INSTRUCTION MANUAL

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ELECTRO MAGNET

⊙ TMR TYPE

⊙ TML TYPE

⊙ TMB TYPE

⊙ TMS TYPE

HANMI TECHWIN
(FORMER, T.H. ELEMA ENG. CO., LTD.)
TEL : +82-31-498-9270
FAX : +82-31-498-9270

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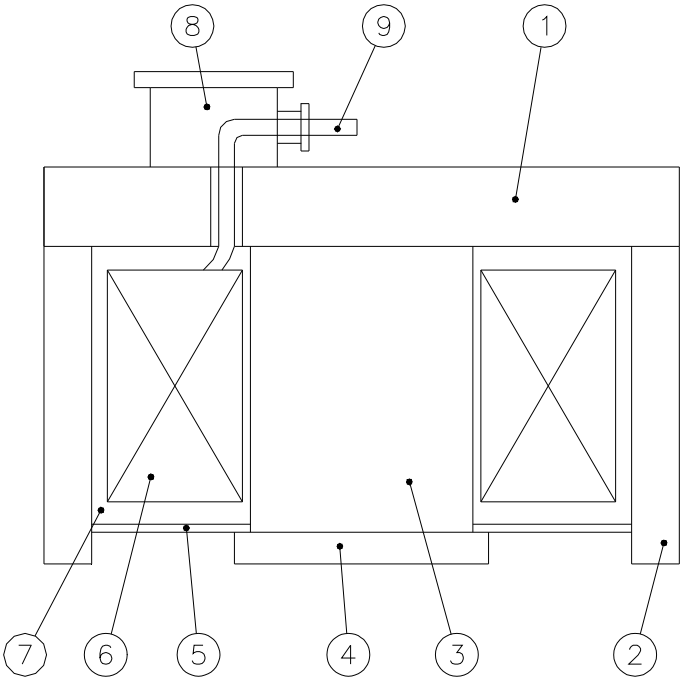
1. Introduction

Hanmi Techwin's electromagnets are products that are designed and manufactured For long service with experience in the engineering and manufacturing of electro magnets. If handling is not correct, it may be considerably affected in performance and life. To allow electromagnets to perform for the best results, read this manual thoroughly before proceeding with their operation and maintenance.

2. Construction

Electromagnets are totally welded structure. The yoke and poles that comprise. The magnetic circuit are of approved quality steel or low carbon contained cast steel. The coil is of highly heat and wear resistive enamel coated Copper wire or NOMEX paper insulated Aluminum wire, and is contained in the hermetically closed yoke. The coil protection plate is made of high-wear resistive non-magnetic stainless steel.



① Upper Plate
② Yoke
③ Pole
④ Pole Shoe
⑤ Coil Protection Plate
⑥ Coil
⑦ Resin
⑧ Terminal Box
⑨ Lead Cable

Figure 1. Construction of the Electromagnets

The electromagnets are available in rectangular and round configuration. Servicewise, the rectangular magnets classified for handling of steel plates, bundled products, and billets, and the other is for handling scraps and occasionally slabs.

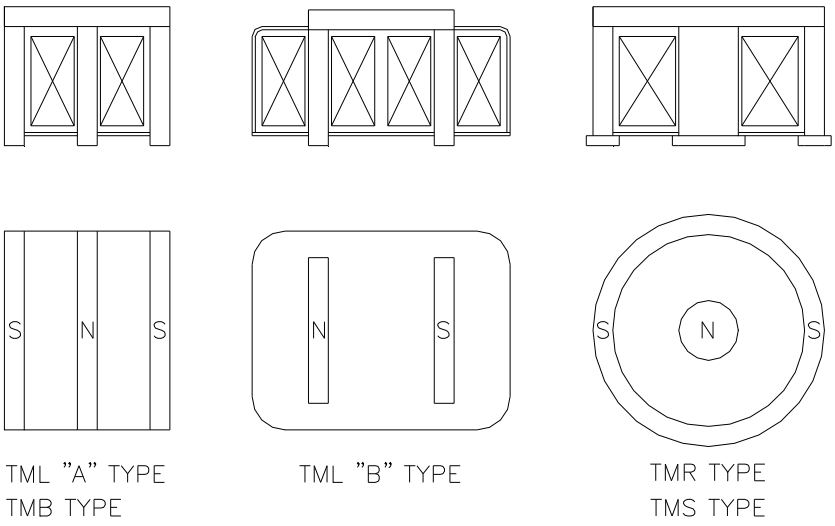


Figure 2. Construction and pole arrangement of the Electromagnets

3. Electrical Characteristics

1) Rating

The term 50%ED is used to express usual operation, which means that the ratio of a total of exciting period to the entire operating period is 50%. The exciting period for the electromagnets are from lifting the load to releasing it at the given destination. The period for the electromagnets to return to their original position is not included in the exciting period.

