KlinkWARE®

Modules

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MODULES - WAREHOUSE MANAGEMENT AND MATERIAL FLOW CONTROL

1.1 Warehouse Management System KlinkWARE®

1.1.1 Introduction

With a software for warehouse management and material flow control your system will come alive. Using the right software you will be able to use your system in an optimal, efficient and sustainable manner – just as we planned the system with you.

KlinkWARE® is the software developed by the Klinkhammer GROUP for controlling and managing flows of goods and information in the supply chain.
KlinkWARE® is a product based on know-how, experience and forward-looking, trend-setting strategy.
KlinkWARE® is the response and solution we offer to meet constantly increasing demands and the requirements of the increasingly complex environment.

Our software is able to fulfil all the functions required. Any adaptations necessary for this are made without negatively influencing performance and future sustainability. The modular character of our software makes this possible …

The following description of our software states different module types. Some of them are mandatory, others optional. For reasons of completeness all possibilities are described here. A note at the respective position in the document gives you information about whether a module will be used in your application or not.

Basically, our software consists of basic modules, control modules, technology modules and processing modules.

Basic modules provide a kind of building ground / foundation on which all other assembly sections are erected. This building ground is prepared and made ready for building accordingly. Basic modules exist for master data, but also for logistics processes such as order picking or packaging.
Control modules are like roads created on the building ground. They are of a certain construction type and thus are intended for a specific purpose. The building ground provides the necessary infrastructure. Control modules are the procedures how orders are picked or an inventory check is performed.

Technology modules are like vehicles driving on the roads. There are different types of vehicles of which not all are suitable for each road. Technology modules are available – among other things – for RF-terminals, by-light procedures and web applications.

Processing modules indicate the equipment the vehicles are fitted with. Featuring the corresponding equipment, driving on the road is possible with the necessary comfort. Processing modules are e.g. order picking via pick-by-voice and performing an inventory check using handheld RF-terminals. Thanks to the software modules a construction kit is available offering an optimal solution that suits your applications. Based on the previous descriptions, however, you will recognize also relationships and dependencies. Not all possibilities offered can be combined or make sense in all combinations. We clearly define the scope of our functions to let you know what you can expect.
In the following section you will see and notice that a large number of modules are listed because it is mandatory. Due to the adaptations made for your system not only special modules but also basic modules are concerned. A single new function may entail many changes that reflect in various modules. When calculating costs and checking the consistency of a solution, we will take this information into account.

Due to the large variety of possibilities and variants the following sections are displayed in tabular form.

1.1.2 Basic modules for master data

Master data are used for many information and settings to render warehouse operation possible. A description or a name is more expressive than a number.

Module name	Description	Mandatory
Basic module “Master data”	This module lays the foundation for connections between data structures. This module is stated for the sake of completeness as it stands for continuous advancement and future sustainability.	X
Basic module “Master data – Articles”	The article master, also called stock list, consists of many aspects a material or product requires when storing or handling it. These aspects are among other things: ◆ Descriptions in several languages ◆ Units of quantity, packaging units and load handling device types ◆ Specifications as to storage in different warehouse areas ◆ Replenishment and QA rules ◆ Hazardous goods information ◆ Advanced characteristics such as batch management requirement, dates of expiry, maturity data	X
Basic module “Master data – BoM, Parts lists”	Parts lists are used for internal production procedures to manufacture, for example, sets. Here, not only components can be assigned, but also work steps incl. costs, allowed times or descriptive documents.	
Basic module “Master data – customers / suppliers”	Customer and supplier master data is maintained and updated jointly. A preferred role – as customer or supplier – is assigned to each account. Accounts can be typed, classified and grouped by corresponding characteristics. Thus, also shipping providers have an account to be able to analyse the supplier relationship.	X
Basic module “Master data – Addresses”	Addresses are not stored directly in the account data. On the one hand, a customer may have various shipping addresses, but only one billing address. On the other hand, based on service agreements also return addresses can be stated to ship goods to the end customer on behalf of the customer.	X
Basic module “Master data – Factory, Resources, Staff”	Starting with monitoring of resources, over resource planning to the shift model at a warehouse, utilization-related information can be delivered. Lead time and follow-up time of stock availability and order processing may be calculated.	

1.1.3 Basic modules for environment and storage conditions

These “environment conditions” are not to be understood in terms of temperature or humidity, but as the environment into which the warehouse is integrated and the necessities of the administration of product properties.

Module name	Description	Man-datory
Basic module “Ware-house management”	This module lays the foundation for connections between data structures of the warehouse topology. This module is stated for the sake of completeness as it stands for continuous advance-ment and future sustainability.	X
Basic module “Multi-warehouse manage-ment”	For us, a warehouse represents a logistics site. For us, it’s a matter of course that different warehouse structures exist at this site which are operated automatically or manually or which han-dle pallets or boxes or which are interrelated. We consider these structures as storage areas with different storage conditions. Thanks to the multi-warehouse management it is possible to use KlinkWARE® for more than one logistics site. Use this module to link several sites to one logistics network which exchanges in-formation and goods. Seize the opportunity of different shipping points or of shipment consolidation, as required, at one site. Be-tween the sites, goods are transported using a common material flow control that takes into account transportation times, loading and delivery slots as well as business hours.	
Basic module “Stock management”	As is the case for warehouse management, this module lays the foundation for connections between data structures, but here for stock properties. This module is stated for the sake of complete-ness as it stands for continuous advancement and future sus-tainability.	X
Basic module “Multi-client/tenant manage-ment”	The goods stored in your warehouse not necessarily have to be-long to you. Your logistics department is a service provider. Cli-ents are used to record the ownership of the products. This in-formation will be stored in the article master such that all stocks of an article belong to the client. Beyond that, customers and suppliers as well as their addresses are linked to clients and thus also incoming goods and orders. Use this module to allow for a simple, consistent and easy han-dling of goods of your ordering party or use inter-company trans-actions for transfer of ownership without movement of goods.	
Basic module “Lot/Batch manage-ment”	If you would like to declare an article as being subject to batch management, the respective information have to be entered at various points or be presented/displayed to the employees. By the way, a batch number may not only be used for backtracking, but also for optimizing FIFO-strategies. If batches are of no importance for you, this module should be skipped to suppress unnecessary information or restrictions. This also applies to the other options.	
Basic module “Lot/Batch master data management”	The batch master data constitutes an extension of the batch management. Using this module, the composition of batches – e.g. due to recipes – or quality assurance of batch components	

	can be handled. Often this happens in connection with a laboratory system.	
Basic module “Expiration date management”	The best before date or expiration date are further properties of articles in a warehouse. Same as the batch management requirement, these attributes as well can be claimed. As far as the shelf or storage life is concerned, however, further dependencies are added such as modified FIFO, modified allocation process due to customer requirements (minimum remaining shelf life etc.) or automated changes in status due to deadline(s) exceeded.	
Basic module “Serial number management”	Serial numbers identify an individual piece or unit. Like with the batch management, the serial number management allows product tracing. Usually, serial numbers are recorded before goods dispatch. However, they could be also entered at the time of goods receipt in the course of a detailed approval procedure and designation of origin. For this purpose, an advanced stock management takes place that extends through all logistic processes.	
Basic module “QA status management”	Not all logistics users need a status management. However, if it is necessary to lock goods held in stock, to put them into inspection status or move them to quarantine, then QA-states must be managed and modified. The QS-states influence the usability / availability of goods for orders or replenishment processes. They can also be set already during first-time receiving of goods to hold back products until successful testing / inspection takes place.	

