



SAP Adapter - Functionality

Version 5.12

Manual



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1 General Description

1.1 Overview

-  This manual assumes knowledge in the use of FORCAM FORCE IIOT. If you do not have any knowledge of using FORCAM FORCE IIOT, take the time to familiarize yourself with the basics.

We recommend that you use our Academy.

The FORCAM Academy (<https://forcam.com/academie/>) provides the knowledge to effectively use the methods for digital transformation and the technologies for the Smart Factory. Based on lean manufacturing and TPM methods, our institute team will guide you to initiate changes in the company and to use the technologies correctly.

The FORCAM Adapter is an Add-On within the SAP standard program environment (ABAP) to integrate a MES system (FORCAM FORCE IIOT).

Data is exchanged between the connected systems via IDOC exchange and HTTP-XML communication.

There is a supply of different master and dynamic data from the SAP system to the connected FORCAM FORCE IIOT. That way consistent, current data can be secured in the systems involved and double data maintenance is avoided.

The following data can be transferred from the SAP system by default:

- production orders
- shift data / machine capacities
- personnel mini-master records

The data is transmitted to the MES system via IDOCS in the SAP standard output.

The MES system can support SAP with different confirmations. These messages are transferred to the SAP system as IDOCS via the SAP standard input. To differentiate the different messages there is the field RECORD TYPE in the transferred data structure.

The most important type of messages that can be processed by the FORCAM adapter are different order-related confirmations. Besides quantity reports (good quantity, scrap quantity and rework quantity) there are also performance reports (duration reports like HR times, set-up times and machine times). The times reported from the MES are assigned to different types of performance in SAP and can be distinguished from each other this way.

The data is transmitted from the MES via XML interface to the SAP system. The SAP standard IDOC XML service of the IDOC communication framework is used. To verify a secure communication an authentication can be used.

The incoming IDOCS are received and processed by the ALE level of the SAP system. The input function module calls a BAPI to process the message.

The default is a serialization of the incoming IDOCS via the business object type /FFMES/MSE.

General Description

Another default is the time synchronization between the MES entries and the SAP system time (maximum difference is 60 seconds).

An integrated correction module enables the prompt transfer of corrections from MES to SAP. Corrections are a special type of messages from MES and are processed similarly

This technical specification comprises exclusively the basic functionality of the FORCAM adapter. Customer specific adjustments without modifications are possible in addition.

All delivered objects of the FORCAM adapter are included in the development packages /FFMES/BASIC2_0, /FFMES/DOBJ and /FFMES/PROGRAMS and delivered as individual software component /FFMES/, which can be installed with the SAP Add-On installation tool (SAINT).

To set-up the basic functionality after the installation only customizing but no programming is necessary. The procedure is explained in another detailed documentation (installation manual).

1.2 Components of the FORCAM Adapter

1.2.1 Database Tables

To realize the functionality of the FORCAM adapter, internal database tables in packages /FFMES/BASIC2_0 and /FFMES/DOBJ are used.

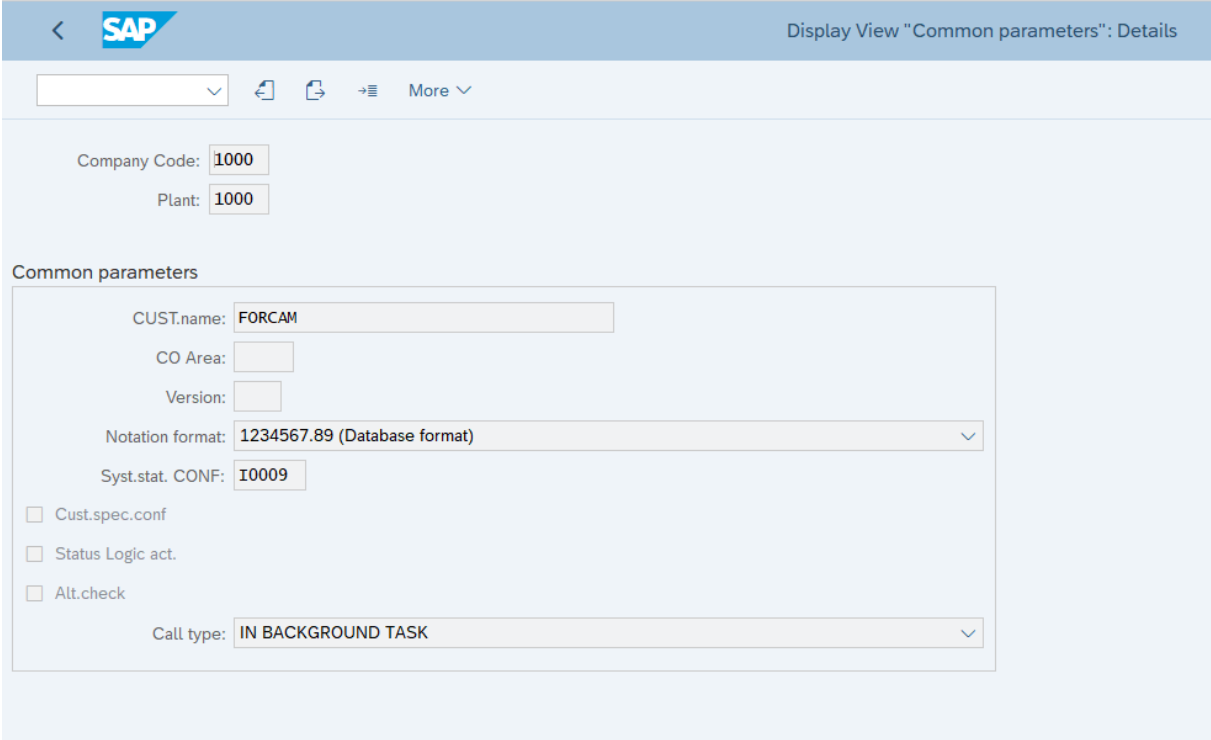
These tables are either control tables that are configurable accordingly or protocol tables in which important entries are updated.

1.2.1.1 Control Tables

The most important customizable control tables are described in the following section.

1.2.1.1.1 /FFMES/GLOBALS

Common parameters for the FORCAM adapter are stored in this table. The table relates to the factory.



The screenshot displays the SAP 'Display View "Common parameters": Details' for the /FFMES/GLOBALS table. The interface includes a top navigation bar with the SAP logo and a title bar. Below the title bar, there is a search bar and a 'More' dropdown menu. The main content area is divided into sections. The first section contains 'Company Code: 1000' and 'Plant: 1000'. The second section, titled 'Common parameters', contains several fields: 'CUST.name: FORCAM', 'CO Area:', 'Version:', 'Notation format: 1234567.89 (Database format)', 'Syst.stat. CONF: I0009', and 'Call type: IN BACKGROUND TASK'. There are also three checkboxes: 'Cust.spec.conf', 'Status Logic act.', and 'Alt.check'.

Figure 1: Structure /FFMES/GLOBALS

General Description

The customers' name (*CUST.name*) is needed as the key for reading the so-called distribution table in which the processing modules for booking the reports from the MES are found.

The fields *CO Area* and *Version* are needed, if the accounting for services should be booked to internal orders (specific record types).

The field *Syst.stat. CONF* is used to determine the current status in the order and to proof the status "completely confirmed".

Time ticket confirmations are always booked as a default.

If the attribute *Cust.spec.conf* is checked (X), the confirmation is not booked via the SAP standard functional module BAPI_PRODORDCONF_CREATE_TT, but via a differing customer specific function.

If the field *Status logic act.* is checked, a user status can be set when booking specific MES reports. To do so, the status logic is stored in the table /FFMES/STATUS_N.

Via the field *Alt.check* it is managed, that a customer specific checking method should be used when checking the operations for their relevance for sending to the MES.

Via the field *Call type* the call-up type of the functional module to create the IDOC creation within the updating of the production orders is managed. The default value here is 'B', in background task.

1.2.1.1.2 /FFMES/AUFTRAG

In this table control parameters for the transmission of production order data from SAP to the MES are set.

The table contains the order type as a key field. This also enables the transmission of other order types, e.g., PM orders (AUTYP = 30)

These other order types are transmitted in the IDOCS with the basic type /FFMES/F.

The segments of the IDOC included in this transmission can be selected via the table /FFMES/AUFTRAG.

This table controls, if the interface for the transmission of production orders for the plant is active. Only then order data from this plant are transmitted to the MES.

To do so, an 'X' for the plant must be set in the field *ACTIVE*.

With the entries in this table, the transmission of specific order data when creating the IDOCS with production order data (/FFMES/F) can be managed. The particularly marked segments in the IDOC are transmitted (for the plant):


- | | |
|--|-----------------|
| • AKTIV_KTX: Flag long text order header | (/FFMES/SHDTXT) |
| • AKTIV_AVO: Flag operation data | (/FFMES/SAFOLG) |
| • AKTIV_TXT: Flag operation long text | (/FFMES/SAFOTX) |
| • AKTIV_FHM: Flag production resources | (/FFMES/SAUFFH) |
| • AKTIV_KOM: Flag components | (/FFMES/SAFOKO) |
| • AKTIV_MKL: Flag material classification | (/FFMES/SAUFMK) |
| • AKTIV_MST: Flag material master | (/FFMES/SAUFMK) |

General Description

There are further control options in this table when sending order data to the MES system:

- **KZCORRCB:** Flag correction with callback:
Concerns the processing of corrections from the MES. If this flag is checked, a response is sent to the MES after a correction is finished.
- **KZNOLOS:** Flag create no time ticket:
This flag overwrites the creation of time tickets.
- **KZEROFF:** Flag send created orders:
With this it can be controlled, that also opened orders are reported to the MES. As a default, orders are reported only after they were cleared.

1.2.1.1.3 /FFMES/FA_FIELDS

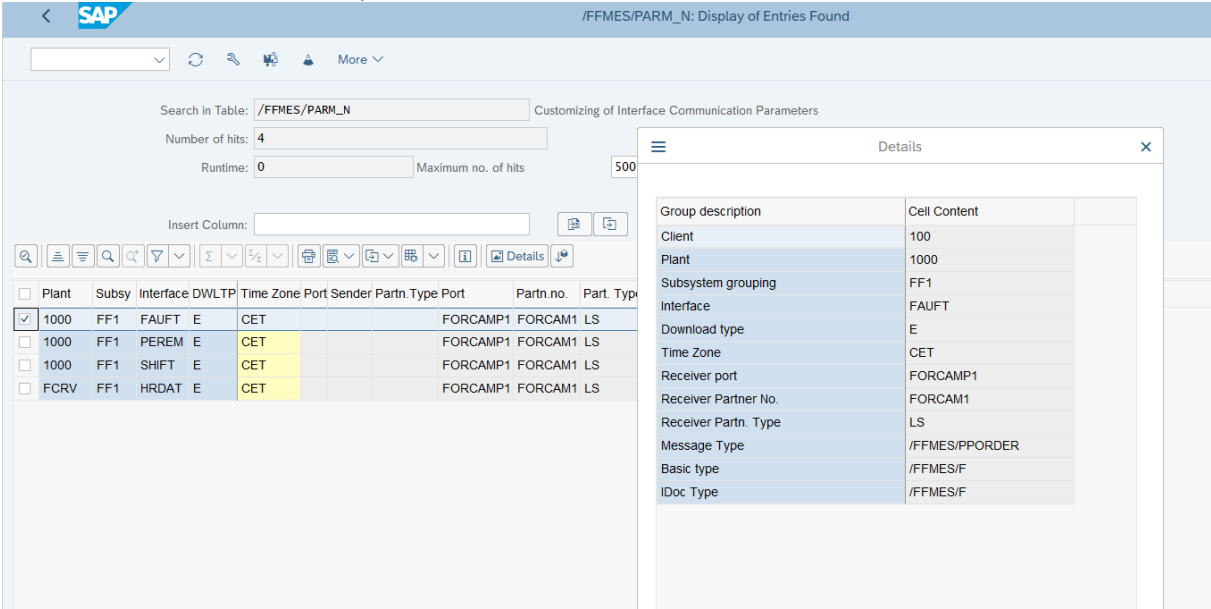
 The table /FFMES/AUFTRAG must be managed first.
This table defines, which fields are relevant for the transfer of order data to the MES. If one of the fields in the table gets changed, the order data will be reported to the MES.

