 switchboards meet the requirements of industrial and commercial installations in currents up to 5,000 A. Safety, robustness, flexibility and modularity are characteristics that define the design of these switchboards. Manufactured according to the requirements of IEC 61439 standard, WEG TTW01 switchboards are the ideal solution for low voltage power distribution, circuit and user protection, motor start, control and system monitoring.

- Simplified installation and operations
- Unique reliability of IEC 61439 tested assemblies
- Robust and compact frame
- In compliance with the applicable safety

General characteristics

Safety and robustness - performance assurance

- The TTW01 Low Voltage Switchgear and Controlgear assembly, designed based on WEG Automation's long experience in the field of electrical panels, is manufactured to meet the requirements of IEC 61439 standard
- Robust, easy to assemble and simple to size, the TTWs are manufactured to allow the assembly by panel building companies properly trained by WEG
- Short circuit tests, for example, ensure safe operation for the switchgear or switchboard, preventing the exposure of people to risks during an abnormal event in the electric operation
- The TTW Configurator, available in our website for certified panel builders, is used to simplify the sizing of TTW01 switchboards, providing a preview and a full list of mechanical parts at the end of the TTW01 configuration

Flexible and fast assembly

- The columns are supplied with assembled structure and roof. The closing sheets for front rear and doors are defined by the panel builder and provided by WEG
- The TTW01 consists of interconnected modules designed according to the requirements of the customer's project. These modules can be divided into three groups:
  1. Columns
  2. Busbars
  3. Component kits
- Wide range of mounting kits, allowing a great variety of arrangements
- Option of special assemblies with blank plates for non-standard designed kit
- Conventional starter controlgear or electric drives may be assembled

Design in parts and pieces

The TTW01 was designed to be supplied in parts and pieces, divided into five main items:

1. Structures

Manufactured within the highest quality standards, with steel made structure and metal sheet closings, the TTW01 is divided into 2 types:

01

300 mm wide columns for cable passage and busbar installation

02

700, 850 and 1,000 mm wide columns to install kits and respective electrical control and protection components (functional units)

The functional units are protected by modular and standardized enclosures. For 300 or 700 mm wide columns, the depth may be 600, 800 or 1,000 mm. For 850 mm wide columns, the depth is 800 or 1,000 mm. For 1,000 mm wide columns, the depth must also be 1,000 mm and it is exclusively for configurations with ABW63 air circuit breakers with 5,000 A busbar. The structure frame, base and roof are pre-assembled at the factory, saving time and labor. The 200 mm high base is composed of removable covers, providing flexibility for the passage of input/output cables and simplifying the installation of the panel in different environments.

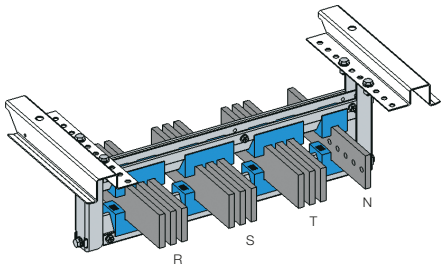
Design in parts and pieces

2. Busbars

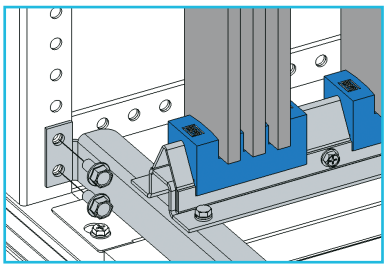
The TTW01 busbars were sized for 1,000, 2,000, 3,150, 4,000 and 5,000 A. The connections between the vertical busbar and the functional units are made without the need of drilling, providing it a quick and flexible assembly.

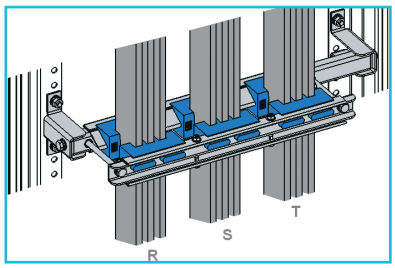
As a standard WEG design the busbars according to the following concepts:

- Connections above 250 A are made via pre-assembled busbars
- Connections equal to or below 250 A via cables are made by the TTW panel builder (WEG does not supply the cables)