1.1.4 Logistics process modules

The basic modules are complemented by control modules that support certain characteristics of the respective processes. The corresponding basic module provides the basis for a process.

1.1.4.1 Receipt of goods

Module name	Description	Mandatory
Basic module “Receipt of goods”	Roughly acquire the data of your goods already right after unloading at the gate, because this provides you with important information. Complaints can be registered and documented promptly. Incoming deliveries get known such that your sales department already gets information about the early availability of the goods. Packages can be built that can be distributed to different goods receiving points (stock formation) and also be prioritized. If no manual or automated entry of the incoming goods is planned, this step is carried out by the partner interface such that incoming goods information are generated as notifications.	X
Control module “Receipt of goods” manual	This form is characterized as manual process e.g. with one work station or one RF-terminal. The user is given information on notifications or orders and enters further information to complete the process.	
Control module “Receipt of goods - automated”	An automated receipt of goods can be realized using scanners mounted to the conveyors or using RF-terminals. This requires information that result from the labelling of the respective goods in the form of barcodes or RFID tags. This information allow identifying notifications or orders and assigning incoming goods. This variant is frequently used for incoming goods coming from production.	

1.1.4.2 Stock formation

Module name	Description	Mandatory
Basic module “Stock formation”	During the detailed acquisition of incoming goods the products are identified, their properties are registered and units are formed which are suitable for transport and storage. The module determines the destination warehouse area which is best for the quantity of goods received and for the load carrier and/or a load carrier suggestion is created. Based on the all-time transparency and stock / order control storage units are built that meet the actual needs.	X
Control module “Stock formation – complete package, manual”	This form is characterized as manual process e.g. with one work station or one RF-terminal. Only complete packages are created. Additions to stock from production or for a replenishment warehouse are processed efficiently.	
Control module “Stock formation - complete package, automated”	By means of an appropriate labelling of the packages this process can be also handled in an automated manner using terminals or conveyors.	
Control module “Stock formation - repacking process, manual”	The repacking process allows quantities received or packages to be split into smaller units. This way, it is possible to create several containers out of one pallet and to divide off order or replenishment quantities. An in-depth identification and counting of the goods received becomes possible as well as the acquisition of product properties missing so far such as dimensions or weights.	
Control module “Stock formation with incoming goods inspection”	This module allows complementing the previous modules by adding control activities and an in-depth inspection. Depending on the QA-module, taking random samples etc. is triggered.	

1.1.4.3 Cross docking

Module name	Description	Mandatory
Basic module “Cross docking”	Cross docking means directly passing on goods from the goods receiving or stock formation to recipients which need the goods. In doing so, the needs of the corresponding recipient are taken into account such that quantities are divided off, if necessary. KlinkWARE® supports and promotes this approach to make material handling leaner and to minimize this way process costs and throughput times.	
Control module “Cross docking for backorder”	In case KlinkWARE® should take over the backorder management of delivery orders, orders not covered so far can be delivered directly and by taking the quickest way possible.	
Control module “Cross docking” for specific order”	If the order or notification information already contains data relating to the order that specifically is to be delivered, hence the corresponding quantity is separated. If the order already exists, it is delivered; if not, the goods are put into interim storage "as if” already picked.	
Control module “Cross docking” for replenishment”	In case you use replenishment strategies and control systems in your warehouse, the order picking zone of an article can be loaded with goods already from the goods receiving department such that costly intermediate steps are avoided.	

1.1.4.4 Customer returns

The common use case to receive returns is to handle them as normal receivings, because the ERP is considered to handle complaints. In order to modify this process and handle returns with KlinkWARE®, an separate and extended view is needed.

Module name	Description	Mandatory
Basic module “Returns”	The return model enables adaption of receiving process and stock formation. The model creates references between return and former delivery not only for logistic handling, but also for commercial correctness and response. That means to bring your ERP in the position to process credits or compensation deliveries. In addition the returned stock may be recorded with condition and state to decode on scrapping or stocking the items.	
Control module “Receiving and capturing”	Here the reference between former delivery and customer is recorded, reasons of complaints are edited. This is the base of the handling process following up.	
Control module “Returns warehouse”	If returns are to separate or are not free for use on stock, a warehouse area to handle returned items and additional QA conditions are needed. Hereby the returned items are recorded in your warehouse and are accessible. After stock formation the units are stored to await further transactions. If applicable rework and reconditioning occurs, repacking, decorating, pricing. The returns warehouse is also called storage area for blocked stock or inspection area.	
Control module “Research and valuation”	Similar to a QA process somebody somehow has to decide about reuse – bring the items back on common stock – or otherwise return to supplier or scrap or return to customer because the complaint is rightless. The research module supports the operator while comparing the product’s condition as it is to be and as it was at shipping time. Also effects on other orders or stock are disclosed.	

1.1.4.5 Storage

Module name	Description	Mandatory
Basic module “Storage / Put away”	When selecting destinations and storage shelves different strategies are applied to assign slow movers to the right storage area and to a comparatively distant location, but to distribute and place fast movers in such way that picking can be done quickly and with little expense and effort. All storage activities are ensured by transports where optimizers are used to identify efficient ways. The basic module stands also for storage shelf search strategies and posting transactions.	X
Control module “Top-up / Additions to existing stock”	Adding goods to existing stock means mixing two stocks and merging them to one unit. Doing this, various aspects are taken into account: This module also covers/includes the addition of loading units on carrier loading auxiliaries (e.g. trays). By means of the various methods described storage density is increased.	
Control module “Storage – GTM”	The control module for the storage in Goods-To-Man Systems cooperates with the materials flow system to address not only the issue of storage conditions, but also the dynamics of the devices such as AS/RS or shuttles. The assignment of the storage shelves allows for the capacity of the devices and other surrounding conditions such as the minimization of load cycles.	
Control module “Storage – MTG”	In combination with the materials flow system this module optimizes the paths for manual applications. This includes also the possibility of combining storage and retrieval transactions, if devices and equipment allow doing so. Individual transports and collective transports can be influenced by the user such as e.g. the selection of alternative storage shelves.	

1.1.4.6 Relocation

Module name	Description	Mandatory
Basic module “Relocation”	Relocations are not synonymous with replenishment transactions. With relocations, in the broadest sense only the storage location changes. Changing the load carrier due to changing storage conditions does not occur.	
Control module “Relocation – GTM”	In a Goods-To-Man System relocations are initiated automatically provided that a multi-deep storage takes place. This includes the assignment of a storage shelf that allows for transport routes and blockades through other transports.	
Control module “Relocation – MTG”	In manually operated areas this module allows the selection of storage units that shall be relocated and transporting them to a new storage location. The relocation is initiated and executed by the user being equipped with its respective technology.	
Control module for central relocations	This module provides the central acquisition of relocation orders by means of which you can instruct users and devices to execute respective goods movements. Using this acquisition tool you determine source and destination of the movements.	
Control module “Warehouse reorganization”	Using the warehouse reorganization control module, you are given suggestions to record central relocations for improving the storage occupancy. This concerns the occupancy of storage shelves with low-priority load carrier types or height classes, low-priority storage zones (alternative zones) or inappropriate ABC-zones of the corresponding article in the respective zone.	