One cycle time is set at no longer than minutes at the standard.

The electromagnets are so designed that the temperature rise is saturated despite of continuous use, thus protection of coil against heat damage and insulation against deterioration are added to the design.

When operated under a severe condition with the efficiency rate in excess of 50% ED at rated voltage, the electromagnets have a heated coil. When such a situation is developed, the electromagnets are not only degraded in lifting capacity but also may have damaged coil as a direct result.

Therefore, care must be used to prevent such situation.

1) Voltage and Current

DC power is required to operate the electromagnets. The electromagnets in this manual employ a constant voltage On-Off system, unless otherwise specified. If the electromagnets are provided with a voltage adjustment prior to operating the crane.

As the operation continues at 50 %ED, the coil is warmed with the exciting current is decreased. When the coil temperature hits a saturation level and stop rising, the current is stabilized, maintaining the stabilized level.

The current at this lever is called a heat time current.

If the electromagnets are used within the standard 50 %ED rate, it should be between cold time current and heat time current voltage (DC 220V).

Check periodically to verify this condition. In a condition where the heat time current is lower than 60% of cold time current, the coil is abnormally heated and the lifting capacity is degraded. A damaged coil may result. It is suggested that all measurements made be recorded for early discovery.

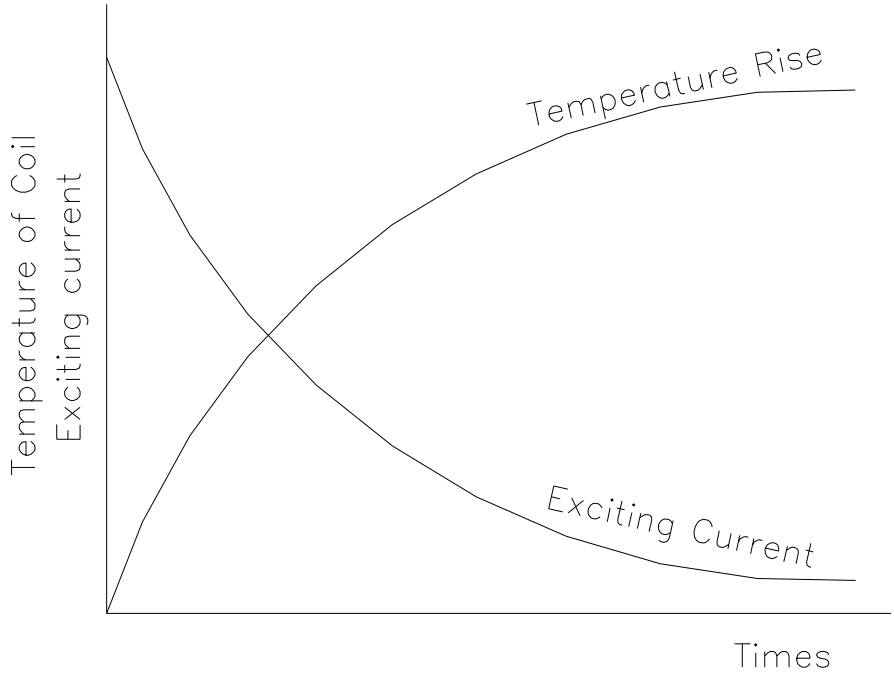


Figure 3. Relationship among temperature rise, exciting current and time

4. Operation

1) Balancing

Except some cases, the electromagnets in this manual are used to carry long steel materials such as billets and bundled products. Two Or more electromagnets are used depending in circumstances. When long steel materials are lifted, caution must be used against length wise off-center deviation.

Let's say, if the loads are 4m long and tilted more than 300mm when they leave the ground, stop the lifting and repeat the practice for balancing lifting. As long as the equilibrium can be achieved, very long loads could be handled. For safety, the use of two or more electromagnets is recommended for loads longer than 4m except for those which are specified otherwise.

2) Exciting Current

The electromagnets are machines that have a high inductance. Therefore, switching on the control board does not allow the exciting current to reach 100% at once. At attempt to lift the load before the exciting current reaches the full level can end up with an unsuccessful lifting.