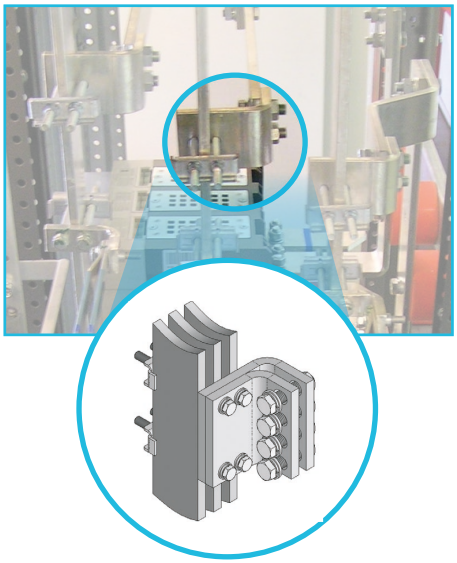


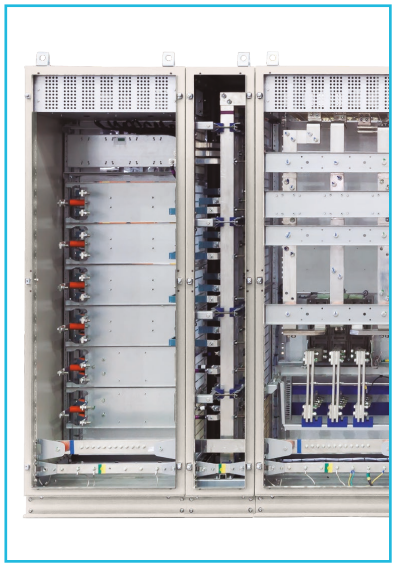
Main horizontal busbar





Main vertical busbar





No hole is required for connections with the main busbar

Note: busbars are made of electrolytic copper (99.9% pure) with 8 µm tin-coating. This coating allows additional 15 degrees of temperature variation in bar-to-bar connections and it increases the performance of the connections.
In addition, no special efforts are necessary when making the connections. For example, application of paste or a similar product to eliminate the presence of oxygen in copper-to-copper connections to avoid oxidation. Oxidation on copper generates an insulating film that compromises electrical connections.
Busbars are also available in other formats for greater flexibility in configurations: Auxiliary busbars, non-separated busbars for form 1, connections with BWW04 busway, busbars for the output terminals of circuit breakers

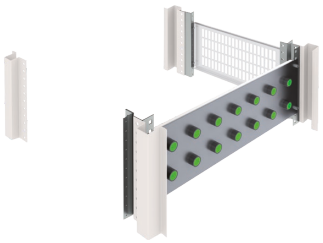
Design in parts and pieces

3. Mechanical assembly kits and accessories

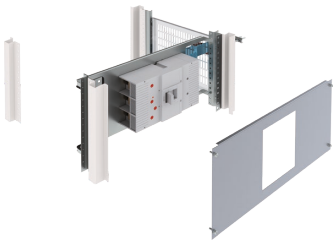
Several customized arrangements are available for the instalation of controlgear, switchgear and circuit protection devices.

Some of the available configurations:

- Mounting kits for single ou multiple DWA/DWB circuit breakers from 16 A up to 1,600 A, mounted vertically and horizontally
- Mounting kits for ACW circuit breakers from 100 to 1,600 A
- Mounting kits for AGW circuit breakers from 100 to 800 A
- Mounting kits for fuse switch-disconnector
- Blank plates for non-standardized kits
- Kits for ABW air circuit breakers in various configurations, including multiple feeders and bus coupler
- Kits for MMW multimeters, PFW03 automatic power factor controllers and other measuring equipment, such as ammeters and voltmeters
- Motor protection and control mounting kits as indicated below:
  - MPW18 + CWC7 9, 12, 16
  - MPW40 + CWM9, 25, 32 or CWB9, 12, 18, 25, 32 and 38
- Mounting kits for lighting and socket circuits with miniature circuit breakers, surge suppressors and RCD
- Power factor correction kits designed for installing capacitors, circuit breakers or fuse switch-disconnectors and contactors

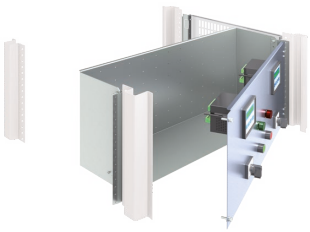


Kit for the CSW line

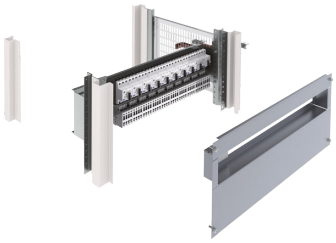


DWB800 Kit

Kit for 2x ABW air circuit breakers



Control kit

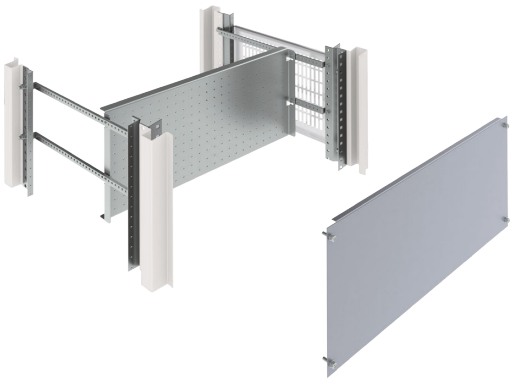


MPW + CWC/CWB kit

PFC - UCWT + CWBC + Protection kit

4. Mounting plate kits

Developed in several sizes, with depth adjusment, for instalation of non-standard equipment.