This table must be filled initially, otherwise the transmission of order data to the MES won't be carried out.

To initiate the field transmission when customer specific extension modules are changed, special entries in the table /FFMES/FA_FIELDS must be managed.

1.2.1.1.4 /FFMES/PARM_N

This table is very important for the successful communication between SAP and MES, because it contains some crucial control parameter.



Plant	Subsy	Interface	DWLTP	Time Zone	Port	Sender	Partn. Type	Port	Partn. no.	Part. Type
<input checked="" type="checkbox"/>	1000	FF1	FAUFT	E	CET			FORCAMP1	FORCAM1	LS
<input type="checkbox"/>	1000	FF1	PEREM	E	CET			FORCAMP1	FORCAM1	LS
<input type="checkbox"/>	1000	FF1	SHIFT	E	CET			FORCAMP1	FORCAM1	LS
<input type="checkbox"/>	FCRV	FF1	HRDAT	E	CET			FORCAMP1	FORCAM1	LS

Group description	Cell Content
Client	100
Plant	1000
Subsystem grouping	FF1
Interface	FAUFT
Download type	E
Time Zone	CET
Receiver port	FORCAMP1
Receiver Partner No.	FORCAM1
Receiver Partn. Type	LS
Message Type	/FFMES/PPORDER
Basic type	/FFMES/F
IDoc Type	/FFMES/F

Figure 2: Structure /FFMES/PARM_N

Different data can be exchanged between SAP and the connected MES. There must be an entry in the table /FFMES/PARM_N for each of these interfaces.

The entries in this table must be managed **for each plant**, in which the interface should be active.

General Description

The **sub-system flag** (field BDEGR) is used to check the relevance of operations with specific workplaces for the transmission to the connected MES.

The relevant sub-system flags must be entered in the table for each plant. If a workplace contains this specified sub-system flag, the operation with this workplace is sent to the MES. The check for the relevant sub-system flag is also executed for other data belonging to the workplace, e.g. capacity data or planned orders.

The field **Schnittstelle** (interface) contains the short term of the interface:

FAUFT	Production orders
SHIFT	Shift data of workplaces / capacity supply
HRDAT	Mini-master records HR
RUECK	Confirmations from MES

Recipient / sender information, logic message and IDOC basic type are also managed in this table. These details are needed, when creating the IDOC.

1.2.1.1.5 /FFMES/MSGPROG

This table is the central control table for the processing of confirmations from MES to SAP. Via this table for each **RECORD TYPE** (Field ZKEY1) is controlled, which processing program should be run. Additionally, a second processing program can be entered for each record type. To determine this program, the customer's name is entered in the table /FFMES/GLOBALS. The customer's name is a key field in this table (field ZFIELD).

In addition to the processing module, the program name that contains the sub-program is entered. This enables the use of customer-owned processing programs to process MES messages. Via the table field "SPEC" a specific handling for special record types can be activated. (Use for implementing of extension methods possible).

Further parameters for the processing of messages can be entered if needed:

- Activity type to be booked
- Should the confirmation be booked as partial or final confirmation?

Special entries can be created in this table, e.g., to implement the activity type for continuous signals (see chapter 3.2.3.1).

1.2.1.1.6 /FFMES/CORR_CUST

This table controls the sequence of adjusting entries.

In the corrections only insert (type = I) or delete (type = D) are allowed.

For each plant in this table, which processing module for certain record types and correction types (delete, insert) should be activated. Customer specific processing modules can be lodged here.

General Description

1.2.1.1.7 /FFMES/FILTERS

Via the table /FFMES/FILTERS complete production orders or single operations can be excluded from a feed to the MES.

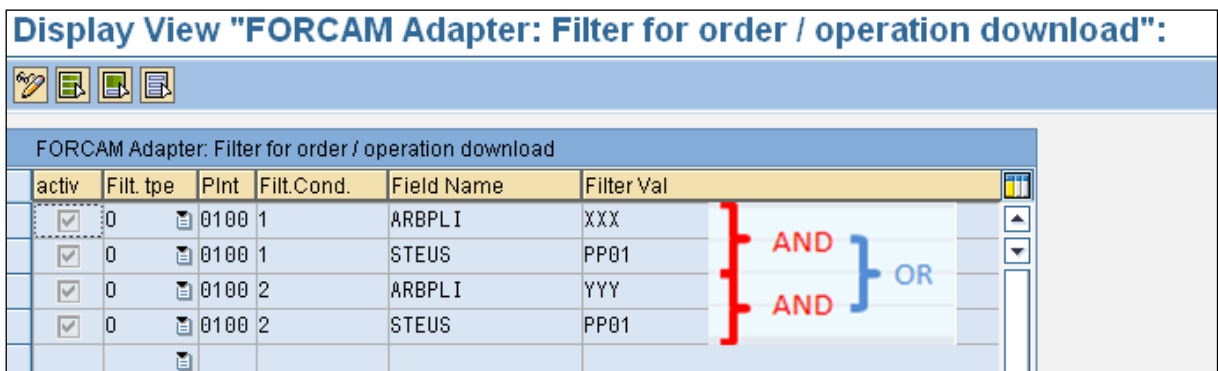
A filtering can be done via each field in the order header and order operation segment.

A filtering of order operations via a combination of control key and workplace could be configured e.g., as follows:

STEUS (control key) = „PP01“ **AND** ARBPLI (workplace) = „XXX“
OR

STEUS (control key) = „PP01“ **AND** ARBPLI (workplace) = „YYY“

Display View "FORCAM Adapter: Filter for order / operation download":



activ	Filt. tpe	Plnt	Filt.Cond.	Field Name	Filter Val
<input checked="" type="checkbox"/>	0	0100	1	ARBPLI	XXX
<input checked="" type="checkbox"/>	0	0100	1	STEUS	PP01
<input checked="" type="checkbox"/>	0	0100	2	ARBPLI	YYY
<input checked="" type="checkbox"/>	0	0100	2	STEUS	PP01

Figure 3: Structure /FFMES/FILTERS

Operations that contain the control key „PP01“, that also have the assigned workplace „XXX“ or „YYY“, would not be reported to the MES with this configuration, even if the basic requirements of the FORCAM-adapter (defined sub-system + confirmation capability) are fulfilled.

Meaning of the single fields:

- **active**
Only active conditions are considered.
- **Filt.tpe**
Differentiation between „H“ for header data and „O“ for operation data
- **Plnt**
The plant in which the filter criteria should be considered
- **Filt.Cond.**
Indicates the counter of the condition.
All entries with the same counter are linked via a AND-condition.
A change of the counter describes an OR-condition.
- **Field Name**
Field of order header and order operation segment
- **Filter Val**
Value to be filtered

General Description

1.2.1.1.8 /FFMES/CONTRL

With the FORCAM specific table /FFMES/CONTRL a special processing logic of confirmations can be entered for each plant.

The number of possible configuration parameters is preset in the value table /FFMES/CONTRL_V in the German and English language.

Following is a list of some of the parameters that can be set per plant:

- **ACTIV_CLEAR_RES**
- Log out of open reservations at final confirmation

- **ACTIV_NO_REMN_1**
- **ACTIV_NO_REMN_2**
- **ACTIV_NO_REMN_3**
- **ACTIV_NO_REMN_4**
- **ACTIV_NO_REMN_5**
- **ACTIV_NO_REMN_6**
- Flag: No remaining performance expected for relevant standard value

- **CHECKLOCK_INACT**
- CHECK_LOCK not active (do not set order module)

- **DONOTUSEF_ARBPL**
- Do not use workplace with confirmation

- **DONOTUSEF_PERNR**
- Do not use HR number with confirmation

- **INACTIV_FINCONF**
- Flag FIN_CONF not active with final confirmation

- **OPEND_TAR_ACT11**
- **OPEND_TAR_ACT12**
- **OPEND_TAR_ACT13**
- **OPEND_TAR_ACT14**
- **OPEND_TAR_ACT15**
- **OPEND_TAR_ACT16**
- Flag: Determine target performance for standard value 1-6 with end-of-operation message

- **QTYMG_TAR_ACT11**
- **QTYMG_TAR_ACT12**
- **QTYMG_TAR_ACT13**
- **QTYMG_TAR_ACT14**
- **QTYMG_TAR_ACT15**
- **QTYMG_TAR_ACT16**
- Flag: Determine target performance for standard value 1-6 with operation quantity message

There are also other parameters. These are described in more detail in the other FORCAM manuals. If parameter-driven processing logic is not sufficient for a particular application, these requirements must be realized via the extension points provided by FORCAM.

General Description

1.2.1.2 Protocol Tables

To enable correction directly initiated from MES and to check the correct function of the FORCAM adapter, protocol tables are updated. These tables are described in detail in the following section.

1.2.1.2.1 /FFMES/RUECKTBL

This table is an important protocol table in which all **successfully processed** confirmation records from the MES are entered. For the record not only all IDOC information are logged, but also the data of the original message sent by the MES.

1.2.1.2.2 /FFMES/OBJECT

All SAP objects that are created when booking the MES messages are logged in this table (e.g., confirmations, time tickets, accounting documents).

The entries in this table are the crucial requirements to process corrections from MES. Without this table it is not possible, to find and cancel the related subsequent documents.

For each successful processed message, the IDOC number and time stamp for start record and end record are collected. Furthermore, the HR number, confirmation number, the counter of the booked confirmation and the entry date and the document numbers of created subsequent documents (e.g., time ticket number, CO document number).

1.2.1.2.3 /FFMES/CORR_PROT

All processed corrective adjusting entries are logged in this table.

The following information is recorded for each entry:

- Client
- Order number
- Operation number
- Date
- Time of day
- Number of IDOCS
- Consecutive number
- Message text: Note to the processed entry, e.g., time ticket deleted, confirmation canceled, new confirmation booked.

There can be multiple lines for a corrective IDOC because there can be multiple entries that have to be canceled and newly booked. (This depends on the RECORD TYPE of the original entry.)