1.1.4.7 Delivery order management

Module name	Description	Mandatory
Basic module “Delivery order management”	The order management affects any type of order – from the delivery of your customers or production, to replenishment, QS and finally to inventory/stocktaking. The order management has the complete control across all processes which are order and stock related, from order release, progress and quantity update across to the dispatch of goods – whether complete and partial deliveries or monitoring of the deadlines.	X
Control module “Order release filter”	Certain order types, shipment types, customer groups, destination countries, orders that exceed or fall below certain volumes, weights or a number of items or that require special processing, may be treated differently. They are either released automatically or have to be processed manually. When a manual release should take place, this filter is necessary.	X
Control module “Backorder management”	A backorder management is necessary, when the ERP-System or inventory management system transmits to the KlinkWARE® without checking the availability of the goods. Even with an availability check it may happen that the KlinkWARE® retains items or quantities not delivered to supply them later.	
Control module “Shipment generation”	For optimizing shipment and packaging costs, it is possible to consolidate single orders to shipments. The generation of routes is possible as well provided that criteria exist for this. This module offers different possibilities to recognize that orders belong together – these are e.g. same customer numbers, postal code areas or sales organizations.	
Control module “Activation”	“Activation” here means strategies which are responsible for deciding if and when an order actually goes into order processing. The availability of work stations, capacities and meeting deadlines and priorities (e.g. express orders) or sequences are decisive here. Furthermore, also multi-stage order picking or multi-order picking is initiated in this module. This module not only considers the start of order picking, but also the provision in the packaging department or at the dispatch gate to be able to work on different processes in parallel.	X
Control module “Allocation’	The allocation takes place in the course of activating an order for picking. In this connection, suitable stocks are selected which shall be used for an order. Strategies are applied which do not only take into account the FIFO principle, but which also consider aspects like quantity optimization, low number of accesses, avoiding opening a pack or equal utilization of resources. At times, these strategies are contradictory such that priorities are set to ensure rapid processing of the order.	X

1.1.4.8 Quality assurance

Module name	Description	Mandatory
Basic module “Quality assurance”	You, your production and all your customers expect highest quality of products and services. From simple checks or inspections to destructive testing – from quarantines to releases and factory test certificates. KlinkWARE® helps you to perform the necessary status changes and stock movements in an adequate manner.	
Control module “QA status change”	This control module executes your status changes to influence the availability and labelling of the stocks. Status changes are made based on various, different criteria. Hence, you may block a complete batch or release a complete expiration/best before date. The statuses can be expanded, i.e. not only the statuses “unlocked” or “blocked” exist.	
Control module “Check/Inspect”	A check or inspection means looking at something externally. A check order is entered and initiated such that the goods are made available at an inspection work station. To differentiate reasons, different types of checks/inspection may be defined.	
Control module “Sampling/Check”	For the purpose of checking, sub-quantities can be sampled or complete packages/trading units made available. Selecting the package/trading unit can be defined manually or you can let the system do this based on a specified batch number. For partial stock removals this is done by picking; complete packages/trading units are made available completely.	
Control module “QA inspection work station”	The inspection work station fulfils the necessary functions to be able to carry out and finalize inspections. Inspection work stations can be configured such that – where applicable – only certain types of checks are done or that checks take place only at certain times. Inspection work stations are included in the logistics routing and are with this control module an integral element to process this type of QA-orders.	
Control module “QA testing station”	The function of testing stations consists in performing and completing tests. They follow the retrieval transaction or are the destination of respective complete packages/trading units. Additionally, same conditions and procedures apply as for the aforementioned inspection work stations.	

1.1.4.9 Replenishment control

Module name	Description	Mandatory
Basic module “Replenishment control”	The function of replenishment consists in providing storage zones at any time with sufficient stock such that this stock is available for the orders. The replenishment control is closely related to the article master data, the stocks and the order data. Changers of these framework data are constantly monitored. This check results in replenishment orders which in turn are integrated into order processing, picked and stored at their destination.	
Control module “Demand-oriented replenishment”	In case an order is received and released which does not find sufficient stock in the requested area (based on quantity analysis), a replenishment order is initiated. Without demand, no replenishment is necessary.	
Control module “Static replenishment”	Based on minimum quantities defined or a minimum number of storage units the system detects a material shortage and a replenishment transaction is triggered.	
Control module “Refill waves”	This module is our supplement to the demand-oriented replenishment to periodically refill the order picking zones. These waves reduce ad-hoc measures.	

1.1.4.10 Order picking

Module name	Description	Man-datory
Basic module “Order picking”	This module handles the supply and posting of retrievals. Some basic rules apply which have to be complied with by each order picking procedure and which are controlled by this basic module. Following the posting of retrievals, follow-up activities are triggered and coordinated such that pass-on procedures take effect and other procedures related to an order may seamlessly connect.	X
Control module “Order picking – I-point”	The I-point (initialization point) represents the central starting point for an order in an order picking area. At the I-point, order pallets or containers/boxes are initiated or order picking lists are printed. The modules “Activation” and “Allocation” provide the I-point with orders which then are further processed and made available to the users or conveyor system.	
Control module “Order picking - GTM”	The control of stock picking in Goods-To-Man systems is strongly geared to the degree of utilization and availability of devices and work stations in the conveyor system. They define the framework within which orders operate. This module controls supplying the respective work stations with stock goods or empty containers, disposing of order boxes, re-storages or empty containers.	
Control module “Order picking - MTG”	In the Man-To-Goods system, the user has much influence. The user may work in an order-specific manner or build batches without having great aids at his/her disposal. This module supports the flexibility of human beings in a working area.	

1.1.4.11 Service

Module name	Description	Mandatory
Basic module “Service”	The term “Service” includes value-added services and simple special processing types. The standard service takes place at service stations between order picking and packing. But also complex processes are possible – up to the production of articles based on parts lists. Another service function is sorting or separating of the article-oriented multi-stage picking.	
Control module “Simple Service – manual”	A manual “simple service” in KlinkWARE® is the display of certain jobs or activities at the service station where the user only has to confirm the fulfilment of these tasks/jobs. The contents of the activity or processing are not controlled by KlinkWARE®.	
Control module “Simple Service - automated”	This module represents the automated procedure of the “simple service”. The automated procedure e.g. may be labelling with an applicator or processing at the production line. The procedure of automation is solely represented and thus posted by passing a certain point of a conveyor system or a transport route.	
Control module “Production Service”	This module represents – among other things – the formation of sets or the display rack construction. Even for the case that an order includes sales bill of materials that physically must be linked to a product this must run via the “production service” module. This module enables providing more information up to work steps that ensure a high quality of the result on the one hand and allow logging the process on the other hand.	
Control module “Service during the order picking process”	In case a service shall take place during order picking, no service work station is required. This module controls the deviation of the order routing and the completion of the processes.	
Control module “Service during the packing process”	In case a service shall take place during packing, no service work station is required. This module controls the deviation of the order routing and the completion of the processes at the packing work station.	