Design in parts and pieces

5. Motor starter kits with drives and smart relay

Available in a variety of custom-made arrangements to install motor drive and control equipment, such as VSDs, soft-starters and smart relays, in addition to circuit protection.
Motor starter kits are compatible with the same structures and busbars of the distribution kits.
It is possible to use one or more drives in the same column depending on the configuration, with options of ventilation systems for proper thermal dissipation.

Some of the available configurations:

- Kits for CFW300, CFW500, CFW11 e CFW900 VSD lines:
  for assembling the VSD, motor-protective circuit breaker or fuse switch-disconnector, control circuit and, on the front, faceplates for HMI, pushbuttons and pilot lights, and external handle of the circuit breaker or switch-disconnector.

- Kits for SSW07 and SSW900 soft-starter lines:
  for assembling the soft-starter, circuit breaker or fuse switch-disconnector, control circuit and, on the front, faceplates for HMI, pushbuttons and pilot lights, and external handle of the circuit breaker or switch-disconnector.

- Kits for motor starters with SRW01 smart relay:
  for assembling smart direct-on-line starters with SRW01, motor-protective circuit breaker, contactor and, on the front, faceplates for HMI, pushbuttons and pilot lights, and external handle of the circuit breaker.

- Options for ventilation sets, reactors and other accessories.

- Duct kits for communication cable passage, to keep them apart from the power cables, avoiding interference in the communication in some applications, for example, programmable logic controllers, energy analyzers, WEG Drive Scan, WEG Edge Devices.

- The TTW01 modular kits allow the installation of the devices capable of collecting and transmitting data to WEG Digital Solutions' energy, process and asset management systems and platforms.

Access to control

Kits and connections

Cooling system

WEGdigital
SOLUTIONS

A new way to combine people, companies and smart products.

We have formatted all of our expertise and provided the market with a new way of combining people, companies, software and smart products, producing a global solution that transforms energy into more reliable, efficient and smart solutions.

Regardless of the size of your industry, we can help you:

Scalable and Flexible Solutions

- Easy implementation regardless of the industry characteristics.
- Flexible, customized solution.

WEG Expertise

- We can help increase the operating efficiency of our partners and reduce waste of the various industrial processes.

Co-working

- We assist in the transition from traditional industry to Industry 4.0.
- We share technologies and experiences for your business.

Want to know more about WDi products and solutions?

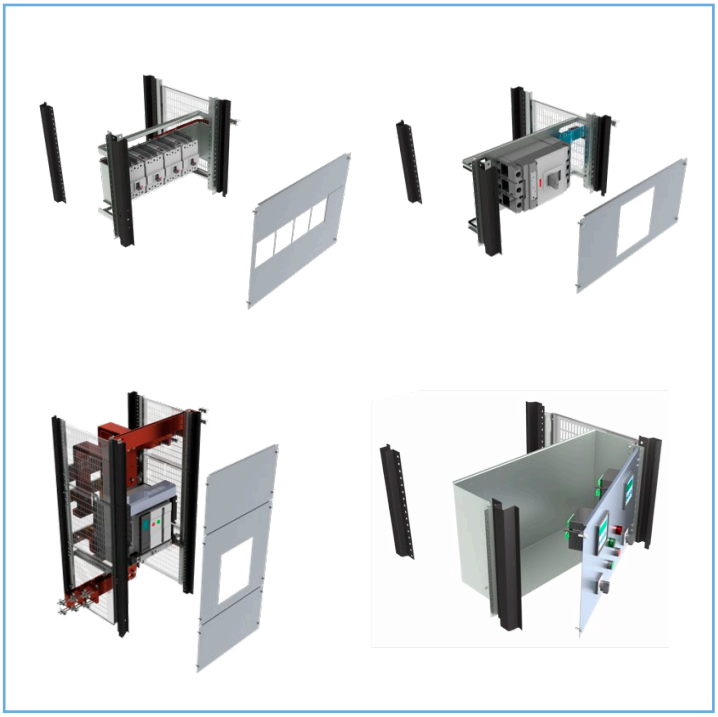
- Wegnology Platform
- WEG Smart Machine
- WEG Energy Management
- PC-Factory OEE
- PC-Factory MES
- PC-Factory IoT
- Intelligenceware Suite
- Advanced Pid Tuning
- Industrial Analytics
- B-Wise Historian
- B-Cloud
- Smart Public Lightning Management