General Description

1.2.2 FORCAM specific IDOC Basic Types

The transfer of production order data is realized with special FORCAM IDOCS in the SAP standard IDOC output.

To transmit messages from the MES to the SAP system, own IDOCS in the SAP standard IDOC input are used.

Further data can be transferred from the SAP system to the MES, as periodic or also as one-time overall data feed. This transmission is also executed with the help of IDOCS in the standard output. An example is the supply with shift data of the workplaces (capacity supply).

A transmission with HR mini-master records to the MES is possible.

The IDOC basic types used in the FORCAM adapter will be briefly explained in the following.

1.2.2.1 /FFMES/F

This IDOC basic type is used to create IDOCS with production order data.

These IDOCS are transmitted to the MES system (IDOC output).

A detailed description of the data contents of the single segments can be found in chapter 2.1.1 .

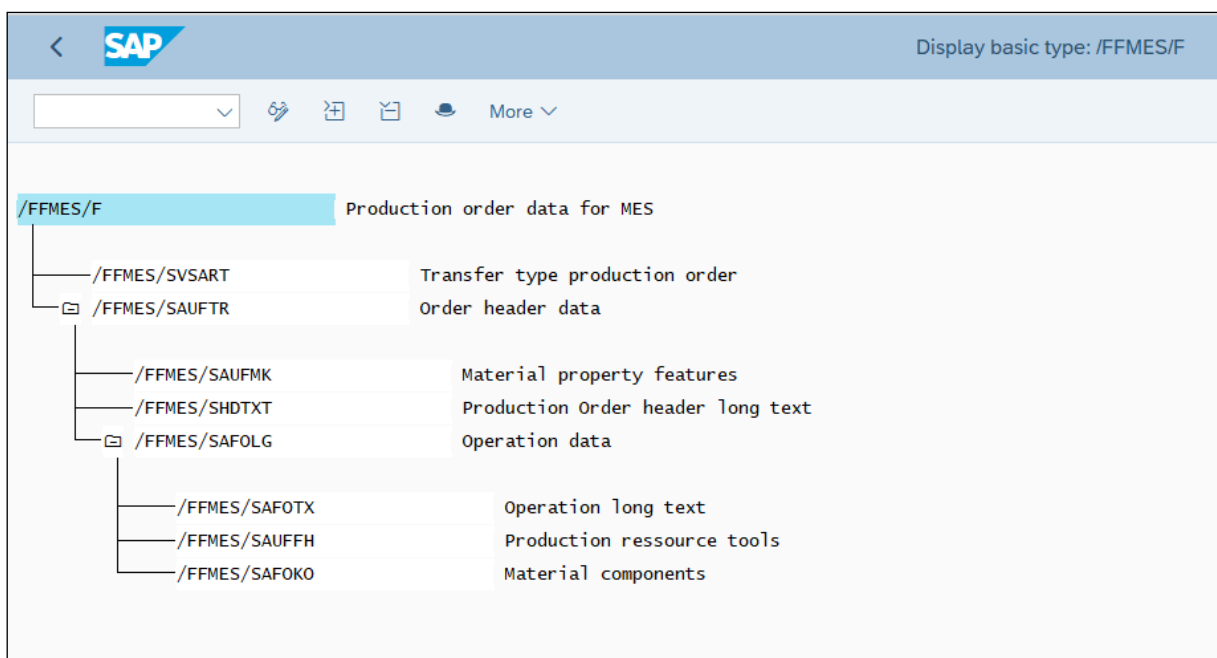


Figure 4: Structure /FFMES/F

General Description

1.2.2.2 /FFMES/R

This IDOC basic type is used to transfer messages from the MES to the SAP system. These IDOCs are sent to the SAP system. (IDOC input)

For further information see chapter 3.



Figure 5: Structure /FFMES/R

1.2.2.3 /FFMES/S

This IDOC basic type is used to create IDOCs with shift data and is an example for the possible overall supply with data from SAP.

These IDOCs are transferred to the MES system (IDOC output).

A detailed description of the data contents of the single segments can be found in chapter 2.1.2.1 .

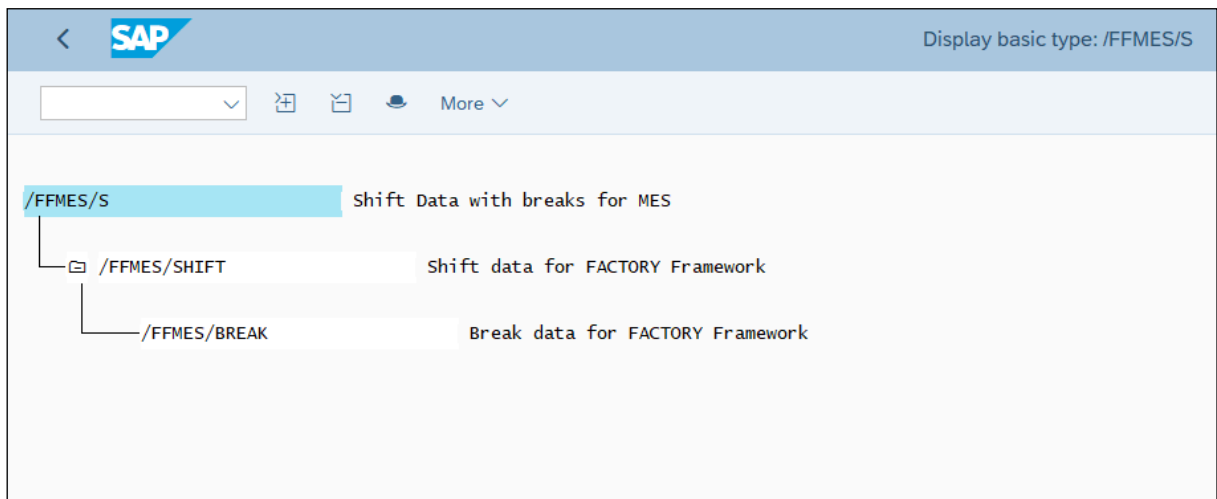


Figure 6: Structure /FFMES/S

General Description

1.2.2.4 /FFMES/H

This IDOC basic type is used to create IDOCS with HR mini-master records. To do so, all HR numbers of a HR department are transmitted in a shared IDOC. (Always done as overall supply, a selection via single HR numbers is not possible.)

These IDOCS are transmitted to the MES system. (IDOC output)

A detailed description of the data contents of the single segments can be found in chapter 2.1.2.2 .

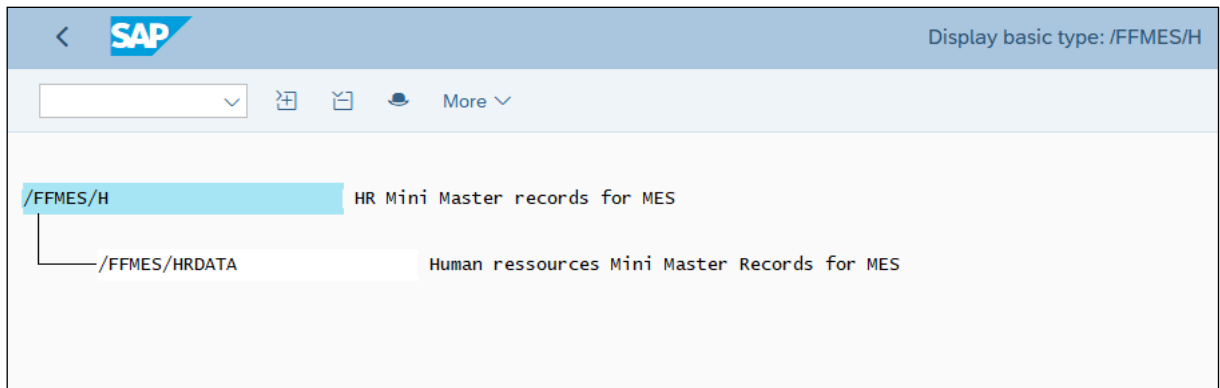


Figure 7: Structure /FFMES/H

1.2.3 Communication SAP – MES

The communication between the SAP system and the connected MES takes place via a HTTP communication. A HTTP port is used for the download of data to the MES through which the output - IDOCS are sent directly to the MES server.

The standard IDOC-XML service of the IDOC Communication Framework is used for the upload.

1.3 Customer Add-ons

1.3.1 Enhancement Spot /FFMES/CUST_ENH

To enable customer add-ons without program modifications, the enhancement spot /FFMES/CUST_ENH was created. The associated BADI definition is named /FFMES/ENH_FUNC.

The interface /FFMES/IF_ADDITIONS_1 contains different methods, that can be implemented with customer specific program code.

1.3.1.1 Customizing Tables

The transfer of data from SAP can be configured individually with the help of the existing control tables. When doing so, different adjustments are possible for each SAP plant. (/FFMES/GLOBALS, /FFMES/AUFTRAG, /FFMES/PARM_N, /FFMES/FA_FIELDS)

In the table /FFMES/GLOBALS basic operating modes of the FORCAM adapter can be adjusted without modifications. (For details see **Fehler! Verweisquelle konnte nicht gefunden werden.**)

Specific operations of production orders are not sent to the MES as a default due to specific contents:

- Operations with a control key which does not allow a confirmation
- Operations, that are not released
- Operations with workplaces, that do not have a relevant sub-system flag

A targeted transfer of data from SAP can also be controlled via these criteria.

1.3.1.2 Customer Specific Interface Methods

1.3.1.2.1 Function Module /FFMES/CREATE_ORDER_IDOCS

Different methods for customer specific Add-Ons via interface methods of the predefined enhancement spot are available in the function module for creating IDOCS with production order data.

- **CHANGE_INPUT_TABLES**
Change the global booking tables. Method will be executed at the beginning of the function module for the IDOC creation.
- **ALT_CHECK_OPERATIONS**
Add customer specific checks for the relevance of sending an operation to the MES. This method must be activated in the table /FFMES/GLOBALS
- **ADD_CHECK_OPERATIONS**
Add additional checks for sending an operation without skipping the default.
- **MODIFY_AVO_TABLES**
Change the internal tables related to a single operation, after checking.
- Adding additional information to our default segments
 - **ENH_FILL_AUFTR**
 - **ENH_FILL_AFOLG**
 - **ENH_FILL_AUFMK**
 - **ENH_FILL_AUFFH**
 - **ENH_FILL_AFOKO**

General Description

- **FILL_CLASSIFICATION**
Filling customer specific material characteristics for segment AUFMK.
- **MODIF_IDOC_CONTRLDATA**
Change the content of the IDOC control record data. Necessary for customer specific basic types.
- **MODIFY_IDOC_OUTDATA**
Adjust the record with the order data for the IDOC creation. A different segment name can be set when using extensions.
- **MOD_STRUCT_IDOC_OUT**
Additional possibility to change the order or add new segments to the IDOCs before sending.

1.3.1.2.2 Further extension options

The overall supply with SAP data via specific IDOCS offers customer specific extensions, too.

In the program used for the supply with shift data, the method **MODIFY_IDOC_OUTDATA** can be used to adjust the IDOC record. When filling the segments for the shifts, additional customized fields can be used. For that the method **ENH_FILL_SHIFT** was prepared.