For the best results, place the electromagnets on the load to be lifted, and turn on the power to energize them. Wait till the ammeter reading is stabilized and proceed to operated the crane to begin lifting the load.

3) Effect of foreign matters and rough surface on magnetic attraction

Steel material often has an accumulation of foreign materials such as scales, grits and wooden pieces which may arrest the attractive force of the electromagnets. When the electromagnets contact the load surface with foreign.

Material in between, a void is produced between the contacting surfaces, which Considerably reduces the attractive force of the electromagnets. To prevent such situation, the load surface to be cleaned periodically. Scarped steels are often found with local indentation, a void is produced between them to arrest the attractive force of the electromagnets. The electromagnets, therefore, must have their poles contact the load surface off large indentations.

4) Prohibition

The electromagnets do not demonstrate their strong attractive force until the load has been properly attracted to them at them at the N- and S- poles equally. Attraction of loads by rectangular electromagnets turned 90° around or single pole attraction by round shaped electromagnets as shown below is prohibited even though the load may lifted if light enough in weight.

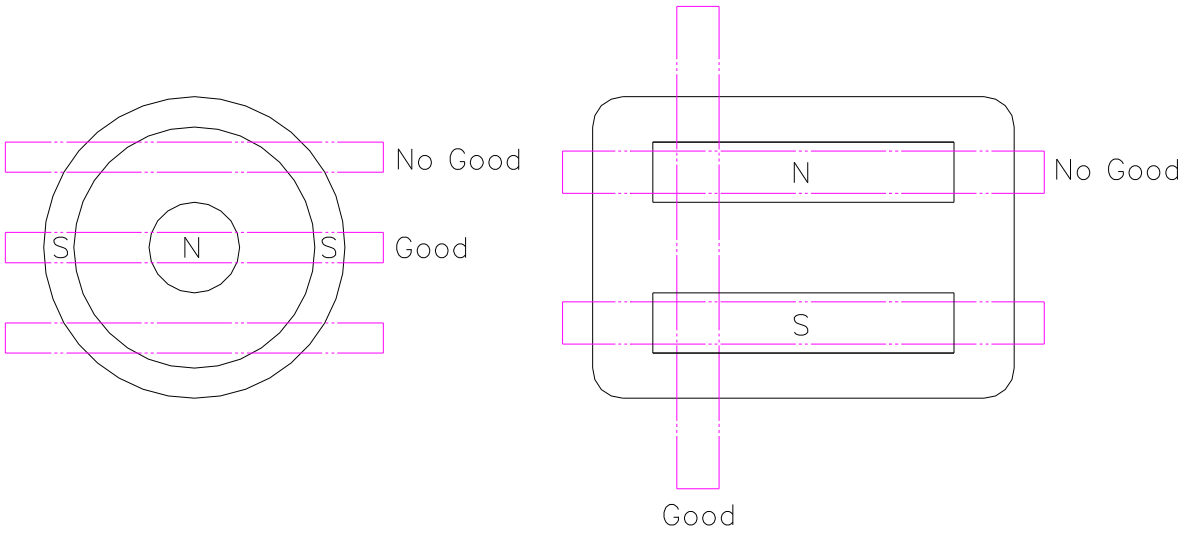


Figure 4. Prohibition of lifting long steel materials

※ When transporting steel products using electromagnets, please control the passage of pedestrians below the steel.

5) Electromagnets for hot service

For handling hot steel material, specially designed electromagnets have to be used. The word "H" in right after the electromagnet's type name means the hot steel handling electromagnets, and type name without the word "H" means normal temperature steel material handling electromagnets. Normal temperature means below 150°C, and hot temperature means below 600°C. If electromagnets for normal temperature handle hot steel material, then hot temperature will transfer into the magnet coil and magnet coil may damage. Therefore, for the longer life, be cautious to use of electromagnets at right temperature.

6) Caution with Cable Connector

Plug the cable connector fully and fasten securely. Make sure that the electromagnets are de-energized prior to disconnecting the cable connector from them.

5. Inspection

The electromagnets are totally welded and hermetically closed except terminal box. Nevertheless, some parts may be damaged during long use. For the best results of operation, inspect the electromagnets in the following respects on a periodical basis, and keep record of all the checks made.

1) Yoke

Check the outer surface of the yoke for excessive indentations.
Check weld for crack.

2) Pole

Check the attracting surface of each pole for the excessive wear.

3) Terminal Box

Check the terminal box cover and terminals located inside of terminal box for loose screws. Also, check lead cable for external damage.