To learn more, access or click here

Benefits of the TTW01 line

Structure and finishing

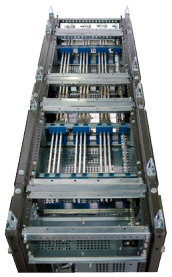
- Assembled frame supplied by WEG: reduced panel assembly time
- Protection degree up to IP55: guranteed performance in different environments — commercial and/or industrial
- Modularity and flexibility to choose the best switchboard design
- Customized mechanical kits for assembling WEG electrical components:
  - Easy and quick installation of the components
  - Shorter assembly time
- Complete mechanical kits composed of brackets, screws, nuts, washers: simple installation without requiring additional assembly materials, reducing costs and assembly time
- Polyester powder coating applied by electrostatic process, minimum thickness of 80 µm: guaranteed quality and durability of the set
- Painting plan according to requirements of specific standards — Adhesion degree (NBR 11003), Resistance to immersion in deionized water (ASTM D870), Salt spray test (ASTM B117), Resistance to SO_2 (DIN 50018), Resistance to UV-A (ASTM D4587):
  - Ensures longer life span without peeling and loss of coating along its life
  - Cabinet and parts protected against corrosive agents
  - Excellent protection in industrial environments
  - Ensures switchboard protection in case of exposure to the sun
- Standard color (RAL 7035) and optional colors Gray RAL 7032, Gray MUNSELL N6.5 and White RAL 9003: flexibility to choose the finishing color
- Antimicrobial paint: certified according to JIS Z 2801:2012 (Japanese Industrial Standards: Antimicrobial products – Test for antimicrobial activity and efficacy)
  - Reduction and non-proliferation of aggressive microorganisms to the human being
  - Application: hospital environments and food processing industries

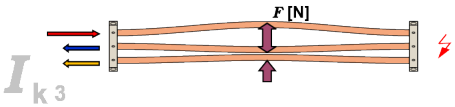


Benefits of the TTW01 line

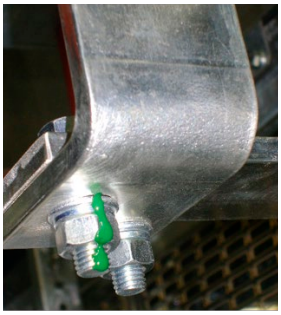
WEG busbar kits

- Tin coated buses:
  - Better performance of electrical connections
  - Prevents copper oxidation
- Customized busbars (drilled and bended in the right fit for assembly):
  - Eliminates losses and waste in the assembly stage
  - Reduction of up to 70% in the assembly time
  - Reduces material and labor costs
- Optimized and specially sized insulators and fasteners for the switchboard:
  - Ensures the switchboard performance against the dynamic effects of short-circuit currents
  - Reduces labor costs

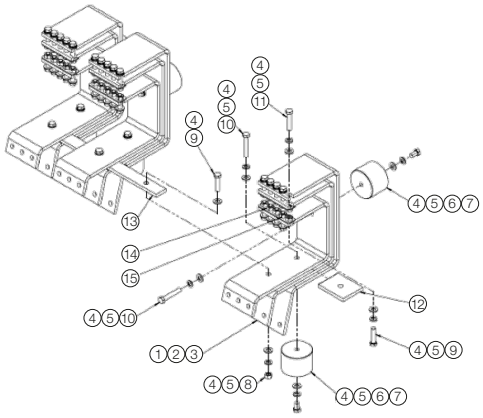


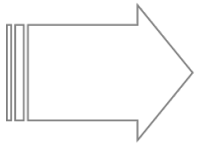


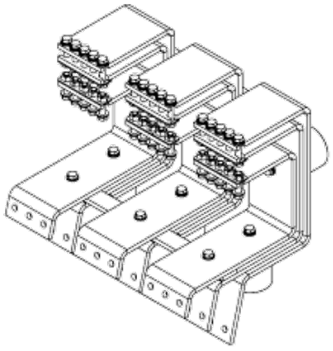
Ilustration of dinamic forces between busbars under a short circuit



Busbar assemblies details



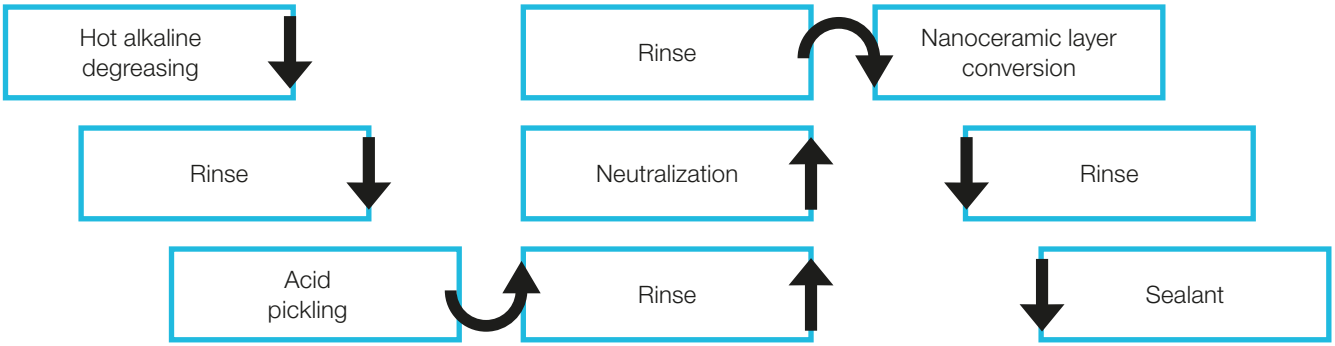




Exemple of busbar exploded view

Preparation and finishing

Executed within strict quality control, the procedure is as it follows:



The quality, strength and durability of the coating are guaranteed by the following tests:

Adhesion degree

Testing reference and standard: NBR 11003
Acceptance criteria: X1Y1
Purpose: identify paint adhesion flaws

Salt spray test

Testing reference and standard: ASTM B117
Acceptance criteria: 500 hours
Purpose: evaluate the paint performance under accelerated corrosion condition

Resistance to SO_2

Testing reference and standard: DIN 50018
Acceptance criteria: 15 cycles / 24 hours
Purpose: evaluate the paint performance in industrial atmospheres

Resistance to immersion in distilled water

Testing reference and standard: ASTM D870
Acceptance criteria: 24 hours
Purpose: evaluate the resistance of the paint in deionized water

Resistance to UV-A

Testing reference and standard: ASTM D4587
Acceptance criteria: 500 hours
Purpose: evaluate the resistance of the painting to sun exposure

Finishing

Panel type	Frame	Door	Walls	Mounting kits	Protection against accidental touch
Self-supported	RAL 7035	RAL 7035	RAL 7035	Galvanized metal plate	Galvanized metal plate

Note: optional colors: gray RAL 7032, gray Munsell N6.5 and white RAL 9003.

Testing

To ensure safety, performance and reliability, electrical panels must be subjected to type testing, verification procedures and routine testing according to the guidelines of IEC 61439-1/2/3. Type tests, which are conducted by the original manufacturer and are mostly destructive, check the structure and performance of the panel. Routine tests, which are carried out by the panel builder after the assembly, check the requirements conformance established in the design.

Type tests

No.	Characteristic to be checked
1	Resistance of materials and parts:
	- Corrosion resistance
	Properties of the insulating materials:
	- Thermal stability
	- Resistance of the insulating material to abnormal heat and fire due to the internal electrical effects
	Resistance to ultraviolet radiation (UV)
	Hoisting
	Mechanical impact
	Marking
2	Enclosure protection rating
3	Clearance distances
4	Creepage distances
5	Protection against electric shock and integrity of the protection circuits:
	- Effective continuity between exposed conductive parts of the ASSEMBLY and the protection circuit
	- Short circuit withstand capacity of the protection circuit
6	Switchgear and component integration
7	Internal electrical circuits and connections
8	Terminals for external conductors
9	Dielectric properties:
	- Withstand voltage at industrial frequency
	- Impulse withstand voltage
10	Temperature rise limits
11	Short circuit withstand capacity
12	Electromagnetic compatibility (EMC)

Routine tests

No.	Characteristic to be checked	
1	Construction verification	Protection degree check
		Check of clearance and creepage distances
		Check of protections against electric shock and integrity of the protection circuits
2	Protection	Check of the built-in component integration
		Check of internal electrical circuits and connections
		Check of the terminals for external conductors
		Mechanical operation check
3	Electrical checks	Dielectric properties
		Cabling, operating performance and function

Applications

With innovative technology and modern design, the TTW01 is ideal for your requirements. Its flexible design allows assemblies that meet a great variety of electrical system requirements.

