

Press-Brake Installation Reference

Magnetic Encoders

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1. INTRODUCTION

The Elektra Press brake scale measures the linear displacement precisely and accurately. To ensure the specified accuracies, installation of the Press brake scale must be done correctly, precisely and written in this manual.

Basic steps should be understood and followed systematically. Care should be taken to perform all procedures carefully.

Read this manual carefully and thoroughly before use of the product.

2. WHAT IS MAGNETIC SCALE?

MAGNETIC SCALES:

Glass scales have been very popular for measuring length, dimensions of a part, distance traveled etc. in machine tool, profile projector, Metrology equipments and such areas for many years. Glass scales give reliable results in clear area and come with high resolution as well as low resolution, high accuracy as well as low accuracy and lengths normally upto 2 or 3 meters.

Over the period a large number of machines / applications have come up where glass scales cannot suit the requirements such as :

- Dirty environment
- There is presence of large cutting oil
- Vibration
- The scale needs to be fitted on bent surface
- Accuracy is low, but cost also needs to be much low

To fulfill such demands a new Technology has emerged over the last decade – magnetic scales.

These scales are based on magnetic principal and can satisfy the above needs. They are becoming more and more popular due to their unique features and cost to benefit ratio.

In this article, we will explain you how a magnetic scale is made, how it works and its applications.

You know magnetism, now do you know a very important thing that magnetism passes through water, through oil, through wood through paper, through dirt, it passes through all these materials that is the property of magnetism. Now what we do in order to magnetism work for us is we take magnetic material powder mostly what is called as Barium Ferrite mix it with a plastic compound and extrude a section looking like Fig 1.

This magnetised strip looks like this

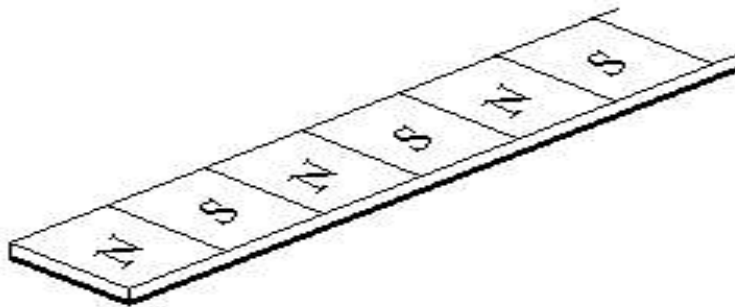


Fig. A

This we cannot use as it is, because it will break or if you stretch it will cut, so immediately we glue it on stainless steel strip. So we have a magnetic strip which is strong because it is glued on to a thin stainless steel strip.

Now this is a magnetic strip it is yet not the scale. It is a magnetic strip which is useful to us. Now we need to magnetise it. So one of the most interesting and important technology in magnetic scale is magnetizing the magnetic strip. It is magnetized with a very special machine.

This steel backed up magnetic strip is magnetised with the help of a magnetizer for alternate poles N-S-N-S-N-S of desired width (say 2mm, 5mm,) See Fig A.

A magnetic sensor is made to move along the length of this strip at right angle to the poles as shown in Fig B.

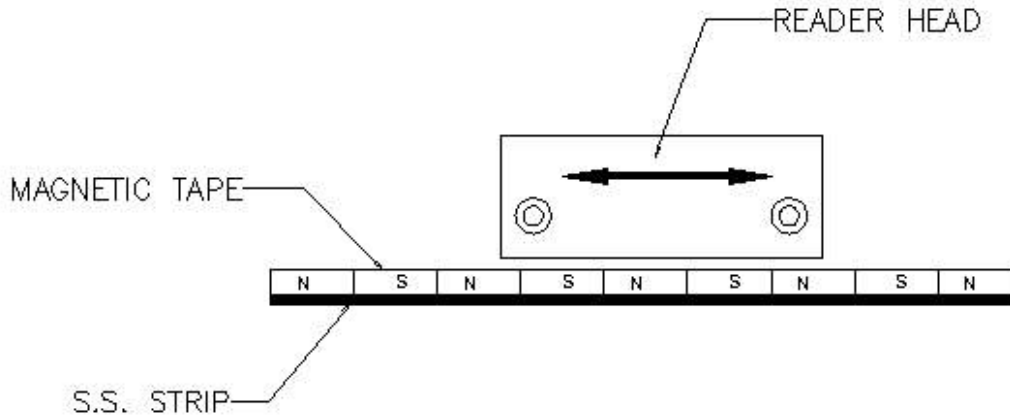


Fig. B

The sensor detects the changing magnetic field and gives voltage signal output.

