



YARNMASTER®

FACTS

CLASSIFICATION OF FOREIGN MATTERS



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YARNMASTER®
DIGITAL ONLINE QUALITY CONTROL

The YarnMaster® optoelectronic yarn clearing system stands for reliable detection and classification of foreign matters such as shell parts of the cotton plant and contamination such as oil or rust in yarns.

Detection and classification

Foreign matters are detected using the SIRO principle developed by LOEPFE to industry maturity. The classification of foreign matters is based on the evaluation of differences in contrast.

The many years of experience gained by LOEPFE BROTHERS LTD in foreign matter detection shows that this topic requires more detailed explanation. LOEPFE has developed a foreign matter standard for the yarn clearing sector to meet this demand.

The LOEPFE foreign matter standard is a classification with different examples of foreign matters per class. Foreign matters are allocated to classes so that differences relative to the class such as brightness, length and appearance can be recognized in a yarn.



ATTRIBUTES FOR CLASSIFICATION

Classification according to the difference in brightness of fibers against the basic brightness

Cotton color:

The color of cotton fibers is not always the same. Several different factors influence the color during growth and storage of the cotton. Rain, frost, insects and fungi are such factors. Extreme fluctuations in temperature and humidity influence the color during storage as well as after ginning.

Depending on the cotton color, the clearer adapts to the basic brightness of the yarn during adjustment. The contrast of a colored foreign matter is greater relative to a bright cotton color than a dark one. This means, that foreign matters are classified from different cotton origins during processing.

Yarn count:

A dark cotton color combined with a coarse spun yarn shows a lower brightness difference to a foreign matter.

Classification according to fiber length

Yarn count:

Foreign matters are not all bound the same in a yarn compound. The probability of binding is greater for coarse yarns than for fine spun yarns. The rule of thumb is: The coarser the yarn, the larger the number of fibers in yarn cross-section.

Foreign matters bound in the yarn can only be classified according to their actual length using mathematical methods such as the classification algorithm because they appear as "broken fibers".

FOREIGN MATTERS



Foreign matter fault in knitted fabric

THE PROBLEM

All foreign matters that do not deviate from the basic cotton brightness or do not show any difference in brightness are not detected by classical methods. This is especially noticeable after yarns have been processed to textile fabrics.

A bleached single jersey knitted fabric serves to illustrate the problem. A fine single knitted fabric for outer garments and underwear was checked visually during cloth inspection before and after finishing.

Gray fabric control

Almost no disturbing foreign matters can be detected in the gray fabric (example: 1000 km yarn with one foreign matter).

Finished goods control

It is possible that disturbing foreign matters can be detected after the knitted fabric has been finished (bleached). Only very fine, brightly colored foreign yarns spun into the yarn are detected in the bleached cloth.

This type of foreign matters cannot be detected by the clearer because the contrast against the raw material is too low or does not even exist.

YARNMASTER® MEASURING PRINCIPLE



THE SOLUTION

In order to detect diameter as well as cross-section yarn faults such as, for example, neps, thick or thin places during the winding process, the yarn is represented with the highest possible precision in the measuring field of a sensor.

The yarn is illuminated sequentially from several sides to detect faults. The signals resulting from reflection and transmission are computed so that yarn diameter differences are compensated and foreign matters made visible.