Shopping centers

Hospitals

Commercial buildings

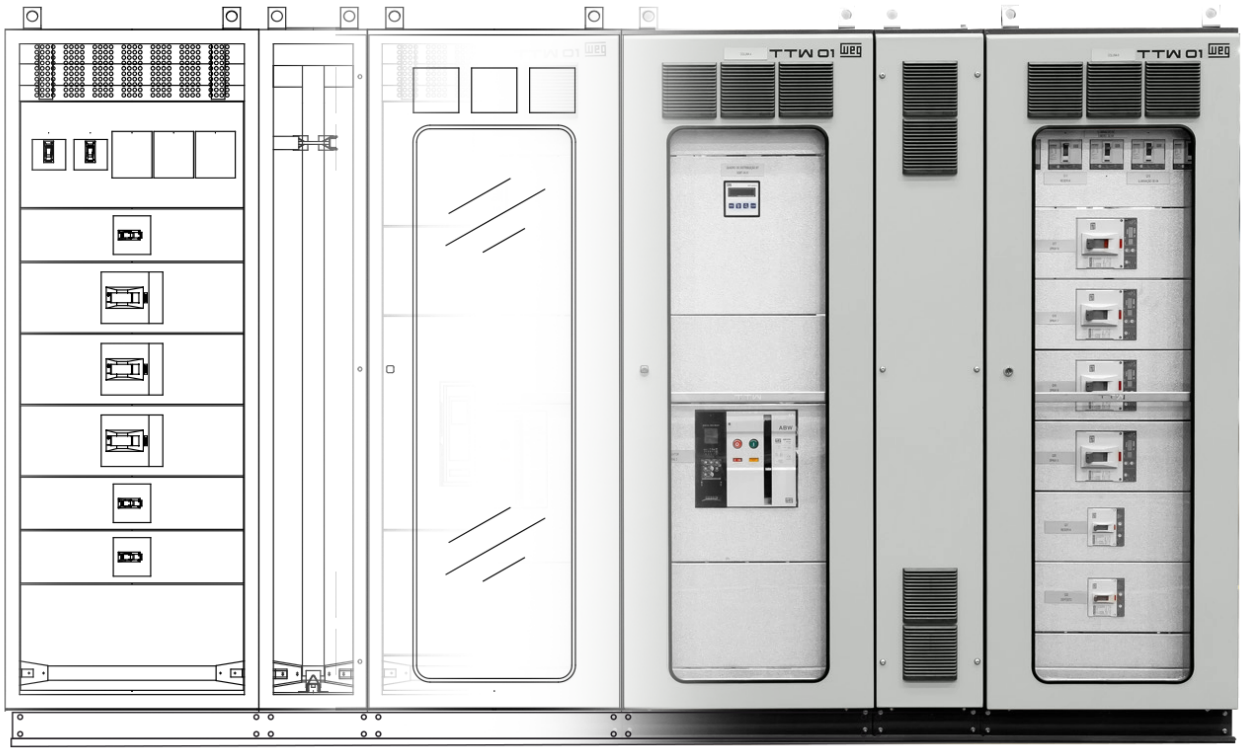
Large buildings

Sanitation

Telecommunication and datacenter

TTW01 configurator

As a complementary design tool of the TTW01, WEG developed the TTW01 configurator, which allows the sizing of every mechanical part of the switchboard.
Easy to access and use, it is a free tool available on our website to all TTW panel builders.
This configuration software allows the TTW panel builder to design the switchboard and have a list of materials and a layout of the switchboard. Thus, errors are eliminated, and the characteristics required by IEC 61439 standard are maintained.



The TTW configurator is accessed directly on the website *www.weg.net*.
It is necessary to be a TTW panel builder and be registered in the WEG e-commerce system with the respective login to access the TTW configurator.
At the end of a TTW switchboard configuration, the following elements are available:

- List of materials - mechanical and electrical parts
- Technical data
- 2D drawings in .dwg
- Its is possible to transfer the above characteristics to the e-commerce procurement system. For quoting or purchasing of these materials

Technical characteristics

Technical data

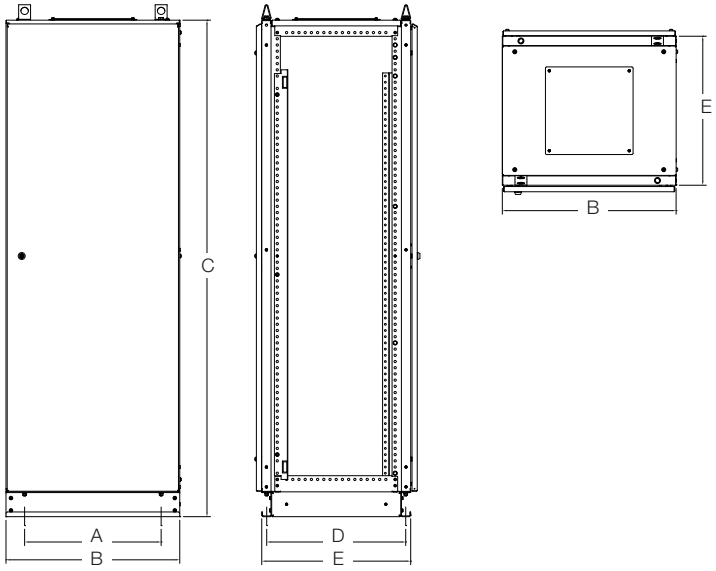
Rated insulation voltage (U_i)		1,000 VAC
Rated short-time withstand current (Icw)		65 kA rms/1 s; 80 kA ms/0.3 s[1)]
Rated continuous duty current (In)		Up to 5,000 A
Access		Front and rear
Internal separation forms		1, 2b and 3b
Dimensions	Width	300, 700, 850 and 1,000 mm
	Depth	600, 800 and 1,000 mm
	Height	2,000 mm (with 100 mm base)
		2,300 mm (with 100 mm base)
Rated operational voltage (Ue)		220, 380, 440, 460, 480 VAC
Rated impulse withstand voltage (U_{imp}) 1.2/50 µs		Switchboard with miniature circuit breakers = 4 kV
		Switchboard with motor-protective circuit breaker = 6 kV
		Switchboard with molded-case and air circuit breakers = 8 kV
Dielectric voltage withstand test, 60 Hz 1min		Switchboard with miniature circuit breakers = 1,890 V
		Switchboard without miniature circuit breakers = 2,200 V
Applicable standards		IEC 61439-1/2
Finishing		Frame: epoxy powder coating RAL 7035 (80 µm)
		Walls: epoxy powder coating RAL 7035 (80 µm)
		Internal brackets and faceplates: aluzinc plate
Protection degree		IP20, IP30, IP42, IP55
Resistance to mechanical shocks		IK10
Ambient temperature		Minimum: -5 °C Maximum: 40 °C
Altitude		< 2,000 m above sea level