In the program used for the supply with HR mini-master reports, the method **MODIFY_IDOC_OUTDATA** can be used to adjust the IDOC record. When filling the segments for the HR data, additional customized fields can be used. For that the method **ENH_FILL_HRDATA** was prepared.

1.3.1.3 Customer Fields in the IDOC Output

To integrate additional customer specific fields in the IDOC basic types that are transferred from SAP to MES, the following procedure can be executed:

- Create own development package for the customizations and enter all changes there.
- Create additional IDOC segments for the customer fields (WE31).
- Create an extension to the existing basic type and arrange the new segments as child segments under the existing segment, e.g., under /FFMES/SAUFTR a new segment /FFMES/CAUFTR.
- Create an extension implementation to the BADI definition /FFMES/ENH_FUNC, interface /FFMES/IF_ADDITIONS_1.
- After that, implement the corresponding method for filling the customer fields, e.g., **ENH_FILL_AUFTR** for the filling of additional fields at the order header segment. The method **MODIFY_IDOC_OUTDATA** can then be used to adjust the segment names for the customer fields. As a default, the segment name '/FFMES/SEAUFT' would be used for an extension field at the order header.

Standard segment names for extensions:

- Order header /FFMES/SEAUFT
- Operation sequence /FFMES/SEAFOL
- Characteristics /FFMES/SEAUFM
- Components /FFMES/SEAFOK
- FHM /FFMES/SEAUFF

1.3.1.4 Customizing Tables

To process messages it is possible, to enter two different customer specific processing methods for each record type in the table /FFMES/MSGPROG.

A custom program name can be entered and used for the processing of the record types.

It is possible, to configure customer specific record types for messages with a special processing.

The activity type to be booked and the status to be set (partial confirmed / completely confirmed) can be defined when entering the confirmation for each record type and each plant with the table /FFMES/MSGPROG.

Attention: If a record type cannot be found in the distribution table, these entries are ignored in the input processing without issuing an error message.

1.3.1.5 Customer Specific Interface Methods

1.3.1.5.1 Function Module /FFMES/IDOC_INPUT_MSG

In this function module for the MES message IDOCS (/FFMES/R) there is a possibility to adjust the specific IDOC status or process events after processing the IDOCS in the method

MOD_IDOC_STATUS_IN. The IDOC status must be '53' (i.e., they were successfully processed).

1.3.1.5.2 Method BAPI_PROCESS_MESSAGE

This method processes the adequate MES message and is called from the input function module.

Before the actual processing of the MES messages, specific messages can be marked as to be skipped. For that purpose, the method **SKIP_INBOX_MESSAGE** is used, in which the flag GF_IGNORE can be set.

Before the actual processing, additional customer specific processing can be executed (e.g., additional checks can be processed, or the content of the MES message can be adjusted).

The method **CHECK_INPUT_PARAMETERS** is provided for this purpose.

After entering the records additional processing can be integrated in the function module by calling up the method **FINAL_PROCESSING**.

1.3.1.5.3 To Enter Confirmations

The sub-program F01_CO11N is the most frequently used entering module for the processing of record types. In doing so, confirmations of a production order are booked.

It is possible to add customer specific extensions.

At first the content of input parameters for the later entry of confirmations can be adjusted. For that purpose, the method **MODIFY_CONF_PARAMETERS** can be used.

The method **PROCESS_AFTER_CONF** allows further customer specific adjustments in the sub-program, by enabling the execution of other functions after finishing the entry.

In the standard scope of an operation, it is always considered, to enter time ticket confirmations in SAP. In the case that the confirmation should not be entered via the SAP standard function module BAPI_PRODORDCONF_CREATE_TT, a customer specific processing module can be addressed. For that purpose, the flag CUST_CONF in the table /FFMES/GLOBALS must be checked. Furthermore, the interface method **CUST_SPEC_CONF** must be implemented with customer specific coding.

1.3.1.5.4 Further extension options

If the creation of time tickets is desired, the method **CREATE_TIME_TICKET** can be implemented. To this a corresponding extension was provided in the processing programs for set-up end, quantity report and HR log-out.

1.3.1.6 Customer Fields in the IDOC Input

To integrate additional customer specific fields in the messages transferred from MES to SAP (IDOC basic type /FFMES/R), the following procedure can be executed:

- Create own development package for the customizations and enter all changes there.
- Create additional IDOC segments for the customer fields (WE31).
- Create an extension to the existing basic type and arrange the new segments as child segments under the existing segment, e.g., under /FFMES/RUECK a new segment ZCUSTCONF.
- Create an extension implementation to the BADI definition /FFMES/ENH_FUNC, interface /FFMES/IF_ADDITIONS_1.
- Implement the method CREATE_CUST_SEGMENT to create an additional customer segment (will be called when creating the input IDOCs).
- To process the customer fields the adequate method must be implemented, e.g., PROCESS_AFTER_CONF, if the processing should be executed after the confirmation.
- Create an own function group in the customer's name space and program special sub-programs there for the processing of specific record types. These can then be entered in the table /FFMES/MSGPROG.

1.3.2 Corrections

Customer specific processing modules for corrections can be entered in the table /FFMES/CORR_CUST.

In the integrated correction module, the option is provided, to use a customer specific processing when cancelling confirmations. Therefore, the flag CUST_CONF in the table /FFMES/GLOBALS must be set and the method **CUST_SPEC_CANC_CONF** must be implemented.

2 Transfer of Data from SAP to MES

As a standard the following data can be transferred from the SAP system:

- Production orders
- shift data / machine capacities
- HR mini-master records

The trigger to transfer the production order data results from a BADI implementation in the entry of production orders. It contains a function module that creates the adequate IDOC.

There are special selection programs to transfer other data (e.g., shift data). These can be started manually or per job and create the IDOCS in the output.

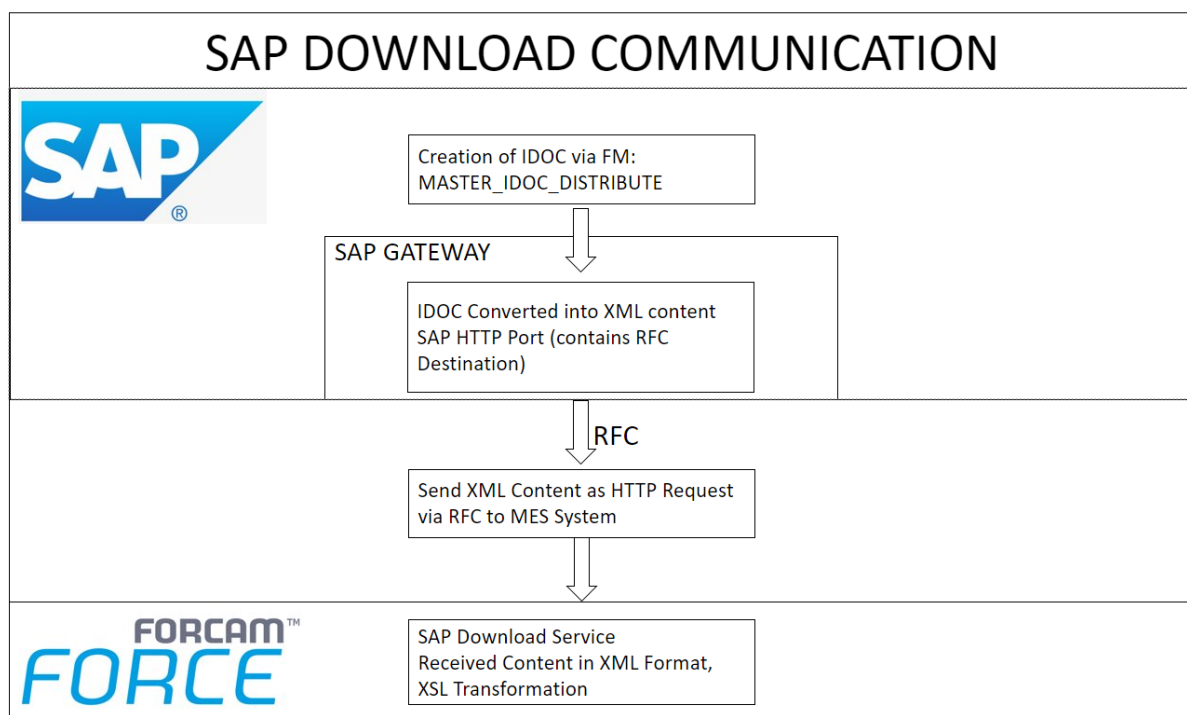


Figure 8: SAP Download Communication

2.1 Transferred Data

2.1.1 Production Orders

Production order data is transferred to the sub-system in the form of IDOC segments of a FORCAM Basic type (**/FFMES/F**). This IDOC contains different optional segments that will be explained more detailed in the following.

The IDOC creation is done with the help of the function module **/FFMES/CREATE_ORDER_IDOCS**, which is called via a BADI implementation of the definition **WORKORDER_UPDATE** when saving the production orders in SAP. At the same time the existing entry records of the last 2 minutes are analyzed and the IDOC segments are filled with the order data.

Only released orders are transferred to the MES system.

As a default it is assumed that the production orders to be transferred always contain only one position (Position 0001).

The parameters to create the IDOC are entered per plant in the table **/FFMES/PARM_N**. Via the table **/FFMES/FA_FIELDS** can be controlled, which fields are relevant for the transfer in the record structure of the order data, and which should not be transferred.

The table **/FFMES/AUFTRAG** contains control parameters important for the order transfer. It defines for which plant the interface is active and which data should be transferred.

The data is transferred in an IDOC when modifying, creating or deleting an order.

If orders are technically completed (setting the SAP status) or when withdrawing the order release in SAP, a deletion record is sent to the FORCAM System.

When changing the status of an order from the value unequal released to released, the complete order data will be transferred. This means, that there is always a supply of the whole order data when releasing and saving an order.

In all other cases there is only a delta supply with the changed data.

Only MES relevant operations of an order are transferred.

This is guaranteed by the following checks:

- The workplace in the OP of the order must be assigned to a specific BDE group
- The operation must be at least confirmation capable (control key)

When there is no MES relevant operation in the order, the order header data will not be transferred either.

As a standard, no text positions or dummy units in the order components are transferred to the MES.

2.1.1.1 Order Header Data

These data are transferred to the sub-system in the IDOC segment /FFMES/SAUFTR with the record type **AUFTR**.

