



Operating Manual



Faraday Road, South Dorcan Industrial Estate, Swindon, SN3 5HE, UK
Telephone: + 44 (0)1793 524566 Fax: +44 (0)1793 490459
Email: sales.eu@magnaflux.com Web: eu.magnaflux.com

Bahnhofstr 94-98, 73457 Essingen, Deutschland
Telephone: +49 (0) 7365 81-0 Fax: +49 (0) 7365 81-449
Email: sales.de@magnaflux.com Web: eu.magnaflux.com/de

Quantitative Quality Indicators (QQI)

CONTENTS

	Page
1 Introduction	1
2 Physical Characteristics	2
3 How to Apply	3
4 Re-use of QQIs	4
5 Observation and Evaluation	4
6 Longitudinal Field Generation	5
7 Multi-directional Magnetism (MDM)	5

6. LONGITUDINAL FIELD GENERATION

When using a Yoke, the field flow means that longitudinal magnetisation is employed. In this case, the QQI should be placed near the centre of an elongated part. When using either an AC or HWDC current for magnetisation, a consistent field will not exist beyond ca 40" (1.02 m) in length. When using a rail mounted coil, QQIs placed at intervals along the length of such a part will show the degradation of field as the distance from the coil edge is increased.

7. MULTI-DIRECTIONAL MAGNETISM (MDM)

MDM usage is increasing as more people realise that the purchase of such equipment can usually be justified on the basis of a saving in excess of 60% in inspection times, with a corresponding measurable enhancement in flaw-finding capability.

It is essential that fields be balanced (that is, full circle indicated). No other satisfactory method is known for achieving this. One direction may overwhelm another, and it becomes uni-directional; initially, this was in widespread usage prior to electronic firing, but with a patented method.

The QQIs should be appropriately placed, with one direction set on zero, and the amperage increased incrementally until a satisfactory indication is shown on all indicators, and a record noted. The QQIs should then be very carefully cleaned, and the part energised again in an alternative direction if desired. The selector switch should then be turned to MD and energised. If the entire circle is shown, proceed unless a distortion of the circle is noted, in which case either a 'blown' module exists or you must repeat the procedure. Some users use a Gaussmeter for control purposes, as, even though the readings are not truly Gauss measurements, they are at least repeatable and accurate.

5. OBSERVATION AND EVALUATION

The circle and cross configuration will indicate if all other requirements are met. The particle content for the magnetic particles used must be between 0.15 mm and 0.25 mm when measured using a settlement volume test, with a minimum UV(A) 'black light' level of 2500 mW/cm² at the part surface, as stated in the NDT specification.

The QQIs should be placed at points of high stress concentration, or at expected positions of service-induced flaws. The 100 micron thickness variant is not suitable for application to curved or convoluted surfaces.

The magnetising current should be incrementally moved upwards from a minimum level until the first indication is observed and noted. When held in position, a longitudinal mode will indicate the vertical indication and, conversely, the horizontal direction with the circular mode. The QQI must be used to establish a balanced field in an MDM (multi-directional) application.

On equipment employing electronic firing, a blown module will be indicated with a grossly distorted field indication. If a numerical quantification of field intensity or a Gauss reading is required, a Hall Effect Probe should be placed at the point of QQI attachment, or at some other location where the measurement can be readily repeated. The fact that such readings are not truly Gauss measurements is not consequential, and the type of meter employed should be noted as models differ. For repetitive measurements, meters should be recalibrated at periodic intervals, for example, quarterly.

When using multidirectional fields, it is important to ensure that the results of one direction are recorded prior to recording the results for other directions. When incrementally increasing the field strength, care must be taken not to rub the surface of the QQI with your finger as this will increase the potentiometer reading. Because of the very low retentivity and high permeability of the shims, they cannot be used for setting up procedures using the residual method.

1. INTRODUCTION

Quantitative Quality Indicators (QQI™s) are artificially-flawed low-carbon steel (AISI 1005) specimens that are used in magnetic particle inspection (MPI) for establishing and assuring the proper field direction and magnitude required to produce satisfactory indications of flaws or anomalies in ferromagnetic parts and structures. They are manufactured strictly in accordance with the applicable AMS specification for mild low-carbon steel (AISI 1005). The specification SAE/AMS number AS 5371 is the governing specification for these standards.

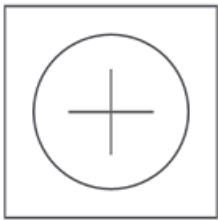
Note: QQIs are, in themselves, flawed parts. Even when placed on another substrate such as wood, or even air, indications of the flaws will be noted in the presence of a magnetic field of sufficient magnitude when the magnetic particles are applied. An example might be where a shim is placed between the poles of an electromagnet.

2. PHYSICAL CHARACTERISTICS

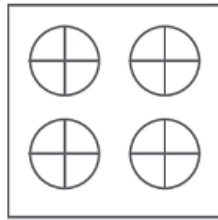
All QQIs are nominally $\frac{3}{4}$ " (19 mm) square. The miniature configurations are intended to be cut into individual specimens for application in small radii and tight places. The three concentric circle configurations have a depth of 40%, 30% and 20% respectively from the outer to the inner circle. While the 30% depth is aimed at approximately 30 Gauss, this configuration will assist in applicable current density to produce optimum indications.

We supply three models of QOI:

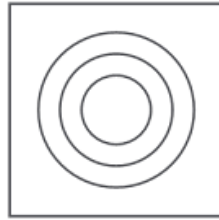
- Model KSC-230 Standard: flaw depth 30% of shim thickness
- Model KSC-4-230 Miniature: flaw depth 30% of shim thickness
- Model KSCT-234 Variable depth: flaws 20%/30%/40% of shim thickness



KSC-230



KSC-4-230



KSCT-234

3. HOW TO APPLY

Leave the hermetically-sealed package intact until ready to use, as such low-carbon steel will corrode in a typical plant atmosphere. The manufacturing process consists of using different chemical etches, and leaving the inert photo resist in place protects the parts from corrosion.

Prior to using the QQIs, you will need to remove this photo resist using a suitable solvent. The solvent used in liquid penetrant testing is satisfactory for this purpose, although we recommend that you check with your Health and Safety Manager before proceeding with this approach. Store the QQIs in the solvent after use.

The part and shim must be clean and dry before application. Place the QOI flaw-side-down in intimate contact with the part being investigated and securely fasten it down on all four sides. Two of our QQIs (519630 and 519632) are self-adhesive; otherwise use either non-fluorescent tape (for example, Scotch brand 191, 471 or 600 series) or a strong permanent adhesive (for example, 'Super Glue'). The latter may be later removed by soaking in acetone.

Be sure that the surface opposite the flaw is not covered and that no air gap exists between the indicator and the part. When using the indicator as a process control part, ensure that there is no adhesive covering the indicator itself. This method is also applicable when the indicator is left in place in preventative maintenance applications.

4. RE-USE OF QQIS

It is possible to reuse QQIs several times as long as they are not distorted in any way, as this will prevent intimate contact with the part. To remove a QOI, we recommend carefully inserting a razor blade at the point of adhesion between the shim and the part.