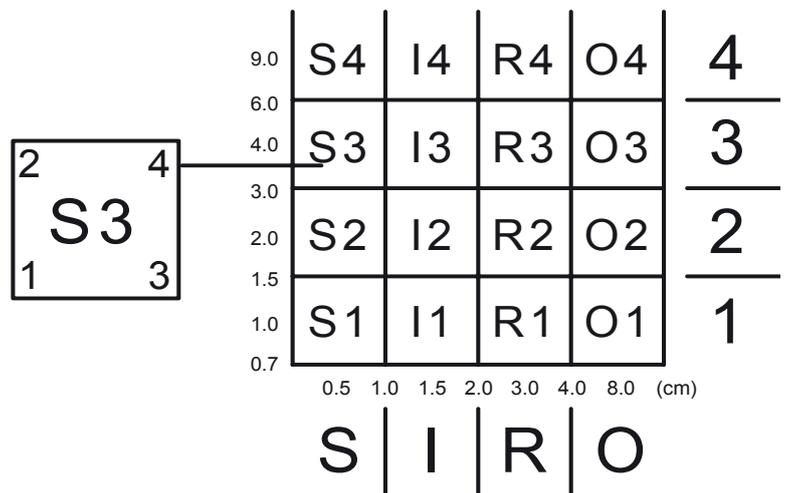
The foreign matters are then allocated to a class field according to contrast difference and length.



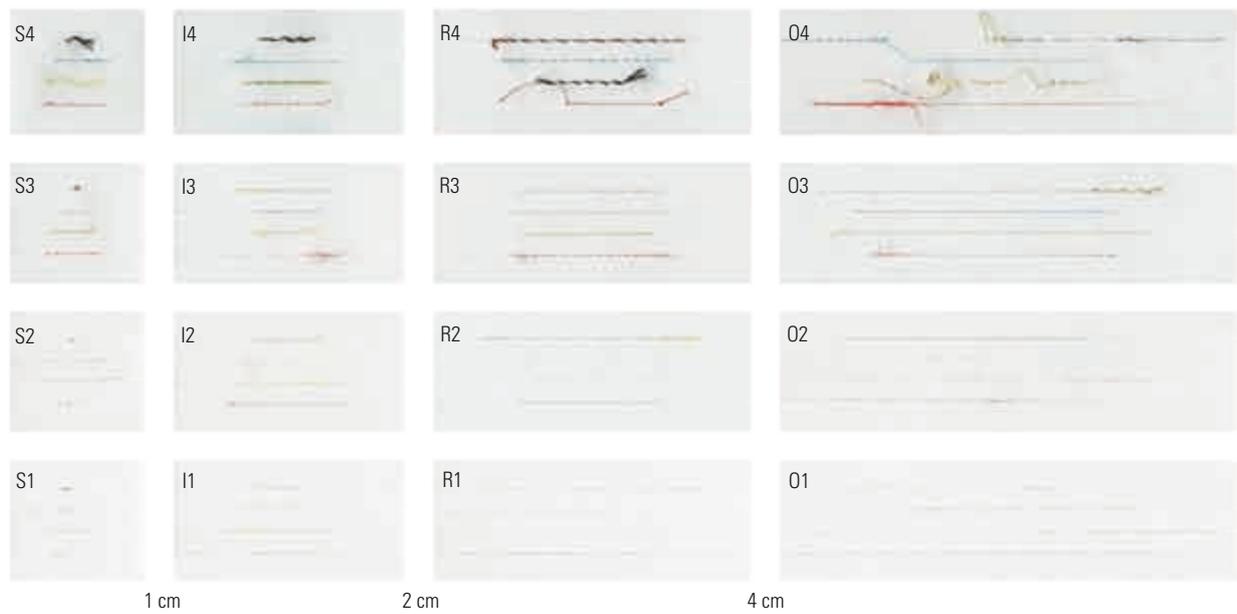
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The LOEPFE foreign matter standard is based on the table of coordinates of YarnMaster® class clearing for foreign matters. The foreign matters are classified according to the following pattern:

- Division of length classes in the horizontal in S-I-R-O.
- Division of darkness grades in the vertical from 1–4.
- Additional division of each class into 4 subclasses (fine classification).



The Figure shows a class field with additional fine classification (see class: S3).



LOEPFE foreign matter classification

REMARK

The foreign matter examples in class 1 in the foreign matter standard deviate too strongly from the yarn for technical printing reasons.

An assignment according to fine classification has not been used in order to improve the visualization of the fine fiber examples within the LOEPFE standard.

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