Nota: 1) Rated short-time withstand current (Icw) will be limited by the supported level of the general circuit breaker of the set

Plate thicknesses

Panel type	Frame (mm)	Door (mm)	Rear walls (mm)	Side walls (mm)	Internal faceplates (mm)
TTW01 - Column H = 2,000 mm	1.5 (16 MSG)	1.9 (14 MSG)	0.9 (20 MSG)	1.5 (16 MSG)	1.5 (16 MSG)
TTW01 - Column H = 2,300 mm	1.9 (14 MSG)	1.9 (14 MSG)	0.9 (20 MSG)	1.5 (16 MSG)	0.9 (20 MSG)

Dimensions

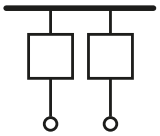
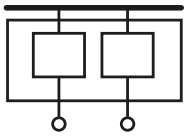
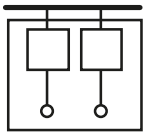
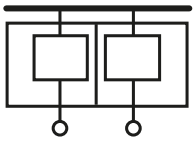
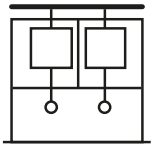
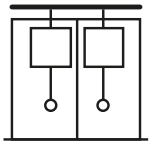
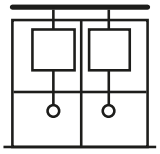


	2,300 x 1,000 x 1,000	2,300 x 850 x 1,000	2,300 x 700 x 1,000	2,300 x 1,000 x 800	2,300 x 850 x 800	2,300 x 700 x 800	2,300 x 300 x 800	2,300 x 700 x 600	2,300 x 300 x 600	2,000 x 700 x 600	2,000 x 300 x 600
A	850	700	550	850	700	550	200	550	200	550	200
B	1,000	850	700	1,000	850	700	300	700	300	700	300
C	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,000	2,000
D	960	960	960	760	760	760	760	560	560	560	560
E	1,000	1,000	1,000	800	800	800	800	600	600	600	600

Note: height, width and depth dimensions in millimeters.

Annex 1 - Forms of internal separation of an electric switchboard

Internal separatins according to IEC 61.439-2 standard:

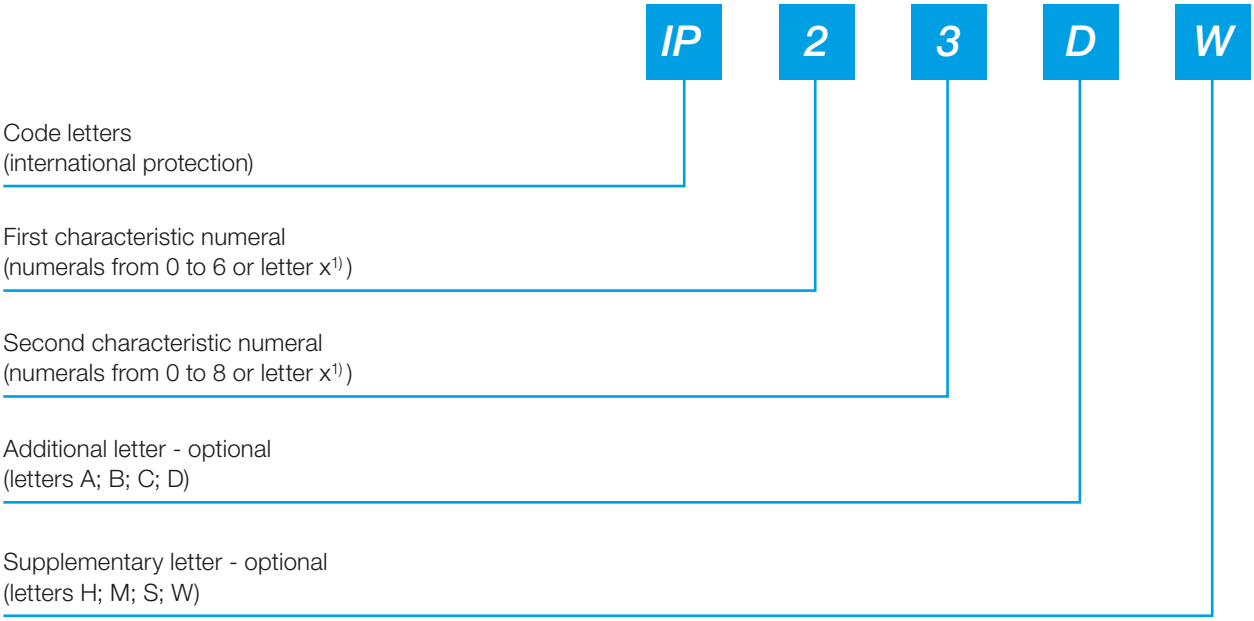
Main criteria	Sub-criteria	Form	
No separation.		Form 1	
Separation of busbars from the functional units.	Terminals for external conductors not separated from the busbar.	Form 2a	
	Terminals for external conductors separated from the busbar.	Form 2b	
Separation of busbars from the functional units and separation of all functional units from one another. Separation of terminals for external conductors from the functional units, but not from each other.	Terminals for external conductors not separated from the busbar.	Form 3a	
	Terminals for external conductors separated from the busbar.	Form 3b	
Separation of busbars from the functional units and separation of all functional units from one another, including the terminals for external conductors which are part of the functional unit.	Terminals for external conductors in the same compartment as associated functional unit.	Form 4a	
	Terminals for external conductors not in the same compartment as the associated functional unit, but in individual, separate, enclosed protected spaces or compartments.	Form 4b	