1.1.4.12 Packing

Module name	Description	Mandatory
Basic module “Packing”	Packing or packaging is a mandatory process just like picking. Packing ensures that a package/trading unit is ready for shipment. This process is triggered automatically after picking, unless a service has to be carried out. During packing, a shipping package is built which may also correspond to the storage unit, provided that picking is complete and no further processing is needed. Upon completion of the packing process the goods are passed on to the shipping department.	X
Control module “Packing, complete package, manual”	This module informs the user about the order or shipment to which a unit belongs, specifies - where appropriate - details on further process such as weighing or labelling. The package/trading unit picked becomes a one-to-one shipping package.	
Control module “Packing, complete package, automated”	The automated packing takes place on the conveyors or via RF-terminals without any further intervention being necessary. Automatic labelling machines or scales may be used.	
Control module “Packing process, manual”	A packing process is the complex procedure to build shipping packages. During this process, contents of order containers are reposted to become packages, where appropriate, quantities are split or consolidated, sub-packaging units and outer packaging units are built, and packaging types are proposed or indicated. During this process, dialogues are maintained with the user.	

1.1.4.13 Shipping

Module name	Description	Mandatory
Basic module “Shipping”	Shipping occurs after packing. This process is mandatory as this process completes orders etc. Based on the provision of goods in consolidation zones or by direct loading the shipping packages leave the warehouse at the factory gate by means of so-called “loading scans”. For supplying your production with goods the “loading scan” can be also considered as delivery to the production.	X
Control module “Shipping, manual”	Manual shipping is ensured through mobile end devices that are equipped with the necessary reading units such as barcode scanners or RFID-reading units. The user receives information about shipping, verifies and acknowledges the process. Loading sequences are communicated via dialogues.	
Control module “Shipping, automated”	The automated shipping is ensured through conveyor scanners or mobile end devices without further interventions being necessary. Loading sequences were already considered by the system before.	

1.1.4.14 Consolidation

Module name	Description	Mandatory
Basic module “Consolidation”	Consolidation can be also called order combination. The consolidation occurs between processes, i.e. picking and service, picking and packing, service and packing, packing and shipping. The routing between function areas defines the possibility or the obligation to consolidate orders. Order or consignments are considered as criteria for consolidation. As already described above, consignments are already groups that are built due to different criteria such as customer number, postal code area etc. If possible, they are consolidated for subsequent steps and then made available to the next process step when complete. In this connection, an activation occurs. During selection of the function area and route finding, the module considers where orders or consignments are already collected and which possibilities and capabilities the function areas offer. The assignment/allocation of a storage shelf for packages/trading units to be stored takes places depending on the storage structure of a consolidation zone. It very much focuses on picking.	
Control module “Consolidation – GTM”	This module is used for automated consolidation storages. In this module, the selection of storage shelves and the activation processes have been especially adapted to the warehouse equipment such you can fully benefit from the advantages and speed of the technology used.	
Control module “Consolidation –MTG”	The Man-To-Goods consolidations offer more possibilities for structuring the warehouse and thus for order access. Goods can be collected such to be mixed or exactly sorted – from shelving system down to storage locations on the floor. Where applicable, storage is done by several users. The picking of orders and consignments is ensured by the corresponding locations themselves or by dedicated means of transportation.	

1.1.4.15 Empties Management

Module name	Description	Mandatory
Basic module „Empties Management“	Empties Management enables quasi-inventory management of transport support units due to their types. From a pallet pool to internal units or serial numbers of special packages can be managed. Basis of the management are bookings transactions made from processes or administratively.	
Control module „EM Transactions Recording“	These transactions are quantitatively related to a transport unit type. Besides type and quantity, the place of the transaction and the cause. Thus, the tracking of empties and maintenance of accounts is possible.	
Control module „EM Account Control“	Pallet accounts can be handled for customers, suppliers and transport service providers. Enter summarily the stock (or liability) for each type. Even your production is a customer or supplier to trace containers.	
Control module „EM Serial Numbers“	Special packaging or loading equipment are often uniquely labeled to track their movements and their condition. Transactions are not only booking amounts of types, but also record the unique identifier. Similarly, these load carriers remain in inventory, whether filled or empty.	

1.1.4.16 Inventory/stocktaking

Module name	Description	Mandatory
Basic module “Inventory/stocktaking"	During inventory, inventory count documents are produced, but also stock corrections are made. The module offers the possibility to define different strategies: to what extent postings are made immediately or after a separate evaluation, to what extent users are allowed to decide by themselves or if the four-eyes principle prevails. The basic module allows triggering inventory/stocktaking actions, dispatching the respective count actions, posting and checking the corresponding results. During the annual inventory, stocks are blocked as they must not be modified. In case of a permanent inventory/ongoing stocktaking, this blockade does not occur.	
Control module “Zero-Crossing”	A zero-crossing inventory takes place when a package/trading unit shall be emptied during order picking. In case of an unexpected zero-crossing, there will be a respective confirmation.	
Control module “Annual inventory – GTM”	The annual inventory in a Goods-To-Man system is often subject to simplification procedures which are supported by this module. The packages/trading units necessary for counting are made available at inventory work stations (usually combined with other work stations). The counting results are posted at the work stations. Deviations requiring approval must be acknowledged on site.	
Control module “Annual inventory – MTG”	In Man-To-Goods systems, a complete inventory of the stocks takes place on the key date. In most cases, simplifications are not permitted, unless it is about processes of the permanent inventory (see below). Counting activities are distributed to storage areas in batches such that counting in the warehouse can take place in parallel.	
Control module “Permanent inventory – GTM”	During permanent inventory, all storage locations and articles are counted once a period. During this process, counting actions are triggered periodically and at regular intervals which are spread in during the normal warehouse operation. The module for controlling the permanent inventory triggers these periodic counting actions considering thereby the remaining time in the period. Close to the end of the period it may happen that it was not possible to count all storage locations and articles. In such case, an annual inventory is required. This module controls the counting actions in Goods-To-Man systems.	
Control module “Permanent inventory – MTG”	The procedure corresponds to the one of the GTM-module, but again the storage shelf types or structures are more diverse such that more complex procedures take place. Various manual warehouse types, e.g. block warehouses, however, cannot be subject to a permanent inventory, but require an annual inventory.	

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1.1.5 Modules for materials flow

Materials flow control is based on a general basic module. This basic module provides the basis for control modules which control various media or devices and thus implement various transport and access methods.
We continue to describe these modules in tabular form.

Module name	Description	Man-datory
Basic module “Materials flow”	The basic module provides the routing concept in terms of the pathways and the usage of the routing in terms of transportation orders and collective transports. The control modules define how transports occur, which devices are responsible for which route section and which optimization principle is used.	X
Control module “MFC manual, GTM”	Goods-To-Man procedures can be also used in manual systems. Hence, narrow forklift trucks should also perform double operations, whereas aisle changes must be reduced. Such and further procedures and optimizations are ensured by this control module.	
Control module “MFC manual, MTG”	Conventional Man-To-Goods applications show a significant need for optimization. Not only route optimizations are important, but it is also important to create collective transports which include more than one container/box or order to allow multiple withdrawals or to combine storage and picking/retrieval transactions. This again requires an advanced route optimization.	
Control module “MFC – communication with PLC”	The communication module takes the responsibility for the telegram exchange with the system controllers. Status messages, transport orders and their confirmation are reliably exchanged.	
Control module “MFC automated, conveyors”	The conveyor controller acts and reacts during the communication with the conveyor PLC. This module is responsible for managing the reporting points and for integrating scanners and other devices. The routing controls the degree of utilization/workload and the availability. By means of “programmed" functions it is also possible to integrate transport-different actions such as the automatic labelling, automatic goods receiving or shipping.	
Control module “MFC” automated, loop	The loop control allows control over sorting and distribution loops in your plant/system. A well-controlled filling level of a loop ensures continuous transport without jamming. KlinkWARE® offers various resource controllers according to the loop type and the optimization method.	
Control module “MFC automated, transfer car / shuttle car”	Transfer cars (or also crossways transfer cars) connect different locations by means of a random access to the handover stations. These cars may feature one or several load handling attachments which must be occupied in an optimized and targeted manner. KlinkWARE® offers various resource controllers according to the crossways transfer car type and the optimization method.	
Control module “MFC automated, AS/RS”	Automatic storage and retrieval cranes are complex devices with high performance. The AS/RS as well can accommodate several loading/storage aids at the same time – with one or several	

