



# TAPSCAN<sup>®</sup> DRM

## DYNAMIC RESISTANCE MEASUREMENT FOR ASSESSING TAP CHANGERS.

TRANSFORMER CONTROL



# CONTINUOUS RELIABLE OPERATION OF TRANSFORMERS.

MR is offering a new service in the form of the TAPSCAN® DRM measurement method: the status assessment of on-load tap-changers using dynamic resistance measurement.



## Information security for the future

The service life of transformers is becoming ever longer. We continuously support operators in making them reliable to operate. Therefore we are continuously further developing our portfolio of asset management solutions.

In addition to classic maintenance and the development of solutions for simple replacement of on-load tap-changers from other manufacturers, we offer the option of assessing the condition of on-load tap-changers using dynamic resistance measurement TAPSCAN® DRM.

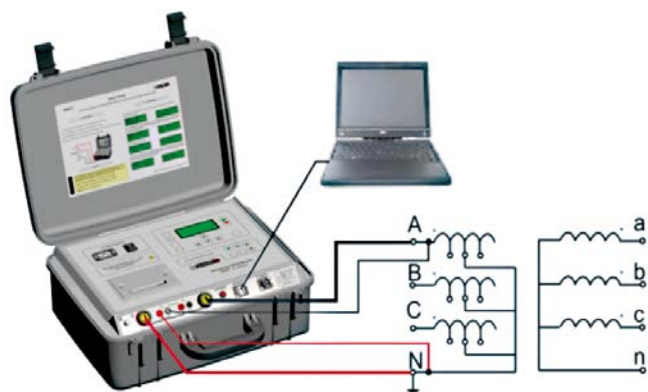
Our TAPSCAN® DRM procedure goes beyond standard measurement and diagnosis procedures and allows diverter switch operations of the on-load tap-changer to be evaluated through graphic depiction of the switching process for the first time.

The innovative TAPSCAN® DRM method thus completes the status assessment of transformers. Additional measures – in addition to the control intervals stored at operators' locations – are derived from the measurement result.

## TAPSCAN® DRM – The method

The new measurement method is carried out on a shut-down transformer within a short period. The tap changer does not have to be opened for this.

Measurement lines are connected to the transformer winding to be controlled (primary or secondary winding) and supplied with DC voltage. Then the on-load tap-changer runs through the regulating range. In addition, the motor current of the motor-drive unit can be recorded. The resistance in the circuit changes with each on-load tap-changing operation. At the same time, the measured current changes due to the applied constant supply voltage. This current change is recorded by software and the recorded current change curve allows the on-load tap-changing operations to be interpreted.



Dynamic measuring has only been carried out for a few years while static resistance measurement is widespread. Carrying out dynamic resistance measurement has been common practice for years among transformer operators in places including Spain, Sweden, Poland and Malaysia.



## TAPSCAN® DRM – The DV Power device

In cooperation with measuring instrument manufacturer Ibeko DV Power, we have developed our own customized measuring device for carrying out TAPSCAN® DRM. We integrated our extensive expert knowledge of developing and constructing on-load tap-changers in the process.

## TAPSCAN® DRM – At a glance

TAPSCAN® DRM can obtain a quick impression of the switching sequence of the on-load tap-changer in just 30 minutes.

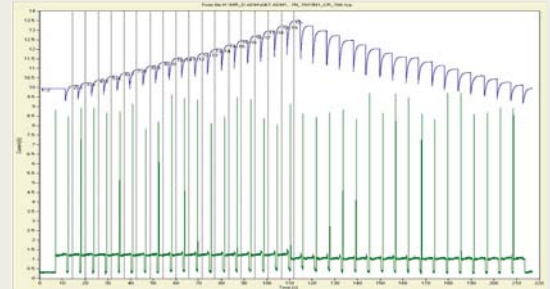
TAPSCAN® DRM allows a simple comparison of tap-change times and thus detects runtime deviations. Mechanical inconsistencies that affect the switching sequence and interruptions can also be recorded.

TAPSCAN® DRM does not replace regular maintenance at defined intervals. However, the measurement allows the configuration of a "fingerprint" that is helpful for tasks such as commissioning a transformer or assessing the status of an on-load tap-changer in order to derive suitable measures. In addition, TAPSCAN® DRM is an excellent method for assessing a fleet of transformers together with the appropriate number of tap changers.

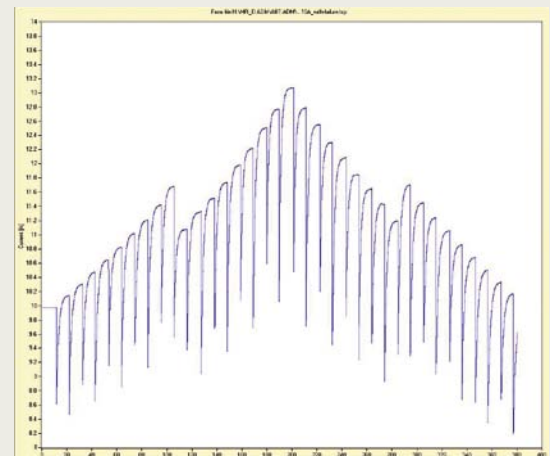
## TAPSCAN® DRM – Measurement by MR experts

Our experts record the DC resistance of a complete transformer winding in every phase and measure the motor-drive unit's motor current during diverter switch operation as well.

*Figure shows a typical measurement curve (neutral point phase) with a depiction of the motor current (effective value)*



*Peculiar measurement curve (neutral point phase) of a measured "bad" switching sequence on an on-load tap-changer NOT from MR*



The switching sequence is compared in all of the phases during analysis of the measurement results and our experts check the measurement curve for inconsistencies. A detailed measurement report is then created and the measurement results are made available in a prepared form. Furthermore, the measurement report provides recommendations for additional actions. The normal switching sequence for the on-load tap-changer has to be known in order to interpret the measurement results. MR has a constantly growing database. Therefore, we can easily recognize deviations from typical behavior. Static resistance measurement can be carried out as needed in order to obtain the DC winding resistance at any step. Furthermore, this allows conclusions to be drawn about a potential increase in resistance in the measured circuit. The saturated transformer is demagnetized at the end of measuring. The transformer can also be prepared for commissioning.

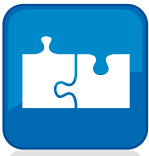
# MORE POWER, MORE VALUE.

Be on the safe side when operating on-load tap-changers.  
With our expert knowledge and TAPSCAN® DRM.



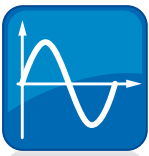
## Quick and reliable

- Quick overview of the condition of the on-load tap-changer in terms of its switching characteristics
- Measuring without opening the on-load tap-changer (no oil removal, no filling needed)



## Flexibly combinable

- Motor current (torque) recorded in parallel
- Comparison with "fingerprint" of the same switch and comparison of different phases
- Diagnosis in combination with gas-in-oil analysis of the transformer provides a good status description
- Measurement to supplement the standard measurements on the transformer



## Graphic depiction of switching characteristics

- Detect switching times with interrupts and/or bounce
- Comparison with other assessments and trend analysis possible



## Diagnosis by experts

- Measurement using analysis device developed especially for MR
- Actions recommended by MR experts after interpreting measurement results

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THE POWER BEHIND POWER.