This voltage signal is further interpolated and the required pulse train out put is obtained along with direction signal. With the help of this pulse train O/P distance measurement can be obtained.

This is how a magnetic linear encoder works. Air gap between the sensor and the magnetic strip is decided depending upon the magnetic field strength and sensitivity of the sensor. It is normally of the order of 0.5 to 2 mm depending upon pole pitch, accuracy etc.

3. TECHNICAL SPECIFICATIONS

READER HEAD (EMR-B) (mounted under the cover of carriage) (fig. no.2)

1. **Resolutions with four edge detection** : 5 micron / 10 micron
2. **System accuracy** :

Resolution	Accuracy
5 micron	±10 micron
10 micron	±20 micron
3. **Repeat accuracy** : ± 1 count
4. **Current consumption** : Typ. 150mA – max. 250mA / Without RS 422 driver current
5. **Power supply** : 5V DC ±5%
6. **Output signal level** : RS 422 5V high > 2.5V, I= 20mA
low < 0.5V, I= 20mA
7. **Operating temperature** : Max. 50° C
8. **Storage temperature** : 20° to 70° C
9. **Output signals** :

—	—
A, A,	B, B,

 Reference and Reference
10. **Maximum measuring speed for scale** : 10 meter / sec. (32 feet/sec.)
11. **Housing material** : Aluminum with Steel bottom
12. **Dimensions** : 60mm.(L) X 22mm.(H) X 16mm.(W)
13. **Reader Head mounting** : M4 X 20 mm Allen screws – 02 nos.

14. **Gap (Sensor to Scale)** : 0.5mm \pm 0.2 mm
15. **Signal cable length** : Standard 0.5meter
Optional Extension cable of 3 meter
16. **Signal cable bend radius** : Min. 60mm.

SCALE

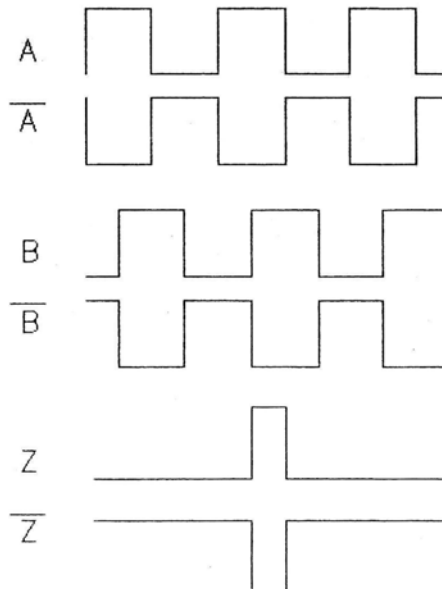
1. **Reference mark** : at 30 mm (standard) from one end
2. **Height** : 20.5mm
3. **Width** : 28mm
4. **Weight** : 1185 gms/meter
5. **Material** : Aluminum with S.S. protective strip
6. **Extrusion mounting screw** : M6X25 Allen Screws.
7. **Standard lengths** : 170, 220, 270, 320, 370, 420, 470, 520mm

4. PIN CONNECTION DETAILS:

READER HEAD CONNECTOR (9 PIN D-TYPE)

PIN NO.	SIGNAL	COLOUR CODE
1	GROUND (0V)	White
2	PHASE \bar{A}	Red
3	PHASE \bar{B}	Green
4	\bar{Z}	Brown
5	VCC (+5V)	Black
6	PHASE A	Pink
7	PHASE B	Yellow
8	Z	Gray
9	SHIELD	Violet (From Conduit & internal Shield)

QUADRATURE OUTPUT



5. PACKING LIST FOR MAGNETIC SCALE (PRESS BRAKE SCALE)

1. Press brake scale
2. Mounting hardware for scale installation,
 - M6X25 Allen screws – 2nos.
3. Technical and installation Manual

6. INSTALLATION PROCEDURE FOR PRESS BRAKE SCALE

Installation condition:

- a. The place where the scale is to be installed should be thoroughly cleaned from oil, dust, coolant, burr etc.
- b. Cable / conduit of the scale should not interfere with any other moving member.
- c. Make sure that scale length (or travel) is greater than machine slide / travel.
- d. Desired location of scale fixing should be near to moving member. Ball joint should be at the side of machine moving member.

