

# **TRACK SHOES**







#### TRIUMPHAL PRECISION ENGINEERING (ZHEJIANG) LTD.

Triumphal Group incorporated in 1977 and with over 30 years of thriving performance, the Group has grown from a single spare parts retailing business to an importing and wholesaling operation. It has also evolved into a resilient and dynamic group with growing international presence and expanding manufacturing facilities. The Group has now emerged as one of the prominent manufacturers and distributors of heavy machinery spare parts globally.

Triumphal Precision Engineering (Zhejiang) Ltd ("TPE") is a wholly owned subsidiary of Triumphal Associates Sdn Bhd ("Triumphal Group").

TPE being the crème and premier company within the Group is located at Zhejiang, China and built on a land area of 52,000 square meters.

To enhance the competitiveness and quality of our products and to also cater for the growing demand, the Group has injected various resources in developing a modern manufacturing plant together with the equipment, on-line quality checking tools, advance and precision production facilities, heat treatment facilities and capability for producing 2,500 tons of Track Shoes per month and 1,000 tons of GET per month.



TGW, which stands for Triumphal Group Worldwide is the brand identity for GET and Track Shoes produced by TPE. To date, TPE has more than 1,000 types of Track Shoes in its production range.





## > Description

Track Shoes as part of the undercarriage system is widely consumed in heavy machinery of various industries such as,

- Mining
- Construction
- Agriculture
- Logging

Track Shoes are applied to many conveyor systems to transport massive heavy abrasive particles in many areas where pertinent and are strongly dependable on its wear resistance, strength and ductility.

Track Shoes make direct contact with abrasive particles such as rocks and sand. It works under extreme, heavy load environment. The life and performance of Track Shoes is strongly dependable on its wear resistance, strength, and ductility.

TGW Track Shoes are designed and manufactured to customize and cater to meet high OEM industry standard.



Figure 1: Single Grouser Track Shoes with Clip Corner



Figure 2: Triple Grouser Track Shoes - Bend



Figure 3: Triple Grouser Track Shoes



Figure 4: Double Grouser Track Shoes



Figure 5: Special Track Shoes for Conveyor System

#### > Types of Track Shoe

Track Shoes profiles has its main three category of Single Grouser, Double grousers and Triple grousers. In addition to the three there are customized profiles for special needs and application. These profiles are as follow,: -



Figure 6: Single Grouser Profile – T type







Figure 9: Special Profile – M Type

In most cases, application for Single grouser is on Dozers, Double grousers is on Pavers and Triple grousers is on Excavators.

## > Materials and Mechanical Properties

TGW Track Shoes are made from Boron Steel that are heat treated and hardened to improve its lifespan while meeting the demanding requirements of earthmoving and mining applications.

#### **Boron Steel**

Boron Steel is the recommended material for high end application. They are best used under harsh and highly abrasive working condition. All boron materials would undergo heat treatment hardening process to enhance its mechanical properties such as hardness, tensile strength, and impact. By achieving the optimum combination between hardness (abrasiveness and wearability), tensile strength and impact (toughness and strength), TGW Track Shoes provides excellent life span under the harsh and adverse working conditions and environment. TGW offers three

types of Boron Steel with the following material specifications and mechanical properties:

Material Chemical Propertie	Boron Steel TM231	Boron Steel TM251	Boron Steel TM252
s			
%			
С	0.20-0.27	0.23-0.28	0.23-0.28
Si	0.150-0.300	0.15-0.35	0.15-0.35
Mn	0.800-1.100	1.100-1.300	1.000-1.300
Р	≤0.030	≤0.030	≤0.025
S	≤0.015	≤0.015	≤0.015
Cr	0.100-0.200	0.300-0.500	0.100-0.350
В	0.0005-0.0030	0.0005-0.0030	0.0005-0.0030

Machanical	Boron	Boron	Boron
Bronortico	Steel	Steel	Steel
Properties	TM231	TM251	TM252
Hardness	HRC 44-51	HRC 44-51	HRC 44-51
Tensile	≥	≥	≥
Strength	1,373MPa	1,373MPa	1,373MPa
Impact @	≥	≥	≥
20°C, Ku	68.6J/cm <sup>2</sup>	68.6J/cm <sup>2</sup>	68.6J/cm <sup>2</sup>

## Production Technology

TGW uses automation technology in its production line from raw material loading, cutting, punching, to heat treatment. With the support of multiple robotic arms, highly integrated conveyor systems and machines, these processes require minimum human intervention.







Figure 10: Material Loading and Conveyor Systems



Figure 11: Continuous Punching



Figure 12: Automated Palleting After Punching

TPE has the technical capabilities and facilities available to cater for different types of heat treatment requirements. It is also worthwhile to note that all heat treated products will go through a stress relieving process, i.e. tempering process, to optimize the mechanical properties of each product and provide balance between the mechanical properties which include wear resistance, strength and etc.

TGW applies full furnace heat treatment

technology which heats the entire piece of product thoroughly, and subsequently improves the product's performance significantly.



Figure 13: Track Shoes Full Furnace Hardening

### Research and Development

TPE possesses the capability to develop new materials and new products thanks to the facilities in its Research and Development Center as well as close cooperation with steel mills and its customers.

TPE has a laboratory that equipped with various types of testing equipment which includes CMM, 2-Dimensional Projector, spectrometer, HRC, HB, HV Hardness Tester, Tensile Strength Tester, Impact Test Tester, and Metallographic analysis while working closely with other testing and certified companies.



Figure 14: HRC Hardness Test









Figure 15: 2-Dimensional Projector

#### > Hardness

Hardness is the measurement of the resistance of metal to plastic deformation or the resistance of a substance being scratched by another substance. There are several popular hardness measurement scales used across the industries such as HRC (Rockwell), HV (Vickers) and HB (Brinell). In general, the product with higher hardness would have greater wear resistance (longer wear life). TGW uses only HRC as a measuring scale and the test is carried out in accordance to ISO6508-1:1999 (GB/T 230.1-2004). As mentioned previously, all TGW Track Shoes are hardened via full furnace hardening process, to achieve a hardness of HRC 44-51. This allows the product to have extraordinary wear life, even in highly abrasive working environment which includes mining sector.

## > Tensile Strength

Tensile Strength is defined as the maximum stress or load that a material can withstand while being stretched or pulled before it fails or breaks. In general, a product with higher tensile strength could sustain a greater load or stress before it breaks. The test is carried out in accordance to ISO6892:1998 (GB/T228-2002). Heat treatment process improves not only the hardness of Track Shoes, it improves the strength of the product as well. High tensile strength properties of TGW Track Shoes allow it to work perfectly even under extremely severe working conditions.

#### Impact Energy

Impact is a high force or shock applied over a short period of time during the collision of two bodies. Impact energy is the amount of energy absorbed by the material during fracture. In TGW, impact energy is measured by performing Charpy U-notch Test in accordance to ISO148-1:2006 (GB/T 229-2007). While heat treatment improves the hardness and strength of the products, it reduces the impact properties of the product at the same time. So, the control of impact energy is one of the critical parts in the production line. TGW is able to keep the Track Shoes impact properties while improving the hardness and strength of the products.





Contact us for further information.



## Triumphal Precision Engineering (Zhejiang) Ltd. (Manufacturing)

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