Data Structure

Name	Type	Length	SAP Field
Record type	C	5	AUFTR
Processing characteristic	C	1	D or S
Client	C	3	AUFG-MANDT
Company code	C	4	AUFG-BUKRS
Plant	C	4	AUFG-WERKS
Order number	C	12	AUFG-AUFNR
Order split	C	1	0
Position number	N	4	AFPO-POSNR
Account assignment type	C	1	AFPO-KNTTP
Account assignment object	C	25	AFPO-KDAUF AFPO-PROJN (conv.) or empty
Order text	C	40	AUFG-KTEXT
Material number	C	18	AFPO-MATNR
Material short text	C	40	MAKT-MAKTX
Customer number	C	20	VBAK-KUNNR
Targeted start date	DD.MM.YYYY	10	AFKO-GSTRP
Planned start date	DD.MM.YYYY	10	AFPO-STRMP
Targeted delivery date	DD.MM.YYYY	10	AFKO-GLTRP
Planned delivery date	DD.MM.YYYY	10	AFPO-LTRMP
Order amount	C	17	AFKO-GAMNG
Quantity unit for display	C	3	AFKO-GMEIN
Order status	C	80	JEST-STAT TJ02T-TXT04

Transfer of Data from SAP to MES

Block indicator	C	1	empty or X
Order priority	C	1	AFKO-APRIO
Production scheduler	C	3	AFKO_FEVOR
Responsible sched. group/ department	C	3	PLKO-VAGRP
Release date	DD.MM.YYYY	10	AFKO-FTRMI
Reduction indicator	C	1	AFKO-REDKZ
Test lot number	C	12	empty
Serial number	C	20	empty
Quantity unit for display	C	3	AFKO-GMEIN
Order status	C	80	JEST-STAT TJ02T-TXT04
Block indicator	C	1	empty or X
Order priority	C	1	AFKO-APRIO
Production scheduler	C	3	AFKO_FEVOR
Responsible sched. group/department	C	3	PLKO-VAGRP
Release date	DD.MM.YYYY	10	AFKO-FTRMI
Reduction indicator	C	1	AFKO-REDKZ
Test lot number	C	12	empty
Serial number	C	20	empty
Drawing number	C	80	empty
Project	C	3	empty
Model	C	6	empty
Machine	C	4	empty
Stock location	C	4	AFPO-LGORT
Production version	C	4	empty
User status	C	40	JEST-STAT

Transfer of Data from SAP to MES

System Status ID	C	80	JEST-STAT
System Status Text	C	80	TJ02T-TXT04
User Status Text in German	C	40	TJ30T-TXT04
User Status Text in Order language	C	40	TJ30T-TXT04
Order Type	C	4	AUFG-AUART
SAP System ID	C	8	SYSID
Region	C	5	/FFMES/AUFTRAG-REGIO
Scheduled Start information	DD.MM.YYYY	10	AFKO-GSTRS
Scheduled finish values	DD.MM- YYYY	10	AFKO-GLTRS
UTC Offset	C	6	TTZZ-TZONE

2.1.1.2 Object Parameter Material

These data are transferred to the sub-system in the IDOC segment /FFMES/SAUFMK with the record type **AUFMK**, if the configuration was adjusted that way. The configuration is adjusted via the table /FFMES/AUFTRAG (Flag AKTIV_MKL).

The data is then transferred with the characteristic name 'Material' and the adequate contents of the material master fields in the characteristic values.

The structure contains the following fields:

Data Structure

Name	Type	Length	SAP Field
Record type	C	5	AUFMK
Processing characteristic	C	1	S
Client	C	3	AUFK-MANDT
Company code	C	4	AUFK-BUKRS
Plant	C	4	AUFK-WERKS
Order number	C	12	AUFK-AUFNR
Order split	C	1	0
Order position	N	4	AFPO-POSNR
Class	C	40	TCLAT-ARTXT
Parameter name	C	30	CABN-ATNAM or 'MATERIAL'
Characteristic or material type (ATWRT)	C	30	AUSP-ATWRT or MARA-MTART
Basic amount unit (ATW02)	C	30	MARA-MEINS
Plant (ATW03)	C	30	AUFK-WERKS
Net weight (ATW04)	C	30	MARA-NTGEW
Raw material (ATW05)	C	30	MARA-WRKST
Value list (ATW06)	C	30	empty
Upper limit (ATW07)	C	30	Read classification to material (MARA)
Lower limit (ATW08)	C	30	Read classification to material (MARA)
Dimensions (ATW09)	C	30	Split von MARA-GROES, length

Transfer of Data from SAP to MES

Dimensions (ATW10)	C	30	Split von MARA-GROES, width
Dimensions (ATW11)	C	30	Split von MARA-GROES, height
Dimensions (ATW12)	C	30	Split von MARA-GROES, depth
Parameter value 13 (ATW13)	C	30	empty
SAP System ID	C	8	SYSID

2.1.1.3 Operation Data

These data are transferred to the sub-system in the IDOC segment /FFMES/SAFOLG with the record type **AFOLG**, if the configuration was adjusted that way. The configuration is adjusted via the table /FFMES/AUFTRAG (Flag AKTIV_AVO).

Data Structure

Name	Type	Length	SAP Field
Record type	C	5	AFOLG
Processing characteristic	C	1	S or D
Client	C	3	AUFK-MANDT
Company code	C	4	AUFK-BUKRS
Plant	C	4	AFVC-WERKS
Order number	C	12	AUFK-AUFNR
Order split	C	1	0
Confirmation number of operation	N	10	AFVC-RUECK
Operation number	C	4	AFVC-VORNR
AFO Split	C	1	empty
Operation short text	C	80	AFVC-LTXA1 and AFVC-LTXA2
Latest scheduled start date	DD.MM.YYYY	10	AFVV-SSAVD
Latest scheduled start time	HH.MM	5	AFVV-SSAVZ
Latest end date	DD.MM.YYYY	10	AFVV-SSEDD
Latest end time	HH.MM	5	AFVV-SSEDZ

Transfer of Data from SAP to MES

Preset quantity	C	17	AFVV-MGVRG
Quantity unit	C	3	AFVV-MEINH
Reported quantity confirmed quality	C	17	AFVV-LMNGA
Reported quantity scrap	C	17	AFVV-XMNGA
Reported quantity rework	C	17	AFVV-RMNGA
Planned scrap amount	C	17	calculated from AFVV-MGVRG / 100 * AFVC-AUFAK
Basic amount	C	17	AFVV-BMSCH
Set-up time (time type 1)	C	17	AFVV-VGW01
Set-up time unit (time unit 1)	C	3	AFVV-VGE01
Machine time (time type 2)	C	17	AFVV-VGW02
Control key machine time unit (time unit 2)	C	3	AFVV-VGE02
HR time (time type 3)	C	17	AFVV-VGW03
HR time unit (time unit 3)	C	3	AFVV-VGE03
Time type 4	C	17	AFVV-VGW04
Time unit 4	C	3	AFVV-VGE04
Time type 5	C	17	AFVV-VGW05
Time unit 5	C	3	AFVV-VGE05
Time type 6	C	17	AFVV-VGW06
Time unit 6	C	3	AFVV-VGE06
Scheduled workplace	C	8	CRHD-ARBPL (with PLPO-ARBID)
Actual workplace	C	8	CRHD-ARBPL (with AFVC-ARBID)
Scheduled workplace group	C	8	CRHD-ARBPL (with CRHS-OBJID_UP)
Salary type	C	4	AFVC-LOART
Salary group	C	3	AFVC-LOGRP

Transfer of Data from SAP to MES

Order status	C	80	empty
Block indicator	C	1	empty or X
Overdelivery tolerance	C	17	calculated from AFKO-GAMNG * AFPO-UEBTO / 100
Overdelivery check	C	1	if AFPO-UEBTK = 'X' then N, otherwise Y
Short shipment tolerance	C	17	Calculated from AFKO-GAMNG * AFPO-UNTTO / 100
Short shipment check	C	1	N
Error OP short term	C	1	empty
Control key	C	4	empty
Confirmation intended	C	1	empty
Short term rework operation	C	1	empty
Operation number	C	4	empty
Material number	C	18	AFPO-MATNR
Material short term	C	40	MAKT-MAKTX or AUFK-KTEXT
Palette slip characteristic	C	1	empty
Status predecessor OP	C	2	empty
Production version	C	4	empty
Document number	C	22	empty
Document type	C	3	empty
Document version	C	2	empty
Series	C	6	AFVC-PLNFL
Series type	C	1	if AFVC-PLNFL = '000000' then empty, otherwise 1
User status	C	40	JEST-STATU
Record number (EVORN)	C	4	empty
Record number (RVORN)	C	4	empty
Order type (AUART)	C	4	AUFK-AUART
System Status ID	C	80	JEST-STAT

Transfer of Data from SAP to MES

System Status Text	C	80	TJ02T-TXT04
User Status Text in German	C	40	TJ30T-TXT04
User Status Text in Order language	C	40	TJ30T-TXT04
SAP System ID	C	8	SYSID
UTC Offset	C	6	TTZZ-TZONE

2.1.1.4 Texts to Operation Sequences

These data are transferred to the sub-system in the IDOC segment /FFMES/SAFOTX with the record type **AFOTX**, if the configuration was adjusted that way. The configuration is adjusted via the table /FFMES/AUFTRAG (Flag AKTIV_TXT).

The structure contains the following fields:

Data Structure

Name	Type	Length	SAP Field
Record type	C	5	AFOTX
Processing characteristic	C	1	S
Client	C	3	AUFK-MANDT
Company code	C	4	AUFK-BUKRS
Plant	C	4	AFVC-WERKS
Order number	C	12	AUFK-AUFNR
Order split	C	1	0
Confirmation number	N	10	AFVC-RUECK
Consecutive number	N	4	is counted up
Operation split	C	1	empty
AFO no.	C	4	AFVC-VORNR
AFO text	C	80	Text ID = AVOT Text name = AFVC-MANDT + AFVC-AUFPL + AFVC-APLZL Text object = AUFK
SAP System ID	C	8	SYSID

2.1.1.5 Production Resources

These data are transferred to the sub-system in the IDOC segment /FFMES/SAUFFH with the record type **AUFFH**, if the configuration was adjusted that way. The configuration is adjusted via the table /FFMES/AUFTRAG (Flag AKTIV_FHM).

The structure contains the following fields:

Data Structure

Name	Type	Length	SAP Field
Record type	C	5	AUFFH
Processing characteristic	C	1	if AFFH-LOEKZ = ' ' then S otherwise D
Client	C	3	AUFK-MANDT
Company code	C	4	AUFK-BUKRS
Plant	C	4	AUFK-WERKS
Order number	C	12	AUFK-AUFNR
Order split	C	1	0
Confirmation number of the operation	N	10	empty
Operation number	C	4	empty
AFO Split	C	1	0
Consecutive number	N	4	AFFH-PSNFH
Type of production resource	C	1	M (material) D (document) E (equipment) S (without material)
Material number	C	18	CRVM_A-MATNR or CRVD_A-DOKNR or CRVE_A-EQUNR or CRVS_A-SFHNR
Material short text	C	40	MAKT-MAKTX DRAT-DKTXT EQKT-EQKTX
FH quantity	N	9,3	AFFH-MGVGW
Quantity unit for display	C	3	AFFH-MGEINH
Order status	C	80	CRFH-FGRU1
SAP System ID	C	8	SYSID

2.1.1.6 Material Components

These data are transferred to the sub-system in the IDOC segment /FFMES/SAFOKO with the record type **AFOKO**, if the configuration was adjusted that way. The configuration is adjusted via the table /FFMES/AUFTRAG (Flag AKTIV_KOM).