Installation of press brake scale on machine. (Fig. 1, 2, 3)

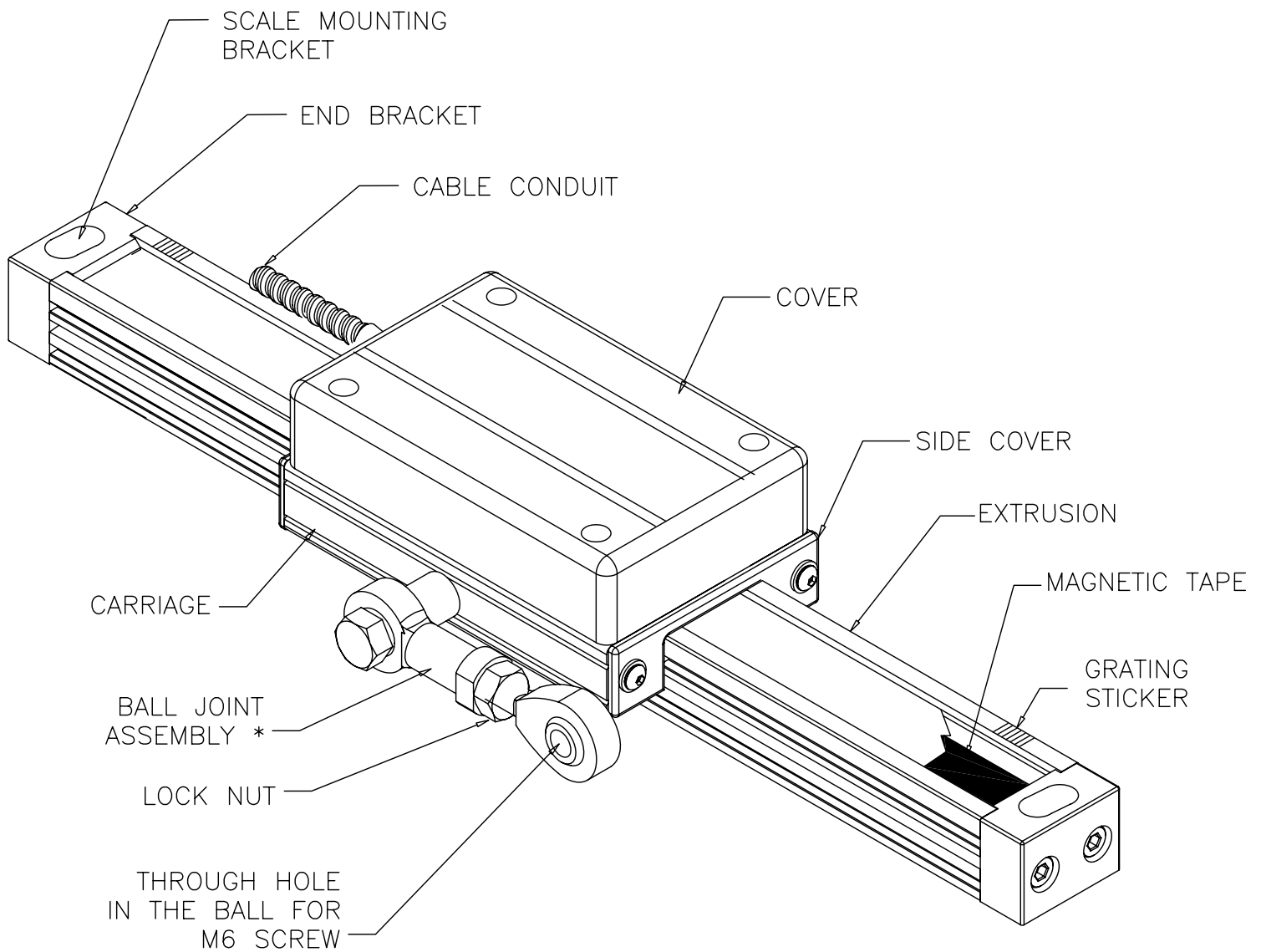
1. Decide the location (surface) for the scale to mount.
2. Check the parallelism of this surface with respect to moving member of the machine. It should be within 0.5mm/meter
3. While fixing the scale place the carriage at one end of the scale. It is recommended that cable should be at bottom of the carriage.
4. First make the first hole (at top of the scale)(M6 tapping)
5. Place the screw at top end bracket. And fix the scale directly on the surface using M6X25 Allen screws. Do not full tight the screws.
6. Place the dial indicator on the moving member of the machine. Touch the ball tip to the side face of the scale. Load the dial. Make the reading '0'. Then move the slide slowly. Make sure that ball tip is touching to the scale and the reading is near to '0'. (See fig. 4)
7. At the end of machine travel mark second hole position and fix the scale. (do not full tighten the screw.)
8. Check the parallelism of front face of the scale with dial indicator (See fig. 4). It should be within 0.2mm/meter. (use filler gauge or shims if required)
9. Again check the parallelism of side face. It should be within 0.2mm/meter. Then tighten the M6X25mm Allen screws at both ends. (See fig. 4)
10. If the scale mounting surface is not parallel, then use suitable scale end brackets. (Note: In such case scale end brackets should be designed and manufactured by the user as per requirement.)

