MiC 4.0

A manufacturer-independent and cross-machine understanding of data

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MiC 4.0 MACHINES IN CONSTRUCTION

in co-operation with

BAUMA INDUSTRIE

VDMA Construction – Equipment and Plant Engineering

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MiC 4.0 - the future is plug-and-work.

A manufacturer-independent and cross-machine understanding of data

Introduction

With currently 126 members from eight European countries, the Machines in Construction MiC 4.0 working group is the largest network organisation and central committee in Europe dealing with a standardised digital language for construction machinery and an identical understanding of data content and its meaning. The aim is to achieve manufacturer-independent and cross-machine interpretation and comprehensive communication of digital machine status and construction process data. Manufacturers can have their construction equipment validated as "MiC 4.0-compliant" so that a globally standardised understanding of data will be possible for operators of these machines in the future.

The members of the MiC 4.0 working group - machine manufacturers, machine operators (including construction companies), telematics providers, software manufacturers and other relevant players - are developing joint agreements and programming instructions for this purpose, the application of which specifies and defines the data that conforms to the ISO 15143-3 standard. They also describe exactly what state a machine is in for a particular command or process. This applies both to the machine status data in accordance with the above-mentioned ISO standard and to the construction process data that will follow in the further course of the work, for which standardised definitions are currently being developed in the respective machine clusters . All machines operated under MiC 4.0 provide the same status description.

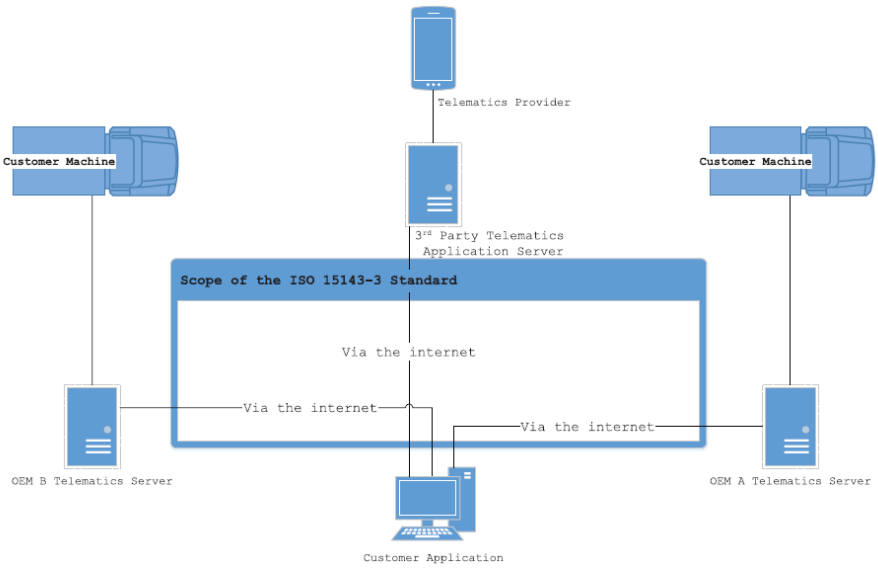


Fig. 1 - Diagram ISO 15143-3

This guide describes the benefits and advantages of MiC 4.0 compliance for construction equipment and explains the **validation process** for manufacturers and the **MiC 4.0 database**.

A separate guide describes the MiC 4.0 protocol for attachments in interaction with carrier devices, the MiC 4.0 bus.

MiC 4.0 for machine operators

The digitalisation of construction sites is progressing continuously. In order to remain competitive, everyone involved in construction must adapt to this development. Almost every machine today provides data that often remains unused but can be a source of better, safer, faster and more efficient construction processes. It is therefore worth utilising this data. In principle, **MiC 4.0 offers measurable benefits for all operators of mobile machinery**. Smaller construction companies or craft businesses can also benefit from it, for example in fleet management and information on construction processes.

Although the data supplied by the OEM server may still be ISO-compliant, each manufacturer interprets and names the status data of its machines differently before making it available to the machine operator (see Fig. 1). This means that comparable machines are in seemingly "different states" when carrying out the same work. This sometimes makes extensive and cost-intensive retrofitting necessary and means that the data cannot be utilised. With MiC 4.0-compliant ISO data, this situation is a thing of the past.

For the machine operator, MiC 4.0 conformity ensures that all machines that rely on MiC 4.0 deliver the standardised and jointly coordinated data value - regardless of manufacturer and across all machines (for details, see the MiC 4.0 conformity chapter and the manual). This means that all statuses, procedures and processes in construction practice can be interpreted identically.

MiC 4.0 conformity - the format of the data is checked.
The manufacturer is responsible for the accuracy of the content.

Operators can use the **MiC 4.0 database free of charge** to check which manufacturers are already working in compliance with MiC 4.0 and which specific data is provided by the OEMs in a standardised manner. It is updated regularly and enables a comparison between different machines and manufacturers.

MiC 4.0 for manufacturers

MiC 4.0-compliant data - significance

MiC 4.0 conformity means that all machines in the MiC 4.0 database adhere to the common agreements and deliver all data in the same format (JSON/HTML) with the same content meaning.

In this way, the recipients of the data always have identical descriptions of the respective operating statuses at their disposal - regardless of the manufacturer and across all machines. This saves them from having to take machine-specific definitions into account and considerably simplifies quality assurance, order and billing management and the further utilisation of data from a mixed machine park.

