MAGNAFLUX

Operating Manual

QUANTITATIVE QUALITY INDICATORS (QQI)

Part numbers:
631590, 631591, 631592

1. INTRODUCTION

Quantitative Quality Indicators (QQI™s) are artificially-flawed low-carbon steel 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 in accordance with AS 5371.

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

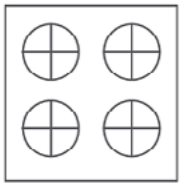
All QQIs are nominally ¾" (19 mm) square. The miniature configurations are intended to be cut into individual specimens for application in small radii and tight places. While the 30% depth is aimed at approximately 30 Gauss, this configuration will assist in applicable current density to produce optimum indications.

We supply three models of QQI:

- CX-230 Standard: 0.002 inch (0.05 mm) thickness with a notch flaw depth of 30% of shim thickness
- CX-430 Standard: 0.004 inch (0.10 mm) thickness with a notch flaw depth of 30% of shim thickness
- CX4-230 Miniature: 0.002 inch (0.05 mm) thickness with a notch flaw depth of 30% of shim thickness

CX-230

CX-430



CX4-230

3. HOW TO APPLY

Leave the hermetically-sealed package intact until ready to use, as shims are manufactured of low carbon steel and must be protected from corrosion when not in use. To prevent corrosion, the QQIs are coated with a refined mineral base oil and stored in the protective plastic packaging.

Prior to use, the protective coating shall be removed from both faces of the QQI using SKC-S, acetone, or a suitable solvent.

The part and shim must be clean and dry before application. Place the QQI flaw-side-down in intimate contact with the part being investigated and securely fasten it down on all four sides. To attach the QQIs, use non-fluorescent tape (for example, Scotch brand 191, 471 or 600 series), a strong permanent adhesive such as cyanoacrylate (Super Glue or equivalent), or the Magnaflux supplied test shim stickers. The latter may be 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.

Store the QQIs in solvent after use. For more details, please refer to ASTM E1444.

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 QQI, we recommend carefully inserting a razor blade at the point of adhesion between the shim and the part.

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 .006 in (0.15 mm) and .010 in (0.25 mm) when measured using a settlement volume test, with a minimum UV(A) 'black light' level of 2500 $\mu W/cm^2$ 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 place 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.

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 if 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.

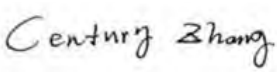
CERTIFICATE OF CONFORMANCE

Product name:	Quantitative Quality Indicators
Part numbers:	631590, 631591, 631592
Manufacturer:	ITW Speciality Materials Suzhou Co., Ltd.
Address:	No. 8 Jshi East Road, Wujiang Economic & Technology Development Zone, Szuhou City, Jiangsu Province, China

We hereby certify that Magnaflux Quantitative Quality Indicators meet the following requirements:

- AS 5371A
- ASTM E709-21, Appendix X2
- ASTM E1444-22, Annex A2
- ASTM E3024-22a, Annex A2
- ASME, Section V, Edition 2021, Article 7, Paragraph T-764.2(b)

Authoized person for documentation:

Name:	Century Zhang	Position:	Quality Assurance Manager
Signature:			
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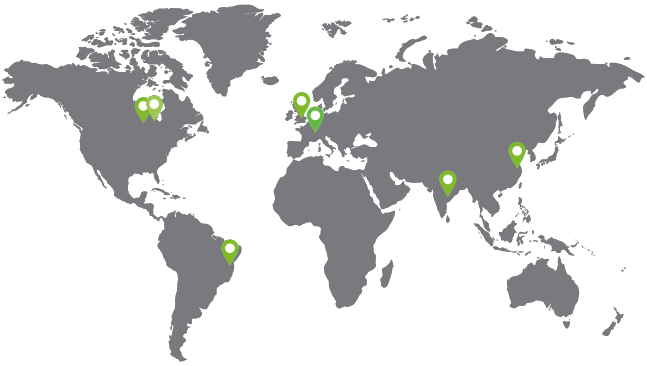

MAGNAFLUX

155 Harlem Avenue,
Glenview, Illinois 60025 USA
+1 847-657-5300
Fax: +1 847-657-5388
www.magnaflux.com
support@magnaflux.com

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