FIXING THE CARRIAGE: (fig. no. 5)

1. One ball joint assembly is fixed on the carriage. It can be fixed on either side of the carriage as per requirement.
2. One end of the ball joint is fixed on the carriage and other is free.
3. Once the scale is fixed, decide the location on moving member for fixing other end. Before fixing make sure that travel of scale should be greater than machine slide.
4. Adjust the location of the hole in the ball as per requirement and tight it with the lock nut provided in ball joint assembly. (See fig. 5)
5. Make the suitable bracket or the spacer if required to fix other end.
6. If the distance between two ball joints is more then use an extension in-between.
7. Fix the end with M6 screw and ensure the travel at slow speed.

CABLE ROUTING:

Cable must be kept out of the way of moving parts of the machine. Ensure that it will never get pulled or pushed during machine operation. Cable should not be bent below radius 60mm during routing. (see fig. 6) Cable should not be routed near any inductive load to avoid electrical noise interference.



* WHEN THE BALL JOINT IS IN THIS POSITION, THE REFERENCE MARK IS AT 30mm.

FIG.1 MAGNETIC SCALE FOR PRESS BRAKE

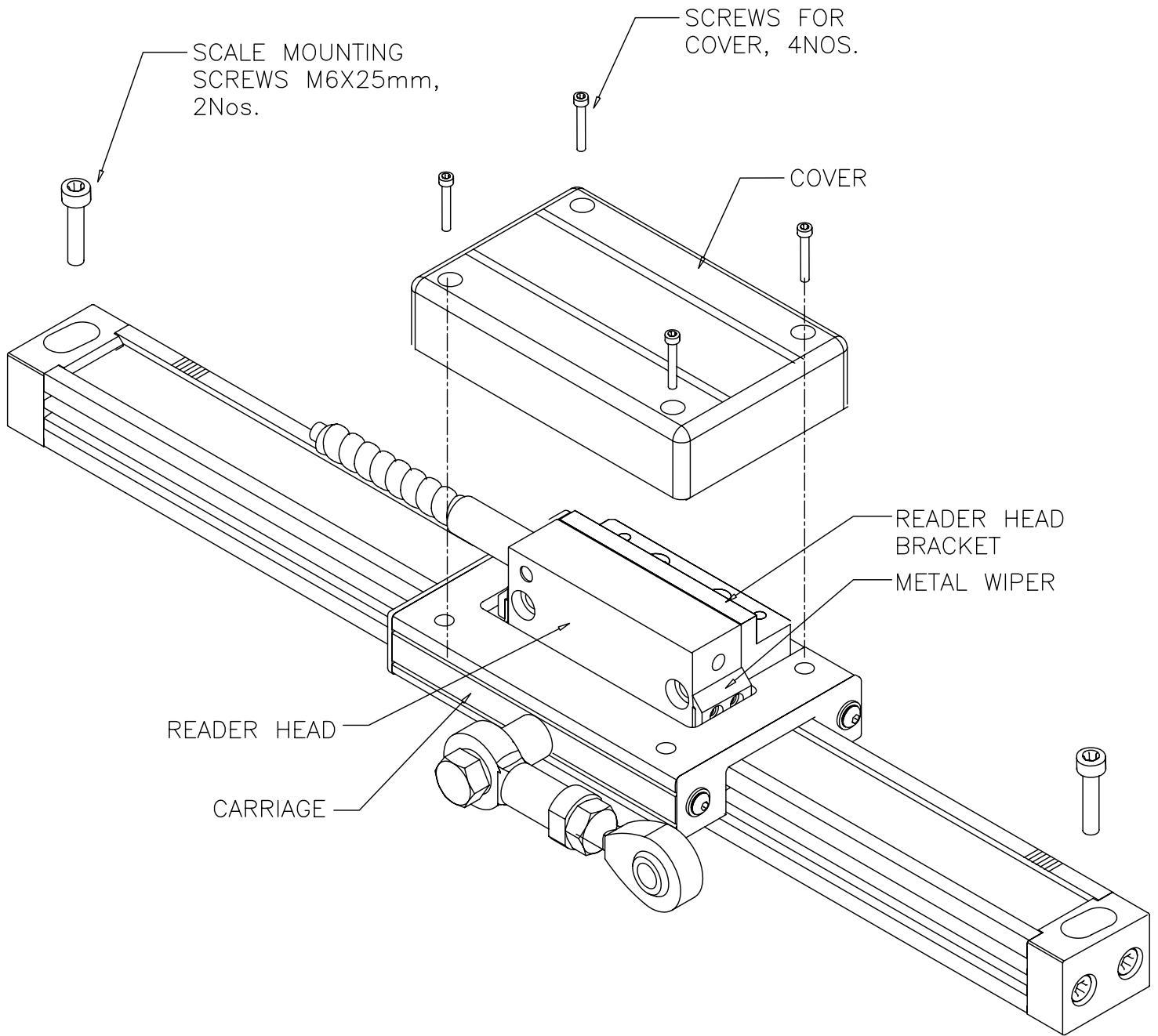


FIG.2 MAGNETIC SCALE FOR PRESS BRAKE
(OPEN VIEW)

METAL CLAMPS
FOR LONGER LENGTH
(ABOVE 600MM)