Fig. 2 - MiC 4.0-compliant machines - manufacturer-independent and cross-machine

MiC 4.0 ensures this standardised understanding, based on the specifications provided by ISO 15143-3. The same will also apply to construction process data in future. It does not matter whether it is a wheel loader, a roller or a road paver - if the machine is equipped with a combustion engine, for example, and sends the data value "on", each of these machines is in the state that the crankshaft is rotating in accordance with MiC 4.0. For this purpose, the sensors and telemetry of the machine must query and check the requested information and only transmit it to the OEM server if the agreements made by MiC 4.0 are fulfilled. For example, the movement status of the crankshaft, which

causes the "on/off" data value to be sent, can be verified using a direct sensor on the crankshaft or via the measured engine speed.

The machine manufacturer is responsible for compliance with the agreements made under MiC 4.0.

MiC 4.0 conformity

To become MiC 4.0-compliant, an OEM and its machine undergo a conformity test**.**

Firstly, the data to be transmitted is checked on the basis of ISO 15143-3 to ensure that it is delivered in accordance with the requirements specified by the standard and in line with the agreed MiC 4.0 understanding. If the standard is not available, the manufacturer can obtain it from DIN Media. (The address can be found in the appendix to the guide.) To check this, manufacturers send their data in JSON/HTML format via an internet link to the **MiC 4.0 test software**, which checks whether the format is correct.

In the next step, the MiC 4.0 test software creates a test protocol that reflects the result in accordance with the MiC 4.0 specifications. If the test is successful, the results can be published in the MiC 4.0 database and MiC 4.0 compliance can be documented for interested customers.

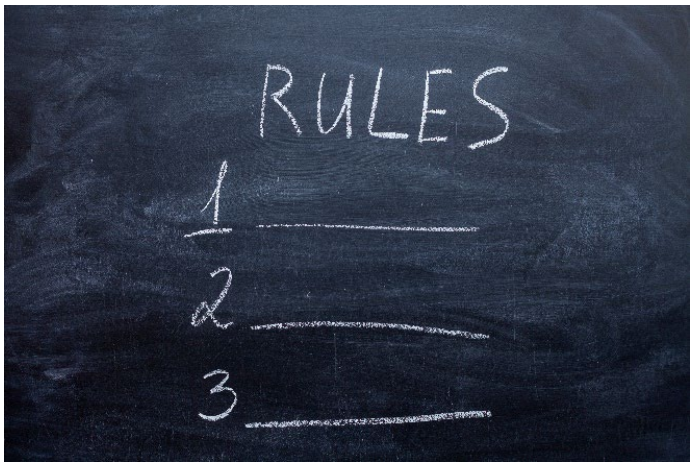
The test software does not check the technical correctness of sensor-relevant data or the accuracy of the sensors used by the machine.

MiC 4.0 provides the test software free of charge for testing purposes in accordance with the terms of use. Companies will receive support if they have any questions or problems. All participating companies must register before using the software. At the end of a successful test, the company concerned has the option of immediately transferring its tested machine to the MiC 4.0 database - at the click of a mouse.

The data sent by the machine is only MiC 4.0-valid once an entry has been made in the MiC 4.0 database! This means that the manufacturer only receives the corresponding documentation after publication.

If not all data, but at least one data value has been transmitted correctly in accordance with MiC 4.0 agreements, the tested machine can be transferred to the MiC 4.0 database and is therefore available to the user.

For MiC 4.0-capable machines, the buyer (machine operator) receives a conformity document with the sales documents, which refers to the respective machine ("serial number") and documents the MiC 4.0-supported data.



Manufacturers can find further details in the **manual** for the MiC 4.0 test software. It is available from the office. Information on the required data can be found in the ISO 15143-3 standard (source) and the MiC 4.0 results protocols, which are available on the MIC 4.0 website and can be downloaded free of charge after prior registration.

Condition data by machine type

The following work results are currently available (as of 2022):

- Machine condition data for earth-moving machinery
- Machine status data Lifting equipment
- Machine condition data for specialised civil engineering machines
- Machine condition data for road construction machinery
- Machine status data for concrete technology

With conformity resp. an entry in the database, the manufacturer ensures that the definitions set by the MiC 4.0 clusters (machine type-related working groups) are adhered to. However, older and current machines on the market cannot currently (as of August 2024) fully fulfil some MiC 4.0 agreements. These are labelled accordingly in the database.

The MiC 4.0 database

The MiC 4.0 database enables operators of construction equipment and attachments worldwide to compare the machines listed from different manufacturers and identify the best solution for their particular application.
It contains the individual models/model types of each manufacturer with regard to their functionality in relation to the data agreed under MiC 4.0. It is necessary that each model or model type of the respective series, as offered by the manufacturers on their websites, receives its own entry in the MiC 4.0 database.

Examples:
Excavator 4711-I
Excavator 4711-LS
Excavator 4711-Compact
Excavator 4715-A
Excavator 4715-Z

It is not permitted to list model series under a model-designating heading according to the excavator 4711xx scheme (4711-I, 4711-LS, 4711-Compact, ...).

Fee schedule for manufacturers

The costs for an entry in the MiC 4.0 database for a model or model type for machines currently amount to

EUR 500.00 per year for MiC 4.0 members

EUR 600.00 per year for non-members

The costs for an entry in the MiC 4.0 database for a model or model type are currently as follows for attachments:

EUR 250.00 per year for MiC 4.0 members

EUR 300.00 per year for non-members

For further information, please contact the MiC 4.0 office.

This guide was created by the MiC 4.0 office.

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Important links:

- mic40.org
- Link to the MiC 4.0 test software
- Link to the MiC 4.0 database
- MIC 4.0 results

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