Data Structure

Name	Type	Length	SAP Field
Record type	C	5	AFOKO
Processing characteristic	C	1	if RESB-XLOEK ne 'X' then S otherwise D
Client	C	3	AUFK-MANDT
Company code	C	4	AUFK-BUKRS
Plant	C	4	AFVC-WERKS
Order number	C	12	AUFK-AUFNR
Order split	C	1	0
Confirmation number of the operation	C	10	AFVC-RUECK
AFO no.	C	4	AFVC-VORNR
AFO split	C	1	empty
Reservation number	C	10	RESB-RSNUM
Reservation position	C	4	RESB-RSPOS
Component number	C	18	RESB-MATNR
Plant	C	4	RESB-WERKS
Stock location	C	4	RESB-LGORT
Charge	C	10	RESB-CHARG
Special stock flag	C	1	RESB-SOBKZ
Required date	TT.MM.JJJJ	10	RESB-BDTER
Required quantity	C	15	RESB-BDMNG
Quantity unit	C	3	RESB-MEINS
Serial number	C	8	RESB-SERNR

Transfer of Data from SAP to MES

Item text	C	40	MAKT-MAKTX
Stock number	C	3	RESB-LGNUM
Stock type	C	3	RESB-LGTYP
Stock location	C	10	RESB-LGPLA
Material type	C	4	MARA-MTART
Flag retrograde withdrawal	C	1	MARC-RGEKZ
Flag bulk goods	C	1	MARC-SCHGT
Product group	C	9	MARA-MATKL
Sequence	C	6	AFVC-PLNFL
SAP System IDC	C	8	SYSID
Trace Type	C	1	Filled customer specific
Trace Needed	C	1	Filled customer specific

2.1.2 Total Data Feed with Various SAP Data

Beside the creation of IDOCs with production order data, other data can be sent from SAP to the MES, too. These data are transferred with the help of outgoing IDOCs.

The data is retrieved with the help of different selection reports from the SAP system. IDOCs are then created in the SAP IDOC output by these programs.

The transmission parameters for this interface are entered in the table **/FFMES/PARM_N** (key = record type from the data record) and in table **/FFMES/SEGMENT**.

The sub-system characteristics of the workplaces of each plant that are relevant for the transfer are logged in the table **/FFMES/PARM_N**

There is always only one data selection via a plant possible.

Via the parameter **Country/Region Key** a specific data output format can be chosen for the transferred data, which is independent from the user default (entry in table T005X respective decimal notation and date format). **DE** is the current default in the German output format.

2.1.2.1 Machine Capacities / Shift Plans

Shift data for a workplace with n breaks can be transferred with the program **/FFMES/TRNSFR_SHIFT_DATA** to the connected MES. The available capacity of the workplaces is selected.

Besides the selection via the time horizon, additional selections via workplace, workplace type, sub-system (BDE group), name of the modifying employee and date of the modification, block indicator and delete indicator of the workplace are offered.

It is also possible to transfer shift capacities that overdrive the factory calendar.

(Capacity on days, that are usual days-off)

The reading of a reference offer for the work capacity is possible.

A segment for the actual shift data is created as well as n segments for the adequate breaks based on the shift definition.

Data Structure Shift Segment

Name	Type	Length	SAP Field
Record type	C	5	SCHIC
Processing characteristic	C	1	SY-MANDT
Client	C	3	T001K-BUKRS
Company code	C	4	CRHD-WERKS
Plant	C	4	CRHD-ARBPL
Workplace	C	8	TC37A-BEGDA
Valid from	DD.MM.YYYY	10	Date from selection time horizon
Shift definition	C	4	KAPA-TPROG
Weekday	C	10	Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday written out in the respective log-in language
Shift start	HH:MM	5	TC37A-BEGZT
Shift end	HH:MM	5	TC37A-ENDZT
SAP System ID	C	8	SYSID
Shift Start	C	16	empty
Shift End	C	16	empty
UTC Offset	C	6	TTZZ-TZONE

Transfer of Data from SAP to MES

Data Structure Break Segment

Name	Type	Length	SAP Field
Record type	C	5	PAUSE
Processing characteristic	C	1	SY-MANDT
Client	C	3	T001K-BUKRS
Company code	C	4	CRHD-WERKS
Plant	C	4	CRHD-ARBPL
Workplace	C	8	TC37A-BEGDA
Valid from	DD.MM.YYYY	10	Should be kept empty (Use date from shift segment)
Shift definition	C	4	KAPA-TPROG
Number of breaks	C	3	TC37P-PAUNR
Break start	HH:MM	5	TC37P-PAUBEG
Break end	HH:MM	5	TC37P-PAUEND
SAP System ID	C	8	SYSID
Break Start	C	16	empty
Break End	C	16	empty
UTC Offset	C	6	TTZZ-TZONE

Transfer of Data from SAP to MES

2.1.2.2 Mini-Master Records HR

HR mini-master records can be transferred to the connected MES with the program **/FFMES/TRANSFER_HR_MASTER_DATA** or **/FFMES/TRANSFR_HR_DATA_LARGE**. A selection via a specific HR department is possible. All HR numbers that belong to this HR department are transferred in a shared IDOC. The transfer of single HR numbers is not intended.

Data of the following type are used:

- Info type 0000 actions
- Info type 0001 organizational assignment
- Info type 0002 Data of a person
- Info type 0050 Time recording

One IDOC segment is created for the HR data of one HR number.

Data Structure HR Data Segment

Name	Type	Length	SAP Field
Record type	C	5	PERSN
Processing characteristic	C	1	S
Client	C	3	PA0001-MANDT
Company code	C	4	PA0001-BUKRS
Plant (HR department)	C	4	PA0001-WERKS
HR number	NUMC	8	PA0001-PERNR
Time recording ID card number	NUMC	8	PA0050-ZAUSW
First name	C	10	PA0002-VORNA
Family name	C	20	PA0002-NACHN
Accounts	C	10	PA0001-KOSTL
SAP System ID	C	8	SYSID

3 Messages from the MES to SAP

Different messages (events) are transferred from the MES to the connected SAP by default. The data is always processed in the form of incoming IDOCS in the SAP system. If errors occur during the transmission, they are recorded in log files. The SAP standard IDOC-XML service of the IDOC communication framework is used for the communication.

The most important type of messages that can be processed by the FORCAM adapter, are different order related confirmations. Besides quantity reports (confirmed quality, scrap amount and rework amount) there are also time reports like HR times, set-up times and machine times. The times reported by the MES are assigned to different activity types in SAP and differentiated from each other that way.

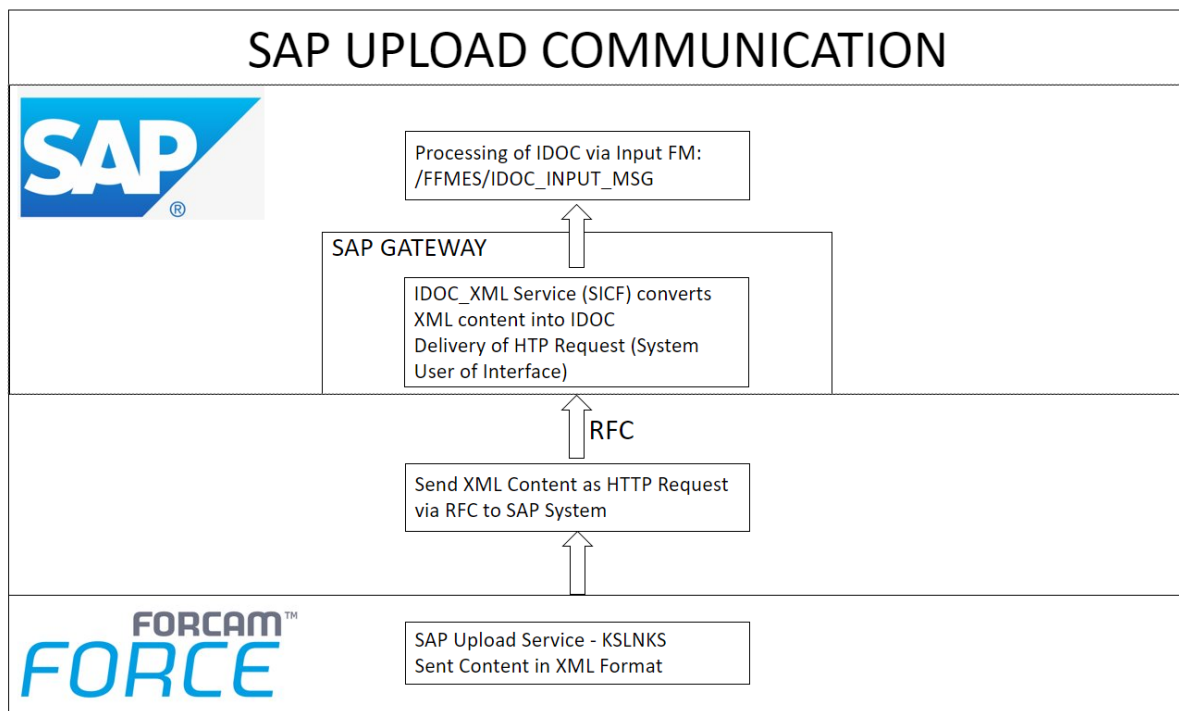


Figure 9: SAP Upload Communication

Messages from the MES to SAP

All messages from MES to SAP are transferred in the standardized structure **/FFMES/RUECK**.

To differentiate between the single entries each record gets a specific **record type** assigned (5-digit letter short term). Besides the mandatory fields in a record, different optional fields are filled depending on the record type. The standardized available messages are explained in detail in the following (The 5-digit short term of the record is always shown in the title.)

To technically realize the processing, different methods were created in the class **/FFMES/CL_UPLOAD** of the FORCAM adapter. These function modules compose the MES distributor.

The IDOCS come via the IDOC-XML service in the SAP system and are processed by the ALE layer. The responsible input function module is determined via the process code.

The input function module **/FFMES/IDOC_INPUT_MSG** processes the input IDOCS sequentially and calls up the method process message of the business object type **/FFMES/MSG** (BAPI **/FFMES/BAPI_PROCESS_MESSAGE**).

After processing different checks, the method **PERFORM_REC_TYPE** is called in this BAPI.

The actual IDOC processing is executed in the method **PERFORM_REC_TYPE**.

The processing program that belongs to the record is found in the table **/FFMES/MSGPROG** and is processed afterwards. Two different processing programs can be entered in this table for each record that are called one after the other. The successfully executed IDOCs are logged, to enable a later correction (Table **/FFMES/RUECKTBL** and **/FFMES/OBJECT**)

3.1 Serialization

3.1.1 General

The messages are transferred from the MES to the SAP system via XML interface. The SAP standard IDOC XML service of the IDOC communication framework is used. To meet the security requirements, an authentication through a RFC system user can be done.

The incoming IDOCS are received and processed by the ALE layer of the SAP system. The input function module calls a BAPI to process the message.

A serialization of the incoming IDOCS via the **business object type /FFMES/MSE** is intended as standard.

With the FORCAM adapter the IDOC serialization is only activated **during IDOC Input**.