4) Chain, Shackle and Pin

Check for wear to 90% or less of the original thickness.

5) Resistance and Measurement

After the electromagnets have been cooled down, disconnect the cable connector from them and measure coil resistance from the connector to see if is normal. The normal value is the cold time value as indicated in the test data and name plate. Calculate voltage ÷current=resistance and compare the result with the normal value. If the measured value is lower, lead cable short-circuit failure may be the cause. In such a case, therefore, remove the read cable at the lead bolt in the terminal box and repeat the measurement.

6. Trouble Shooting

1) Lead Cable

The cabtyre cable is rubber-sheathed for protection against external damage. This makes it difficult to detect inside core wire. If the electromagnet fails to attract handling materials, check the cable for disconnected or short circulated core wire inside in the first place. Replacement of the lead cable require the following steps of work. Wait long enough till the electromagnet has completely cooled down. Uncover the terminal box by removing bolts. The cable end is connected securely to the lead bolt in the terminal box. Disconnect this cable end and check to verify the continuity of the cable by measuring the resistance. If the cable has short-circuit failure or lacks continuity, replace it with a new one with specified length.

Be sure to use the replacement cable designed by us. If the new cable fails to match the electromagnet in the current capacity or fails to seal around the cable gland, it can affect the hermetical design feature and cause ingress of moisture, leading to an unexpected accident such as a lead bolt short-circuit failure. Care must be taken to prevent such defect.

After the replacement of the cable, clean inside the terminal box, remove moisture if any, and bolt the cover tightly to close the terminal box completely.

2) Chain and Shackle

Chain pins and links are worn by repeated frictional movement. Check them for wear and service them in the following manner on a periodical basis. Clean the friction surfaces and apply grease to them.

The wear limit for the chain links, shackle and pin is 90% of their original diameter.

When these parts are reduced in diameter more than that, replace them.

3) Terminal Box

Moisture entering the terminal box through surface of the cable or clearance. Produce sweat when the electromagnets are cooled down, which remains in the terminal box. The sweat causes degradation in insulation, resulting in damaged terminal. Check inside the terminal box for such sweat. If any sweat is found, remove it immediately.

If terminals are damaged by over heat, repair them with new one, and connect the cable securely. Check for any loose lead bolt during the periodical check and retighten it if necessary.

4) Pole

Long use wear the pole tips to an increasing roundness. If such poles were continuously used, they would fail to attract steel, affecting the performance of the electromagnets. In such a case, repair the pole in the following manner.

(1) If the wear is comparatively small, put the electromagnets for one crane together and grind the pole surfaces, and make their levels equal. Be sure not to cut any pole to such a depth as weld bead.

(2) If the wear is 3 to 5mm, apply build up welding to where worn, using soft steel welding rod, and surface grind the welding area. Take time in welding so that the coil is not overheated unnecessarily.

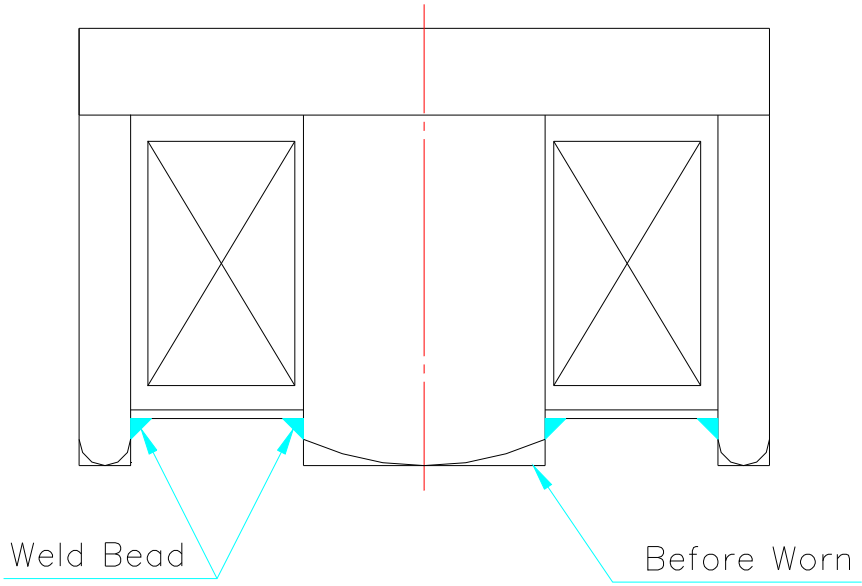


Figure 5. Inspection of pole