	load handling devices. Blockades and transport sequences must be considered. Thanks to the route optimizations, the load handling attachments can be filled to a maximum degree. Load changes and individual trips are reduced, double operations are pushed. KlinkWARE® offers various resource controllers according to the AS/RS type and the optimization method.	
Control module “MFC, compact storage”	Compact storage systems are e.g. lifts, paternosters and similar devices. These systems hold and manage a lot of smaller loading units on trays. Our control module for compact storage systems ensures the optimized access and transport. KLINKWARE offers various resource controllers according to the compact storage system type and the optimization method.	
Control module “MFC, storage shuttle”	Being a mixture of crossways transfer car and AS/RS, the shuttle is used in an aisle for storage and retrieval of loading units. In most cases, several shuttles are active in one aisle; however, they have separate working zones. The resource controller assumes the coordination and optimization of the respective transport movements.	
Control module “MFC, truck control system”	Our truck control system is based on a “Milk-Run-System” that connects different loading and unloading stations which result from pending transports. Based on the capacity and on the capabilities of a stacker or train, this module determines the processing sequences by combining information such as location, priority, waiting time and subsequent transport. This processing sequence not only reduces empty runs, but also increases the utilization and supply speed.	
Control module “MFC, AGV” (automated guided vehicles)	AGV connect loading and unloading stations with each other. They travel on paths which are stored in the controller of the AGV. Our control module communicates with the AGV or their control software. We are able to administer interim destinations and thus are able to navigate. Locations and availability are managed in a similar way to the stacker control system.	
Control module “MFC external sub-systems”	Hereby 3rd party systems are integrated, that have own logic for material flow or location management. They act as block-boxes in the view of KlinkWARE®. An example of such an external sub-system is the integration of AutoStore.	

1.1.6 Modules for partner interfaces

It is very rare that a logistics system is able to work independently and without interfaces to other systems. Even then it is necessary to enter incoming goods notifications or delivery orders. These interfaces then are not automated, but manual.

Module name	Description	Man-datory
Basic module “Host interface”	The basic module offers the possibility of receiving or sending data according to our own standard. The following data is received: ◆ Articles ◆ Parts lists ◆ Customers/suppliers ◆ Addresses ◆ Orders/incoming goods notification ◆ Delivery orders ◆ QA orders ◆ Inventory orders The following data is sent: ◆ Feedback messages on logistics processes with regard to orders/incoming goods notification ◆ Feedback message on logistics processes with regard to delivery orders ◆ Feedback message on logistics processes with regard to delivery orders ◆ Feedback message on logistics processes with regard to inventory orders	X
Control module “External systems”	In case a partner system shall not use our native interface, we use KlinkWARE®-WRX – our communications module - which can handle various formats and procedures. This includes also monitoring activities and errors.	
Control module “Interface converter”	The interface converter is an advanced feature of KlinkWARE® -WRX. This feature is listed separately here, as the transport of messages and their interpretation are two different things. When receiving messages, the interface converter converters your format into our format and vice versa when sending messages.	
Control module “Manual entry - article”	If there is no automated interface to make available the article master data, hence this data must be entered manually. For this purpose, a dialogue is needed that feeds the interface.	
Control module “Manual entry – parts lists”	If there is no automated interface to make available the parts lists, hence this data must be entered manually. For this purpose, a dialogue is needed that feeds the interface.	
Control module “Manual entry – customers/suppliers”	If there is no automated interface to make available the customer and supplier accounts, hence this data must be entered	

	manually. For this purpose, a dialogue is needed that feeds the interface.	
Control module “Manual entry - addresses”	If there is no automated interface to make available the addresses, hence this data must be entered manually. For this purpose, a dialogue is needed that feeds the interface.	
Control module “Manual entry – orders/incoming goods notification”	If there is no automated interface to make available the orders or the incoming goods notification, hence this data must be entered manually. For this purpose, a dialogue is needed that feeds the interface.	
Control module “Manual entry – delivery orders”	If there is no automated interface to make available the delivery orders, hence this data must be entered manually. For this purpose, a dialogue is needed that feeds the interface.	
Control module “Manual entry – QA orders”	If there is no automated interface to make available the QA orders, hence this data must be entered manually. For this purpose, a dialogue is needed that feeds the interface.	
Control module “Manual entry – inventory orders”	If there is no automated interface to make available the inventory orders, hence this data must be entered manually. For this purpose, a dialogue is needed that feeds the interface.	

1.1.7 Modules for data archiving

Archiving data is always necessary when a process has been completed. One example is an order that has been shipped.

In some cases, a complete process cannot stay to render possible subsequent processes. Example: the transport order of a loading auxiliary to a storage location. After having reached the storage location, the transport is irrelevant and would probably interfere with or impede the access to the loading auxiliary or the storage location.

Data which is complete and which is no longer needed thus cannot stay in the active data as this would restrict the performance of database and software.

An additional and not less important aspect of archiving is the informative value of the information archived. Often there is a need for research or traceability – not to mention legal provisions on archiving relevant data. This includes also complex data structures and not only a simple “order” …

Just one example here: the order belongs to a customer and must be sent to an address; the third position requires four retrievals from two storage areas and was passed on across several picking stations where different order pickers are working and of whom one picker stated a deviation which had for consequence that a substitute retrieval from another batch was made, which was provided by another supplier. Finally, three shipping packages were generated at two packing stations. Two of them were sent by a forwarding agent and one package left the warehouse as express package. In times of “Big Data” archiving, indeed, has become a big topic.

Module name	Description	Mandatory
Basic module “Data archiving”	The basic module is responsible for identifying and making available the information to be archived as well as for completely removing the data once archiving has been completed. Additionally, this module ensures cleaning up the archive, when the respective “expiration dates” have been reached.	X
Control module “Archiving”	This module is used for packetizing the data to be archived and to transfer this data to the archive. As there may be a need to complement data structures such to meet your needs and requirements, also a supplement is needed for archiving to ensure that no information are lost.	X
Control module “Archive server”	The sole purpose of the archive server is to receive archive data, to keep it over a very long period and to make it available for information. This requires a certain kind of optimization of the access methods.	

1.1.8 Control panels

Control panels are a meant to show the current use and capacity of your system quickly. How many shipments are in different storage areas, how many jobs are in the queue, how is the current warehouse occupancy? These questions can be answered quickly and clearly with our control panels. Our consoles are based on the Web modules that serve as information and administration in general.