Annex 2 - Protection rating in electrical equipment (IP)

The protection degree defines the level of protection provided by an enclosure against access to dangerous parts, against the ingress of foreign solid objects and/or against water penetration, verified through standardized testing methods.
With the IEC 61439 standard we have a system to classify these protection ratings.
The protection degrees aim at:

- Protecting people against access to dangerous parts inside the enclosure
- Protecting equipment inside the enclosure against the ingress of objects
- Protecting equipment inside the enclosure against damages due to the ingress of water

To identify the protection degree, we use IP codes.
The identification of these codes follows the coding below:



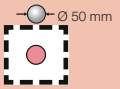
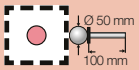
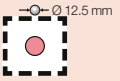
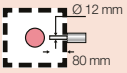
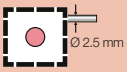
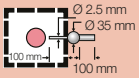
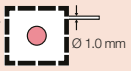
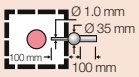
Note: 1) Letter "x" must be used where the specification of a characteristic numeral is not required.

Annex 2 - Protection rating in electrical equipment (IP)

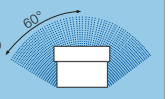
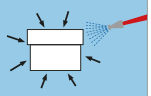
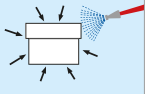
To identify the numerals that will compose the IP code, IEC 61439 standard defines criteria as follows:

IP **2** **3** **C** **W**

1st characteristic numeral:
Protection against ingress of solid foreign bodies and access to hazardous parts

	Indication related to equipment protection	Indication related to the protection of people
0	Not protected	Not protected
1	Protection against solid objects larger than 50 mm 	Protection against access with the back of the hand 
2	Protection against solid objects larger than 12.5 mm 	Protection against access with a finger 
3	Protection against solid objects larger than 2.5 mm 	Protection against access with a tool 
4	Protection against solid objects larger than 1 mm 	Protection against access with a wire 
5	Dust protection (limited ingress is allowed, no harmful deposit imparing safety) 	
6	Full protection against ingress of dust 	

2st characteristic numeral:
Protection against liquids

	Indication related to equipment protection
0	Not protected
1	Protection against vertically falling drops of water 
2	Protection against up to 15° angled falling drops of water 
3	Protection against up to 60° angled rain 
4	Protection against splashing from any direction 
5	Protection against water jets (low pressure) from any direction 
6	Protection against strong jets of water 
7	Temporary protection against the effects of immersion (immersion between 15 cm and 1 m) 
8	Protection against the effects of submersion (prolonged immersion under pressure)

Additional letter (optional)
Indication concerning protection of people against access to dangerous parts

A	Protection against access with the back of the hand (used in IP 0X protections)
B	Protection against access with a finger (used in IP 0X, and IP 1X protections)
C	Protection against access with a tool (used in IP 0X, IP 1X and IP 2X protections)
D	Protection against access with a wire (used in IP 0X, IP 1X, IP 2X and IP 3X protections)

* To be used when:
- The effective protection against contact with dangerous parts is greater than that indicated by the first characteristic numeral, or when only protection against contact with dangerous parts is indicated (first numeral replaced by "X").

Supplementary letter (optional)
Supplementary information

H	High-voltage equipment
M	Tested against harmful effects of water ingress with moving devices
S	Tested against harmful effects of water ingress under stationary conditions
W	Recommended for use in specified atmospheric conditions

Notes

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Cod: 50048500 | Rev: 04 | Date (m/y): 04/2024.