1 Application and Purpose

These Specifications are for:

Scanning head LIF 97W	Id. No. 524 064-01
Scale LIF 902W	Id. No. 524 065-01

2 General Information

The LIF 972W encoder is a small, exposed, incremental, transmitted-light angle encoder for small measuring steps. It consists of a scanning head with external interface electronics and a glass circular scale, which is set in a metal holder.

A phase grating forms the graduation of the scale. Deeply-etched lines with a width of 7.25 µm are located 14.5 µm apart on a transparent quartz glass substrate. The lines are aligned to a virtual center point (which is not on the scale substrate). The lines are scanned using an interferential procedure. The light generated from the laser light source in the scanning head is separated into various orders of diffraction by the scale's phase grating, and then successively passes through two grid structures on the scanning reticle, which are located on the front and rear. The light beams, which have been diffracted several times, are thus brought into interference with each other.

When the scale moves relative to the scanning head, the phase positions of the interferential light beams change such that incident light beams landing on the discretely aligned photovoltaic cells are modulated in their intensity. Electrical signals with a period equal to half the grating period are generated. The encoder also features a reference mark integrated in the main track.

A signal amplifier integrated in the scanning head ensures a very high level of noise immunity of the output signals. These signals are interpolated in the external interface electronics (APE), where they are also converted to square-wave output signals as per the TTL convention. The supply voltage is 5 V. The connecting cable (15-pin sub-D) can be connected externally to the APE housing.

The scale and scanning head are attached with the help of screws.

Special advantages of the LIF 972W are its generous mounting tolerances, the reference mark integrated in the main track, and the high level of noise immunity.

3 Mechanical Data

3.01 Measuring Standard

Quartz substrate with phase grating structure and DIADUR aperture

3.02 Measuring Length:

±8° (± 4.45mm @ R31.9mm)

3.03 Grating Period 93.757" (14.5 µm @ R31.9mm)
Signal period: 46.879" (7.25 µm @ R31.9mm)

3.04 Measuring Step
(25fold TTL,
4-fold signal edge evaluation) 0.47" (72.5 nm @ R31.9mm)

3.05 Scale Accuracy
(only grating, based on 16° measuring length @ 20 °C)

Class: ±2" (app. ±0.3 µm @ R31.9mm)

3.06 Scale Thermal Coefficient of Expansion

$(0.5 \pm 0.1) \bullet 10^{-6}\ K^{-1}$

3.07 Reference Marks

9.7°

3.08 Dimensions and Mounting Tolerances
see the dimension drawing

D 384 587

3.09 Weight (approx.)

Scanning head: 16 g
APE w/o cable: 140 g
Connecting cable: 25 g/m
Scale: 1.5 g

3.10 Maximum Measuring Speed

1.45 m/s (minimum edge separation: 50ns)

3.11 Maximum Mechanical Acceleration

200 m/s²

3.12 Maximum Vibration (55 to 2000 Hz)

Scanning head:	200 m/s²
Scale:	200 m/s²

3.13 Maximum Shock (11 ms)

Scanning head:	400 m/s²
Scale:	400 m/s²

3.14 Operating Temperature

0 °C to 50 °C

3.15 Storage Temperature

–20 °C to 70 °C

3.16 Permissible Relative Humidity in Operation and in Storage

75 %, temporarily 90 %, but without condensation

3.17 Protection as per DIN 40 050

IP 40 (system mounted according to dimension drawing)

Note the protection mark for ISO 16016!