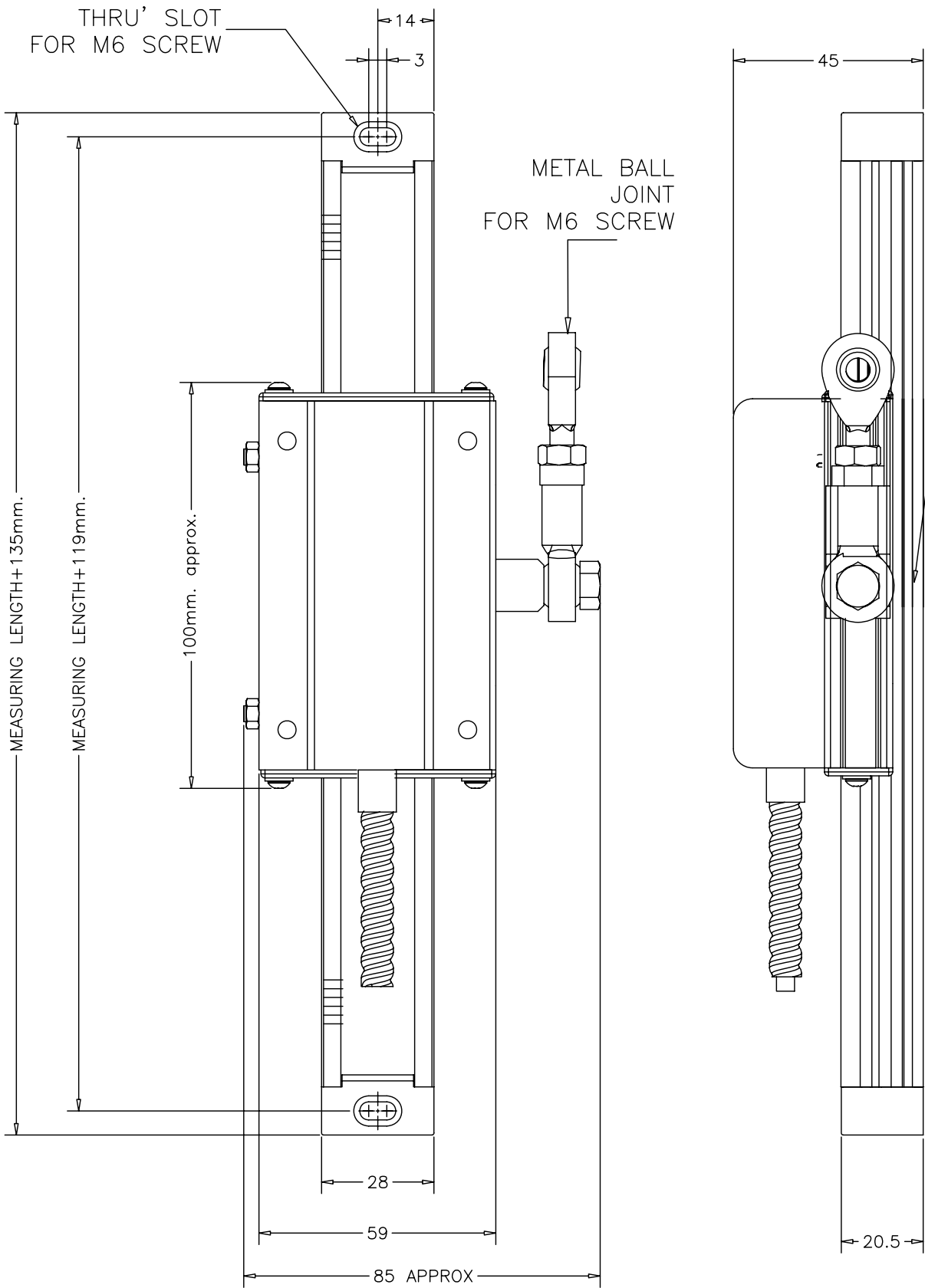
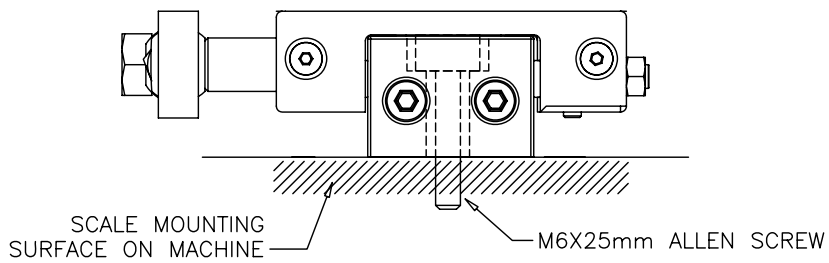
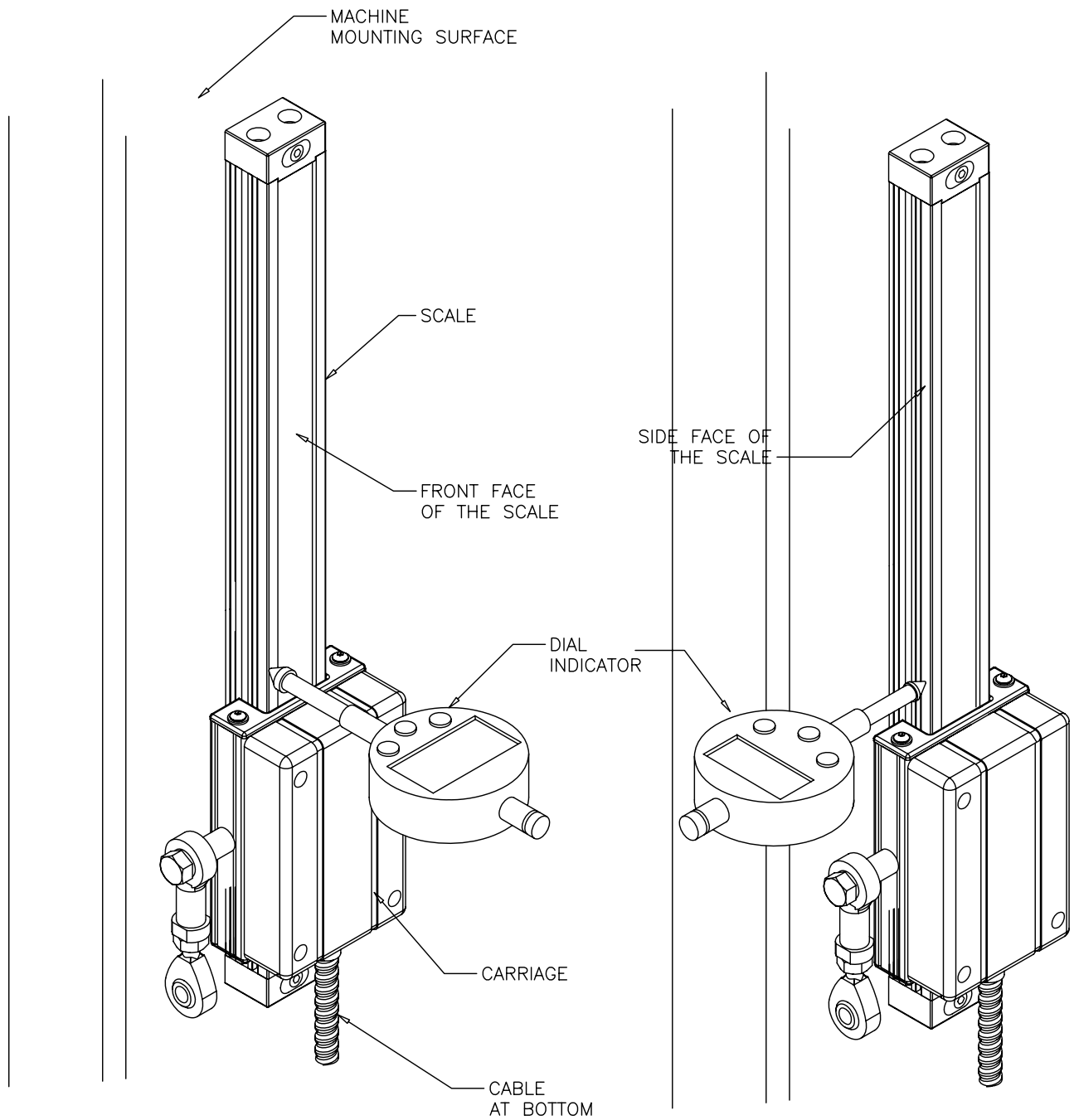


FIG.3 MOUNTING DETAILS



NOTE— ALIGN THE SCALE WITHIN 0.2mm/Meter WITH RESPECT TO MACHINE SLIDE.