Module name	Description	Mandatory
Basic module „Web Control Panel“	The base module provides technology and data as the basis for all views.	X
Control module „Order Control Panel	In this view, which corresponds to a cyclically updated list, the running and pending jobs are displayed. A color coding indicate critical and important orders.	
Control module „Transport Control Panel“	The utilization of your conveyor system and equipment is here partly graphically, partly shown in list form. It can be seen quickly, where a high load is to take care of.	
Control module „Special Control Panels“	These views we create according to your storage areas and warehouse functions. Does the packing need its own overview, does a picking area view ensure greater transparency in the tasks - the special control panels are an effective way to information of functional areas.	
Control module „External Control Panels“	You have already control panels and want to integrate data from KlinkWARE®? We create an interface to your system and prepare data accordingly.	

1.1.9 Statistics and reporting

Show control panels the current situation, so bring statistics the past to light.
Due to the variety of data that is created by the execution of processes, a deeper look into the operations of the warehouse is possible. What are the top products, customers or suppliers? In which storage area the music plays? How is the course of the day at goods receipt and shipping?
This and more we graphically show for hours, days, weeks and months as well as offering a built-in Excel export for your own evaluations.

Module name	Description	Mandatory
Basic module „Statistics“	The base module cares about storage and processing of data. Here, a document database is used. Basis for reporting is in again our web application.	X
Control module „Statistical Evaluations“	This will give you a variety of views and reports that not only give an overview of the activities, but also allow in-depth analysis.	X
Control module „External Evaluations“	If you already have a system that prepares statistical information, so we hereby enable access to our data.	

1.1.10 Modules for Printing

With our printing services we enable creation of lists and labels and bringing them to the right printer. Printers must be integrated into the network, either directly or shared. List and label design is initially done by us, but may be changed by our customers within a given data set.

Module name	Description	Mandatory
Basic module “Print documents”	The basic module on the one hand brings server side services to access printers on the network. On the other hand is a design tool to edit and modify layout and design of each list and label. To configure the right document on the right printer each workstation needs to be defined with its printers and their functionality. In addition each document is related to a function. Hereby we get a high flexibility to use color printers, black-white, thermal transfer, direct print, duplex or a printing system with several paper trays.	
Control module “Print lists”	Hereby the output is given to page printers, such as laser printer. List documents are defined, designed and integrated.	
Control module “Print labels”	Labels are printed on different media and with different methods. Single or batch printing are enabled.	
Control module “External printing systems”	From the integration of complex applicators to a document management system, that expects to receive PDF-documents – those systems are integrated with this module. We also enable herewith the integration of local, not network-integrated printers, by providing local runtime components..	

1.1.11 Technology- and processing modules

Technology modules allow operating your system/plant. In this field, there a many possibilities and they become more and more numerous. Although the technologies use the same logistical processes, they feature different types to present them to the outside world.

1.1.11.1 Processing with papers

Even if it might appear completely far-fetched in the electronics age to work with lists, there are however practical reasons to take paper solutions into account. Examples to mention here are the operation of an external store without digital infrastructure or an emergency plan in case the wireless network fails.
In case a paper-based solution is used, one entire storage area must be operated using this paper-based solution. It is not possible to do the storage with lists and to do the order picking e.g. with RF-terminals. Online accesses to storage locations and stocks cannot be combined with offline processes.
The technology module “Paper” provides both the possibility of printing lists and documents and the necessary work station applications to report back tasks performed.

Module name	Description	Mandatory
Technology module “Paper”	This module provides the infrastructure for the corresponding processing modules – for triggering the print process, printing itself and for the completion messages.	
Processing module “Storage”	During stock formation in the goods receiving area storage vouchers are generated. Based on these vouchers the goods are stored.	
Processing module “Relocation”	In case relocations are entered manually and centrally, a relocation order is printed which is used by a worker to relocate the goods.	
Processing module “Order picking”	Picking lists are generated which are used as basis for order picking. These picking lists include information on the order, storage locations and on the quantities and articles required. The order of the positions on a list is route-optimized.	
Processing module “Service”	If a service is necessary, a service order is added to the picking list.	
Processing module “Packing”	Packing can be done either based on picking lists or packing orders. It is indicated which position has been assigned to which shipping package. After completion confirmation of the packing process, it is possible to generate a packing list which is attached to the package as list of contents.	
Processing module “Shipping”	When an order or a consignment is complete, it is possible to print a shipping order which indicates the packages to be loaded and their sequence/order.	
Processing module “Consolidation	Between logistical processes it may happen sometimes that storage is necessary to collect / accumulate orders. Based on the order completed (e.g. using a picking list) it is also possible to ensure storage during consolidation. However, it is also possible to print separate storage vouchers once a confirmation of	

	a process has been received based on which consolidation takes place. This approach offers more transparency.	
Processing module “Checking”	For quality assurance, orders are printed in form of vouchers that indicate goods to be checked and inspection instructions.	
Processing module “Inventory”	Counting lists are printed which become counting vouchers once they have been filled in and returned.	

1.1.11.2 Processing using by-light-procedures

The option of guiding the user by visual signals is commonly used in areas requiring high speed and high accuracy. It offers the possibility of very short distances. Installing such display systems is comparatively costly such that the advantages compared to mobile devices must be immense.

Module name	Description	Mandatory
Technology module “By-Light”	This module provides the connection to the respective technology and thus provide the basis for the desired usage. This module manages display and acknowledgment.	
Processing module “Storage”	Using put-by-light, goods are stored in the corresponding storage shelves/locations.	
Processing module “Relocation”	Relocations are a combination of pick-by-light (retrieval at the source location) and put-by-light (storage at the destination location). These relocation transactions must be entered manually and at a central terminal.	
Processing module “Order picking”	Pick-by-light is very common. Here, it is not absolutely necessary that only the picking location is equipped with signal elements, also a picking vehicle can be used on which the place of deposit is equipped with a signal element. This process is comparable to a relocation.	
Processing module “Service”	Depending on the application, this may be pick-by-light or put-by-light. In any case, it is about the position of a container/box which shall be processed and the processing of which is acknowledged. A specific application is sorting articles during a multi-stage picking process into several order boxes (stage 2, stage 1 is the article-oriented picking process).	
Processing module “Packing”	As already described before, this can be pick-by-light or put-by-light. Here, it is about the position of an order box or shipping package which shall be processed and the processing of which is acknowledged.	
Processing module “Shipping”	Here, it is about signalling a consolidation location or area that shall be loaded and/or about the signalling at the shipping gate that shall be used.	
Processing module “Consolidation	In case of a consolidation, it is either possible to state the destination location of a storage process or it can be signalled that an order in a location is complete such that it is retrieved.	
Processing module “Checking”	Depending on the application, this may be pick-by-light or put-by-light. In any case, it is about the position of a container/box which shall be processed and the processing of which is acknowledged.	
Processing module “Inventory”	Even storage locations/shelves that are equipped with signalling technology must be counted during inventory/stocktaking. This module provides the necessary functions for this.	

1.1.11.3 Processing using handheld RF devices

Handheld RF-terminals are rugged and versatile companions in the warehouse. They offer the possibility of covering almost all logistical processes. These terminals, however, are limited as to their

display possibilities. This is not necessarily a disadvantage, as it is able to focus on the respective process and give clear instructions during this process.