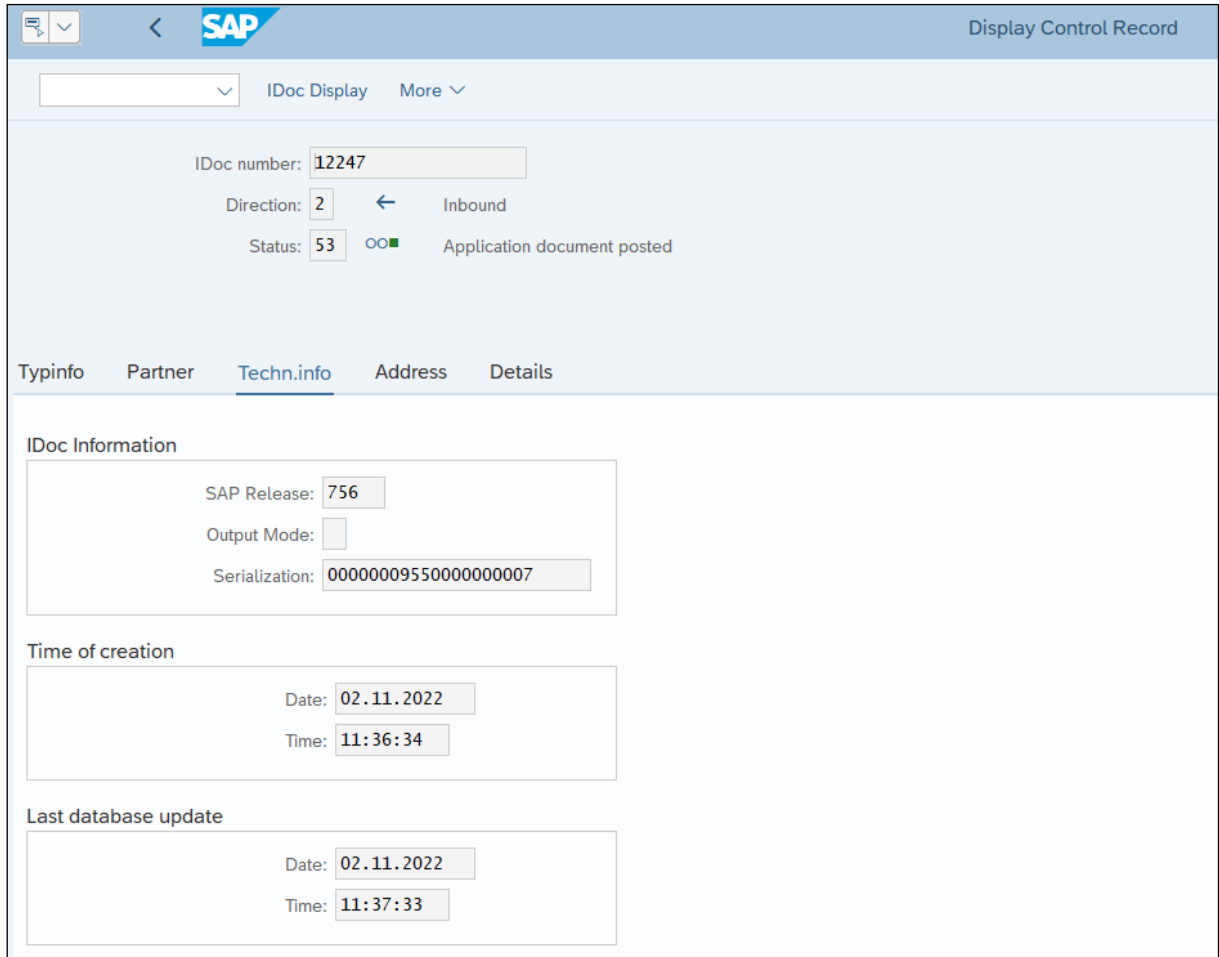
With the object serialization is guaranteed, that the order of messages with the same object type on the recipient side is always observed. All entries on the recipient side are processed exactly in the order that was defined on the sender side.

Each message to be transferred (IDOC) gets a consecutive number assigned. This information is generated in FORCAM FORCE.

In the standard installations of FORCAM Adapter, serialization is setup on operation level. The customizing necessary to establish the serialization is explained in detail in the installation manual of the FORCAM adapter.

3.1.2 Serialization Information in IDOC

The serialization information that determines the processing sequence of the inbound IDOCS can be found in the IDOC control record.



The screenshot shows the SAP IDoc Display interface. At the top, there's a header bar with the SAP logo and the title "Display Control Record". Below this, there's a navigation bar with tabs: "Typinfo", "Partner", "Techn.info" (selected), "Address", and "Details". The main content area is divided into sections. The first section, "IDoc Information", contains fields for "SAP Release: 756", "Output Mode:", and "Serialization: 00000009550000000007". The second section, "Time of creation", contains fields for "Date: 02.11.2022" and "Time: 11:36:34". The third section, "Last database update", contains fields for "Date: 02.11.2022" and "Time: 11:37:33".

Figure 10: Serialization Information in IDOC

It is found in the tab “Techn.Info” (technical information) in the field Serialization.

This serialization information is filled by the MES when sending the messages.

In this example: channel 955 (the first 10 digits) and message counter 7 (the last 10 digits).

Each Production order operation has a specific channel assigned; the sent messages are counted up consecutively.

3.2 Confirmation Types

3.2.1 Status Messages

3.2.1.1 OPSTR – operation start

Logging of the message in table **/FFMES/RUECKTBL**

Entry of a confirmation to the operation of the order with amount Zero, to set the status to partially confirmed (PCNF) and to fix the order. (In the status “partially confirmed” certain changes to the order are not allowed anymore.) The creation of the confirmation can also be done with a customer specific confirmation function. Therefor the exit CUST_SPEC_CONF can be used.

Setting of a user status, if the table **/FFMES/STATUS_N** is managed accordingly.

Updating of the table **/FFMES/OBJECT** with the confirmation number

3.2.1.2 OPEND – operation end

Logging of the message in table **/FFMES/RUECKTBL**

Entry of an initial confirmation to the operation of the order with amount Zero, to set the status to confirmed (CNF). Therefor the entry in the distribution table must contain the adequate record type for the confirmation (L40). The creation of the confirmation can also be done with a customer specific confirmation function. For it the exit CUST_SPEC_CONF can be used.

Setting of a user status, if the table **/FFMES/STATUS_N** is managed accordingly.

Updating of the table **/FFMES/OBJECT** with the confirmation number

3.2.2 Quantity Messages

3.2.2.1 QTYMG – quantity messages

Logging of the message in table **/FFMES/RUECKTBL**

Determine the activity type to be entered from table **/FFMES/MSGPROG**. There is a separate field for each type of reported quantities (confirmed quality quantity, scrap quantity or rework quantity)

Entry of the confirmation with **BAPI_PRODORDCONF_CREATE_TT** with the status defined according to table **/FFMES/MSGPROG** and the activity type or with a customer specific confirmation. For that the exit CUST_SPEC_CONF can be used.

Updating of the table **/FFMES/OBJECT** with the confirmation number

3.2.3 Performance Messages (Duration)

3.2.3.1 DURAT – duration messages

Determine the activity type with help of the distribution table: The time base sent by the MES is converted into the SAP activity type to be entered.

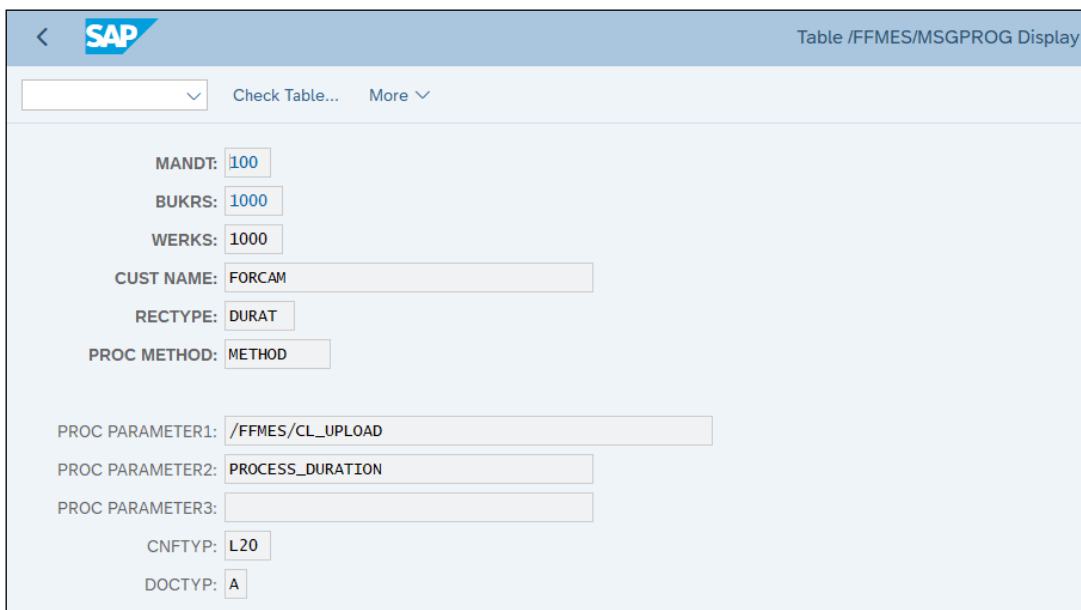
The duration is always sent in milliseconds by the MES.

Logging the message in table /FFMES/RUECKTBL

Enter confirmation with activity type, no quantity message. The entry of the confirmation can also be done with a customer specific confirmation function. For it the exit CUST_SPEC_CONF can be used.

Optional creating of time tickets

Updating of the table /FFMES/OBJECT with the confirmation number



SAP

Table /FFMES/MSGPROG Display

MANDT: 100

BUKRS: 1000

WERKS: 1000

CUST NAME: FORCAM

RECTYPE: DURAT

PROC METHOD: METHOD

PROC PARAMETER1: /FFMES/CL_UPLOAD

PROC PARAMETER2: PROCESS_DURATION

PROC PARAMETER3:

CNFTYP: L20

DOCTYP: A

Figure 11: Detail entry of table /FFMES/MSGPROG

3.2.4 User Status at Confirmations

In the FORCAM adapter the option is given, to activate a status logic when entering different confirmations. With it a specific user status can be set when processing a MES message. To execute this function the **Status Logic act.** must be switched on in the table **/FFMES/GLOBALS.** (see chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**)

The order of the single status fields to be set is controlled by entries in the table **/FFMES/STATUS_N.** The message sent by the MES contains the FACT order status. A to be set user status is assigned to this status field by managing the table **/FFMES/STATUS_N.**

Table /FFMES/STATUS Display	
Client	100
Company Code	0010
Plant	0100
Order Type	PP01
FACT order status	50
Status Profile	FCPROD
Status	E0004
Status Inact.	<input type="checkbox"/>

Figure 12: Entry in the table /FFMES/STATUS_N

When all relevant adjustments were made, a prepared sub-program is called up which sets the user status after the confirmation is entered. No modifications in the coding are necessary.

4 Tools

To start these special programs, a separate authorization is needed:
/FFMES/T with the activity BTCSUBMIT.

4.1 Deletion of IDOCS

If it becomes necessary to delete specific IDOCS, the report /FFMES/DELETE_IDOCS can be used besides the existing SAP standard tools (transaction WE11).