FIG.4 SCALE INSTALLATION

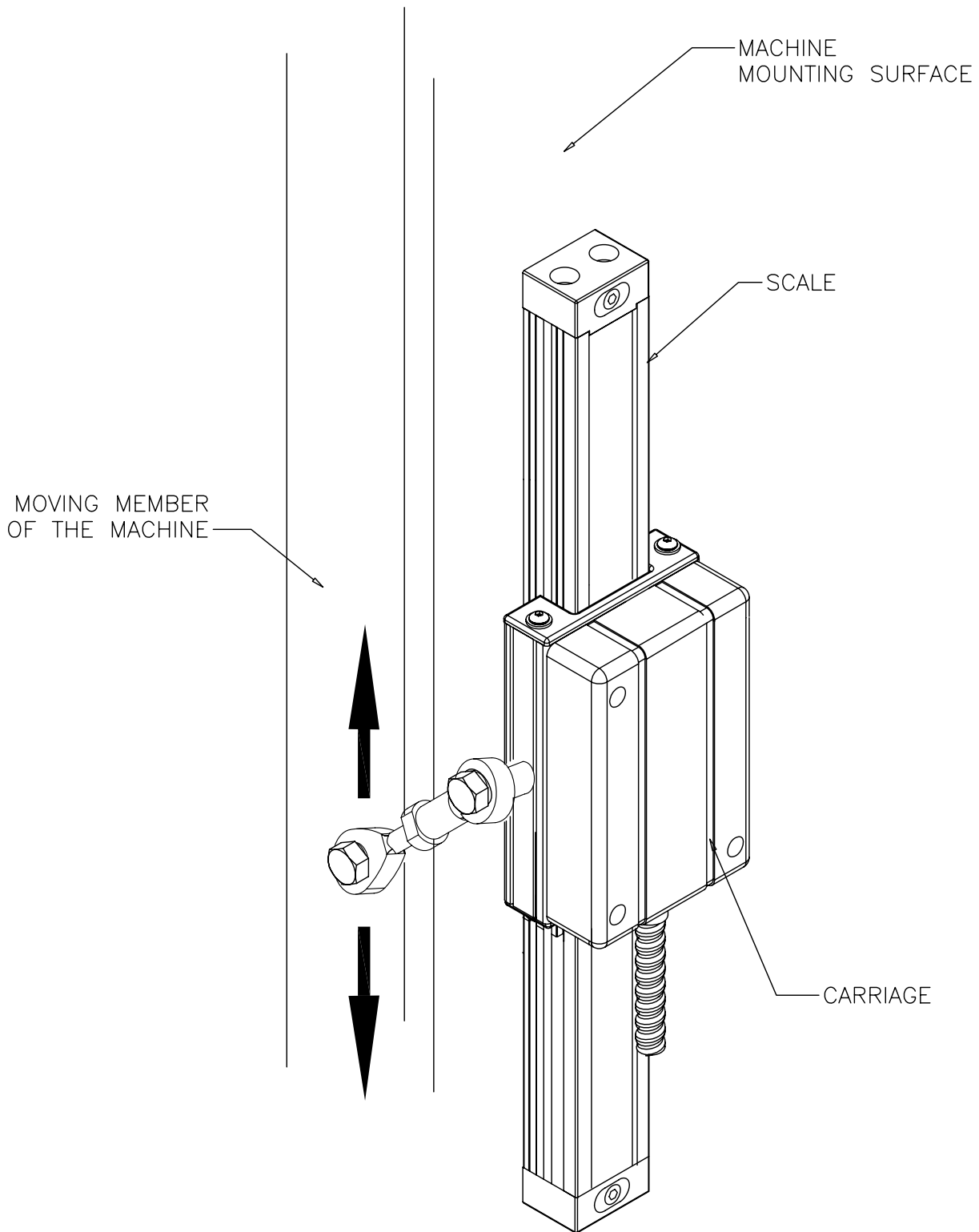
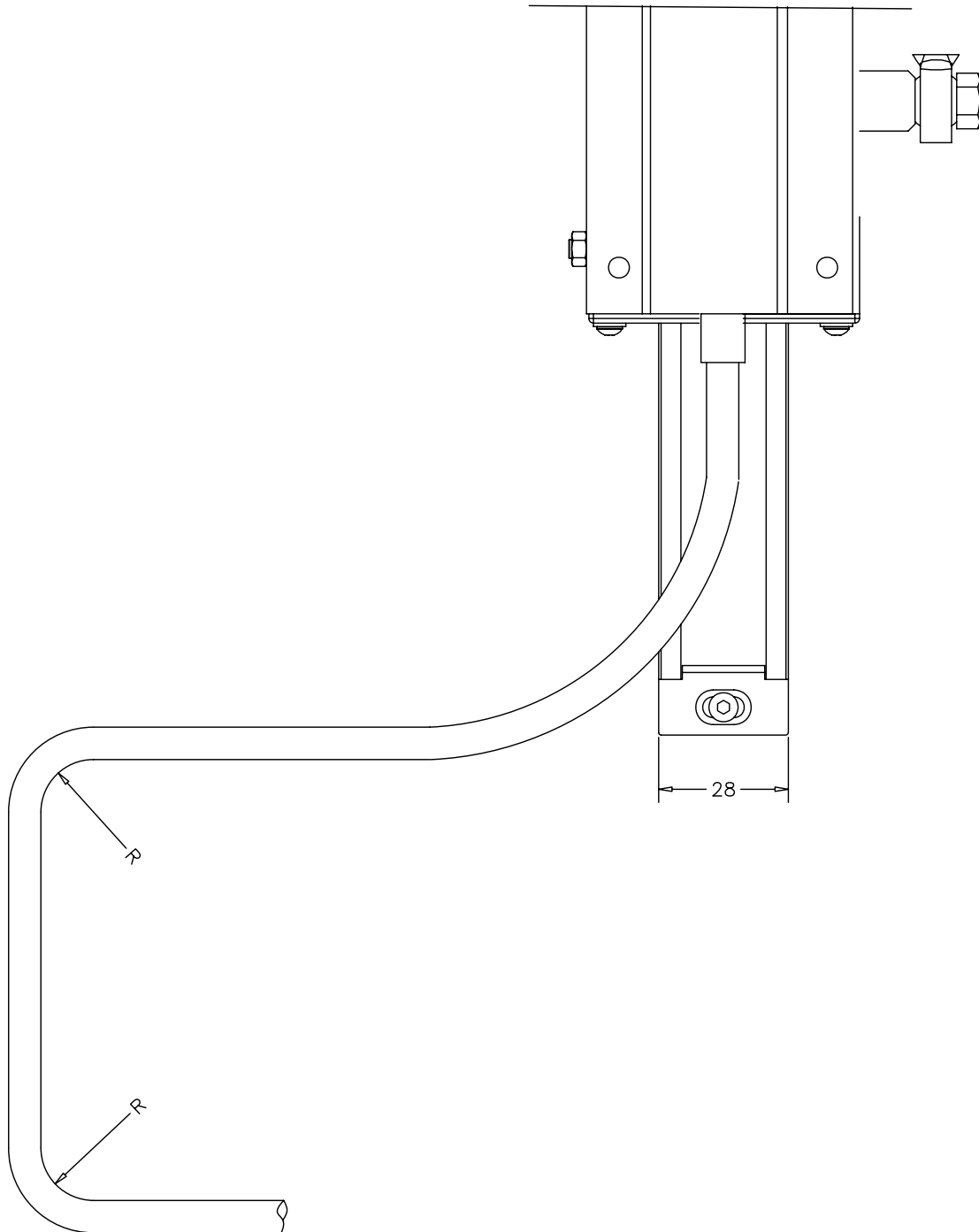


FIG.5 CARRIAGE INSTALLATION

READER HEAD WITH
OPEN EXTRUSION MAGNETIC SCALE



WHERE, R IS NOT LESS THAN 60mm.

FIG.6 INSTALLATION LAYOUT

6. MAINTENANCE

As the basic magnetic scales are reliable, there is almost no maintenance required if used properly.

As a part of TPM (Total Plant maintenance), we suggest you to follow two things to be done as a regular check once in 3 months / 6 months depending upon the use of machine.

- a. Check all alignments of the scale are not disturbed due to any unknown external reason.
- b. Make sure that wiping action of the reader head wiper is smooth & reliable over the entire travel of the scale.
- c. Check all the fitting screws. If it found loose then tight again.

7. NOTES ON SAFETY

- 1) The magnetic tape may only be transported in its original packing.
The same is to be used for storing.
- 2) Remove the magnetic scale from its packing at the site of installation and immediately prior to installation.
- 3) **Do not touch any permanent magnet to the magnetic scale. Irreversible damage will be caused to the scale by doing such a thing.**
- 4) **Ensure that magnetic scale does not come in contact with kerosene or petrol.**



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