Module name	Description	Man-datory
Technology module “Handheld RF”	Our handheld RF applications are used by the devices via a terminal server. Thus, computing performance and memory of the devices play only a minor role as the server acts as host for the application. Even a loss of the network connection does not lead to a malfunction, but only to the interruption of a session that can be continued seamlessly once the RF network has returned. The technology module offers also functions for logging the applications and for updating our software.	
Processing module “receipt of goods”	This module is less suitable for entering delivery note information, but for entering stock additions in form of complete packages/trading units such as e.g. from production.	
Processing module “Stock formation	The RF option is able to generate complete packages/trading units or to give instructions for repacking goods and initiating the further transport.	
Processing module “Storage GTM”	Storage using handheld RF-terminals is commonly used. These terminals provide a wide variety of information and offer the possibility of entering deviations online such as the indication of an alternative location without a need for further clarification. In the Goods-To-Man system, only one package / trading unit is moved, e.g. with a forklift.	
Processing module “Storage MTG”	In the Man-To-Goods system, storage runs can be performed that comprise several storage actions that are route-optimized. A storage vehicle may be used as support. A combination with order picking MTG is possible as well.	
Processing module “Relocation”	This module allows to enter relocation transactions via handheld RF terminals not only at a central terminal, but also locally by the terminals themselves	
Processing module “Order picking GTM”	In this module, order picking is considered as retrieving a complete package/trading unit. As advanced feature it is possible to realize order picking to order with only one order package.	
Processing module “Order picking MTG”	Same as described for the module “storage MTG”, this module makes it possible to create complex round trips that allow multi-order picking or a combination with storage.	
Processing module “Service”	This processing module supports the user when performing special tasks by making specifications and receiving acknowledgments.	
Processing module “Packing”	This option is able to ensure packing of complete packages/trading units and make them ready for shipment or to give instructions for repacking goods in shipping packages.	
Processing module “Shipping”	During loading goods, the terminal provides loading instructions to the user such that the right packages leave the warehouse at the right gate in the right order.	
Processing module “Consolidation	For consolidation, this module uses storage and retrieval functions which will then be complemented by order information.	
Processing module “Empties Management	Here the empties transactions are recorded by the handheld RF-terminals to keep track of empties accounts or serial numbers of load units.	

Processing module “Clarification point”	There is always something that goes wrong. Sometimes packages/trading units appear which are in the wrong place at the wrong time. Although the reasons for this can vary, the more important it is to have a clarification point application to bring the goods again to their right place or to trigger the pending process once more again or continue it.	
Processing module “Checking”	This module supports the user when doing checks/inspections by giving specific information and receiving acknowledgments.	
Processing module “Inventory”	Via handheld RF-terminals, this module provides the users with orders that require counting actions. Depending on the control module “inventory” different inventory methods are supported.	
Processing module “Stacker control system”	A stacker or forklift that is equipped with and handheld RF terminal is able to participate in the stacker control system. The stacker/forklift is given loading and unloading orders in a path-optimized and loading-optimized way. The terminal communicates the necessary information to the stacker/forklift such that the latter is able to correctly fulfil its duties.	

1.1.11.4 Processing using forklift terminal

Basically, stacker/forklift terminals are able to fulfil the same functions as handheld RF-terminals. Here as well, we use terminal server sessions. Stacker/forklift terminals, however, mostly offer a larger display for information and hence operation is easier. Furthermore, these terminals are firmly attached to the stacker/forklift which simplifies the device identification and thus the identification of the stacker's position.
In the following table we will refrain from giving a detailed description, as the single points are identical to the information given in the handheld RF-terminal section.
The only exception is the additional technology module "stacker control". This module allows communicating with the stacker/forklift. The latter may receive drive commands from us which usually reduces the procedure times. Of course, the stacker/forklift must be equipped with the respective interface.

Module name	Description	Mandatory
Technology module "Stacker terminal"	See handheld RF-terminal	
Technology module "Stacker control"	Stackers/forklifts often offer the option to receive drive orders and to transmit position data via an interface. We need this module to communicate with this interface and to integrate it into the processes such as storage and retrieval. Depending on the interface type, it is necessary to install this module on the stacker/forklift terminal by yourself to establish a local connection.	
Processing module "receipt of goods"	See handheld RF-terminal	
Processing module "Stock formation	See handheld RF-terminal	
Processing module "Storage GTM"	See handheld RF-terminal	
Processing module "Storage MTG"	See handheld RF-terminal	
Processing module "Relocation"	See handheld RF-terminal	
Processing module "Order picking GTM"	See handheld RF-terminal	
Processing module "Order picking MTG"	See handheld RF-terminal	
Processing module "Service"	See handheld RF-terminal	
Processing module "Packing"	See handheld RF-terminal	
Processing module "Shipping"	See handheld RF-terminal	
Processing module "Consolidation	See handheld RF-terminal	
Processing module "Empties Management"	See handheld RF-terminal	

Processing module “Clarification point”	See handheld RF-terminal	
Processing module “Checking”	See handheld RF-terminal	
Processing module “Inventory”	See handheld RF-terminal	
Processing module “Stacker control system”	See handheld RF-terminal	

1.1.11.5 Processing using by-voice-procedures

Basically, Voice-Over-IP devices allow the same functions to be performed as with handheld RF-terminals. With the respective communications software, the voice terminals can be controlled via the manufacturer software.
However, it must be pointed out that the information output to the user is reduced again. These devices have been designed and developed for simple announcements and clear commands. They are not able to read out something.
In the voice modules, the processes are downsized once more again and thus allow less deviations from the standard procedure. The reason for this is the restricted dialogue behaviour which is possible on a display by “clicking”, but which would lead to labyrinth of functions when entries are made by voice.

Module name	Description	Man-datory
Technology module “Voice”	This technology module ensures the communication with the voice devices and/or the manufacturer software. It saves the user profiles and defines announcements and commands. Because of these circumstances logistical processes are downsized such that they focus very much, allow only few deviations and thus contribute to a simple, reliable and error-free operation. If additional device are connected to the voice terminals, this technology module realizes also the interpretation of the entries our outputs.	
Processing module “receipt of goods”	Additions to stock in form of complete packages / trading units – as e.g. from production – can be processed very efficiently, if an additional reading unit (e.g. a scanner) is connected to the voice terminal.	
Processing module “Stock formation	Stock formation occurs only for complete packages / trading units. An additional reading unit (e.g. scanner) is necessary.	
Processing module “Storage GTM”	In the Goods-To-Man system, only one package / trading unit is moved, e.g. with a forklift. For handling deviations, such as e.g. stating an alternative storage location, an additional reading unit will be required (e.g. a scanner).	
Processing module “Storage MTG”	In the Man-To-Goods system, storage runs can be performed that comprise several storage actions e.g. with storage vehicles that are route-optimized. A combination with order picking MTG is possible as well. For handling deviations, such as e.g. stating an alternative storage location, an additional reading unit will be required (e.g. a scanner).	
Processing module “Relocation”	Relocation transactions via voice terminal can be made locally and only for complete packages / trading units. An additional reading unit (e.g. scanner) is necessary.	
Processing module “Order picking GTM”	In this module, order picking is considered as retrieving a complete package/trading unit. As advanced feature it is possible to realize order picking to order with only one order package. In case additional information have to be entered, an additional reading unit (e.g. scanner) is necessary. Further advantage of a reading unit is that it can accelerate processes such as stating loading auxiliary numbers and avoid errors.	
Processing module “Order picking MTG”	Same as described for the module “storage MTG”, this module makes it possible to create complex round trips that allow multi-	