There are two alternatives to delete:

- Delete completely - remove from all data bases
- Delete logically - set a new status, that excludes the IDOC from further processing

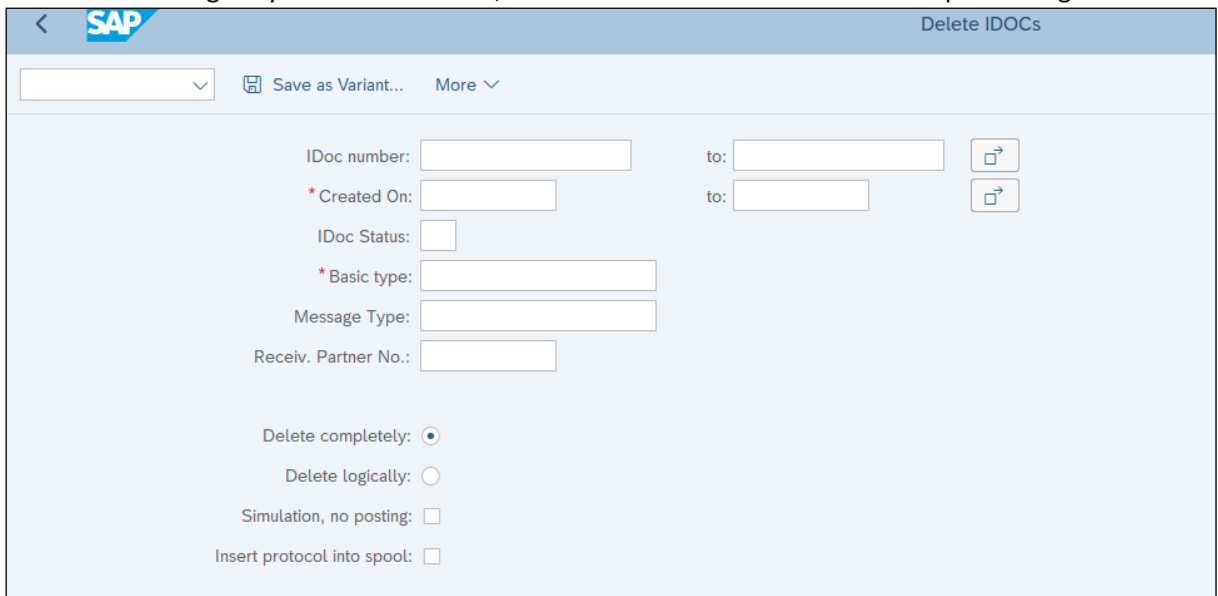


Figure 13: Selection screen of report /FFMES/DELETE_IDOCS

To execute the deletion, the SAP standard function module EDI_DOCUMENT_DELETE is used. A protocol is issued. It is possible to run a simulation, to check the selection.

When deleting logically the IDOC receives status 68 (Error - no further processing).

This change is only possible with IDOCS in the input.

4.2 Deletion of Protocol Entries

The tables /FFMES/RUECKTBL and /FFMES/OBJECT can grow strongly over time and so the access to these tables is getting slower. To enable the deletion of entries that are not needed anymore, the reports **/FFMES/DELETE_OBJ** and **/FFMES/DELETE_RUECKTAB** can be used. An increase of the processing speed can be achieved by running those reports on a regular basis.

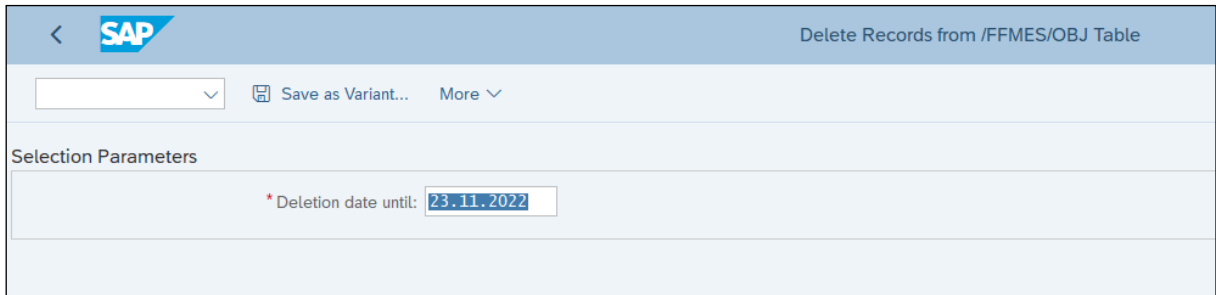


Figure 14: Selection screen of report /FFMES/DELETE_OBJ

Deletion is possible for both reports retrospectively up to the date entered.

4.3 Forwarding of Orders via http Port

To retry sending IDOCs which failed for some reason **/FFMES/RBD_AGAIN_HTTP** can be used. When forwarding these orders, intermediate changes on the orders are respected. IDOCs with the base type /FFMES/F are selected, that have the IDOC status 02. To send the IDOCs the SAP standard function module IDOC_PROCESS_ERROR is called up.

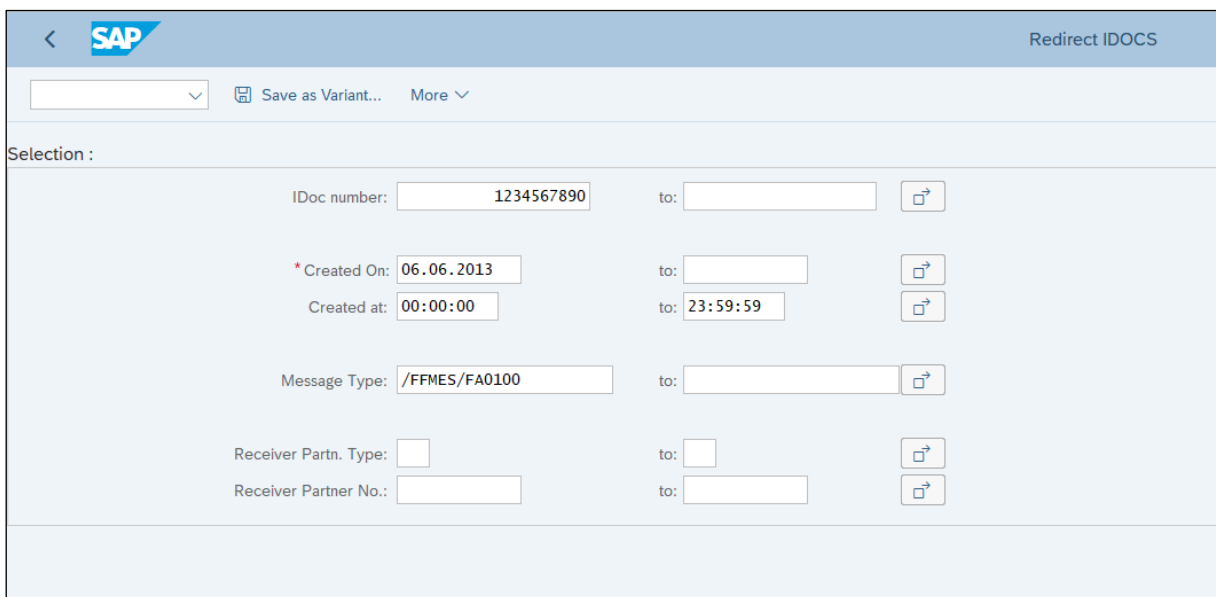


Figure 15: Selection display of the report for forwarding IDOC via the http port

4.4 Selective Transmission of Order Data

If it is necessary to transfer specific orders again, even without any order modifications done, the report **/FFMES/TRANSFER_PROD_ORDER** can be used.

This report creates standard FORCAM order IDOCS with the base type /FFMES/F (respectively with an existing customer add-on to this base type).

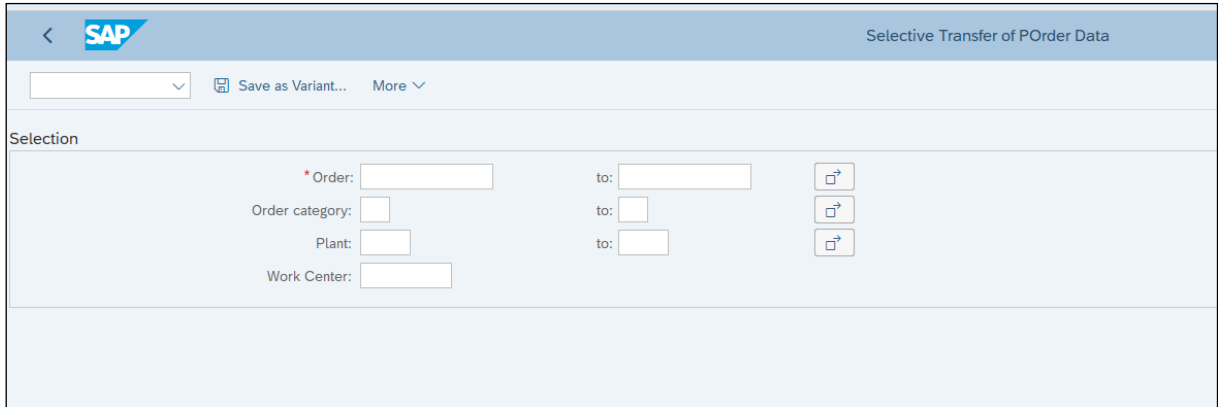


Figure 16: Selection display of the report /FFMES/TRANSFER_PROD_ORDER

The order number is mandatory for executing this report. Besides the selections it is checked, if the interface for transmitting the orders is activated in the respective plant. Furthermore, the global adjustments of the SAP adapters are checked (table /FFMES/GLOBALS).

The current order data is read and the transmission tables for the FORCAM function module /FFMES/CREATE_ORDER_IDOCS are filled. This function module is then called up to create and transmit the order IDOCS.

5 Corrections

5.1 General Description

The FORCAM Adapter has an integrated correction module that enables a direct trigger of corrective entries from the MES, which are then sent to the SAP system.

The corrections can be looked at as a special form of messages from MES to SAP.

IDOCs are received in the SAP standard input; as well with the base type /FFMES/R. The sequence of the IDOC input processing as described in chapter 3 is also valid here.

But in this case a special processing method (standard method **F10_KORR**) is found in the table /FFMES/MSGPROG.

5.2 REVMG Correction Messages

The corrections are sent to the SAP system with the record type **REVMG**. These records contain in addition the record type (KORSA) and the internal GUID (KORID) of the message to be corrected.

The correction record also contains the correction type (KORTY). (insert = I, delete = D)

With the help of the record type and the internal GUID the message to be corrected is searched for in the table /FFMES/RUECKTBL.

In the table /FFMES/OBJECT it is searched for the IDOC number of this message, the time stamp and potentially existing subsequent document numbers.

The existing subsequent documents are canceled at time of deletion and when inserting a new IDOC is created for the correction entry. This IDOC is transferred to the input processing. After successful processing the correction entries are always logged in the table /FFMES/CORR_PROT.

A customized processing for the corrections can be adjusted via the table /FFMES/CORR_CUST.

6 Appendix

6.1 Document History

Version	Date	Name	Change
1	2022-11-24	C Buwaya	General content revision Pg 1-38
2	2022-11-29	A. Hierlemann	General content revision Pg 1-37

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