	order picking or a combination with storage. Here as well, expansion/upgrading and optimization is possible using an additional reading unit.	
Processing module “Service”	This processing module supports the user when performing special tasks. Specifications can be made to a limited extent only; acknowledgments are made. An additional reading unit (e.g. scanner) is necessary.	
Processing module “Packing”	Using voice terminals, you are able to pack complete packages/trading units and thus make them ready for shipment. An additional reading unit (e.g. scanner) is necessary.	
Processing module “Shipping”	During loading goods, the voice terminal provides loading instructions to the user such that the right packages leave the warehouse at the right gate in the right order. We recommend an additional reading unit for verification and acknowledgment.	
Processing module “Consolidation	For consolidation, this module uses storage and retrieval functions which will then be complemented by order information. For handling deviations, such as e.g. stating an alternative storage location, an additional reading unit will be required (e.g. a scanner).	
Processing module “Inventory”	Via voice terminals, this module provides the users with orders that require counting actions. Depending on the control module “inventory” different inventory methods are supported. An additional reading unit (e.g. scanner) is necessary.	
Processing module “Stacker control system”	A stacker or forklift that is equipped with a voice terminal is able to participate in the stacker control system. The stacker/forklift is given loading and unloading orders in a path-optimized and loading-optimized way. Stating additional information is restricted. We recommend an additional reading unit for verification and acknowledgment.	

1.1.11.6 Processing with work station dialogues

Work stations are workplaces where different tasks have to be performed or fulfilled. Usually, these workplaces are stationary as they have exactly one main task, e.g. to carry out the goods receipt, to pick products or to pack goods into shipping packages.
Stationary work stations must be highly efficient as they have higher costs due to a less flexible use. Our special applications ensure highest efficiency as they stand out and are well ahead as to ergonomic aspects and feedback to the user (e.g. browser applications). Many of these applications are optimized for touch screens to allow an intuitive handling.
The application can be installed locally on the computers (fat client) or operated via a terminal server (thin client variant).

Module name	Description	Mandatory
Technology module “Work station”	This module offers the functions for logging and updating our software, setup packages and future sustainability thanks to up-to-date technologies. The authorization management is common to all technology modules acting as user interface. The application design focuses on the ergonomic and rapid operation within the scope of state-of-the-art hardware such as especially wide monitors or touch screens. The more complex and extensive the applications, the earlier they are found as work station program.	
Processing module “receipt of goods”	The “Receipt of goods” module offers the full spectrum of possibilities – from picking complete packages/trading units to entering delivery notes incl. complaint handling.	
Processing module “Stock formation	The stock formation is performed as repacking process, but is also possible for complete packages / trading units.	
Processing module “Storage GTM”	As work station in the pre-zone of an automated warehouse packages/trading units are added to the stock here. These can be complete packages / trading units, but also additions to stock on existing loading auxiliaries in the warehouse.	
Processing module “Storage MTG”	This function represents an addition to the storage function, using mobile terminals in the Man-To-Goods system. It may be more efficient to fill a storage vehicle etc. with goods at a work station before being executed with the mobile terminal.	
Processing module “Order picking GTM”	As work station in the pre-zone of an automated warehouse, here stock withdrawals are made. Mostly, these are partial stock removals, as complete stock removals go directly to the subsequent process. The application supports several supply actions to the work station, but also multi-order picking according to the strategies applied for order management and processing. It is not important what is the cause for stock withdrawal (delivery, replenishment, QA). The information are made available to the user accordingly.	
Processing module “Order picking MTG”	As with the module “storage MTG”, a work station application can work doing preparatory work for the mobile terminals to make their activities more efficient. Application possibilities are: equipping picking vehicles with empty boxes/containers or acting as I-point.	
Processing module “Service”	The user is guided through the special processing procedure according to the service strategies. This may be a simple service	

	for the purpose of confirmation or a complex production with document templates.	
Processing module “Packing”	Packing occurs as packing process, but is also possible for complete packages / trading units.	
Processing module “Shipping”	During loading goods, the terminal provides loading instructions to the user such that the right packages leave the warehouse at the right gate in the right order.	
Processing module “Consolidation	For consolidation, this module uses storage and retrieval functions which will then be complemented by order information. The work station directly posts these processes. It represents a kind of I-point for a consolidation which is not operated by mobile terminals or in an automated manner.	
Processing module “Empties Management	Here the empties transactions are recorded by the PC-terminals to keep track of empties accounts or serial numbers of load units, transactions and exchange.	
Processing module “Clarification point”	Especially in Goods-To-Man systems error work stations at the conveyors are necessary which solve problems like wrong products, loading auxiliaries not read or other problems to keep the whole system running.	
Processing module “Checking”	This module supports the user when doing checks/inspections by giving specific information and receiving acknowledgments. The statements made during acknowledgment can be very detailed (e.g. even a test certificate).	
Processing module “Inventory GTM”	As work station in the pre-zone of an automated warehouse, here, packages are entered in the course of the respective inventory procedure.	
Processing module “Interface data acquisition”	In the event that there is no automatic interface available for master or transaction data, a work station allows entering or maintaining the necessary degree of information. This application also is used for entering orders etc. in case of emergency plans, e.g. if the connection to the ERP-system fails.	

1.1.11.7 Processing with browser applications (web)

Our browser applications mainly serve information and administration purposes. In this connection, by default, many applications exist which subsequently are not part of the processing modules, but which are contained as basis in the obligatory technology module “web”.
The processing modules are considerably restricted as we consider the usability of the browser applications to be also restricted for a logistical process. The applications mentioned in the below table thus are very simple and consequently are used in application cases that are simple as well.

Module name	Description	Mandatory
Technology module “Web”	The applications are made available by the Microsoft internet information server. Each network participant has access to the web sites provided he is authorized. All applications for information and administration purpose are made available by the technology module “Web”. The applications have been optimized for wide screens to provide as much relevant information as possible. By linking pages the informative value is further increased by one click.	X
Processing module “receipt of goods”	The incoming goods can be entered in a simply way e.g. by assigning delivery note data to an order. Entering packages is not planned.	
Processing module “Storage GTM”	This module allows a simple provision of packages / trading units to automated warehouses by a web application. Prerequisite: stock formation must have taken place before.	
Processing module “Order picking GTM”	Using this module, posting the retrieval of complete packages/trading units can be ensured via a web application. Correction possibilities are restricted.	
Processing module “Service”	For the “Simple-Service-Procedure”, the user is provided with simple information and may then confirm the service procedure.	
Processing module “Packing”	Packing is ensured solely for complete packages / trading units with the necessary information and the prompt to confirm the packing procedure.	
Processing module “Shipping”	The user gets an overview of the units to be shipped and confirms them.	
Processing module “Checking”	The user is provided with the information necessary for a simple checking procedure and can confirm the procedure.	
Processing module “Inventory GTM”	In the pre-zone of an automated warehouse, here, packages are entered in the course of the respective inventory procedure.	
Processing module “Interface data acquisition”	In the event that there is no automatic interface available for master or transaction data, a web application allows entering or maintaining the necessary degree of information. This application is also used for entering orders etc. in case of emergency plans, e.g. if the connection to the ERP-system fails.	