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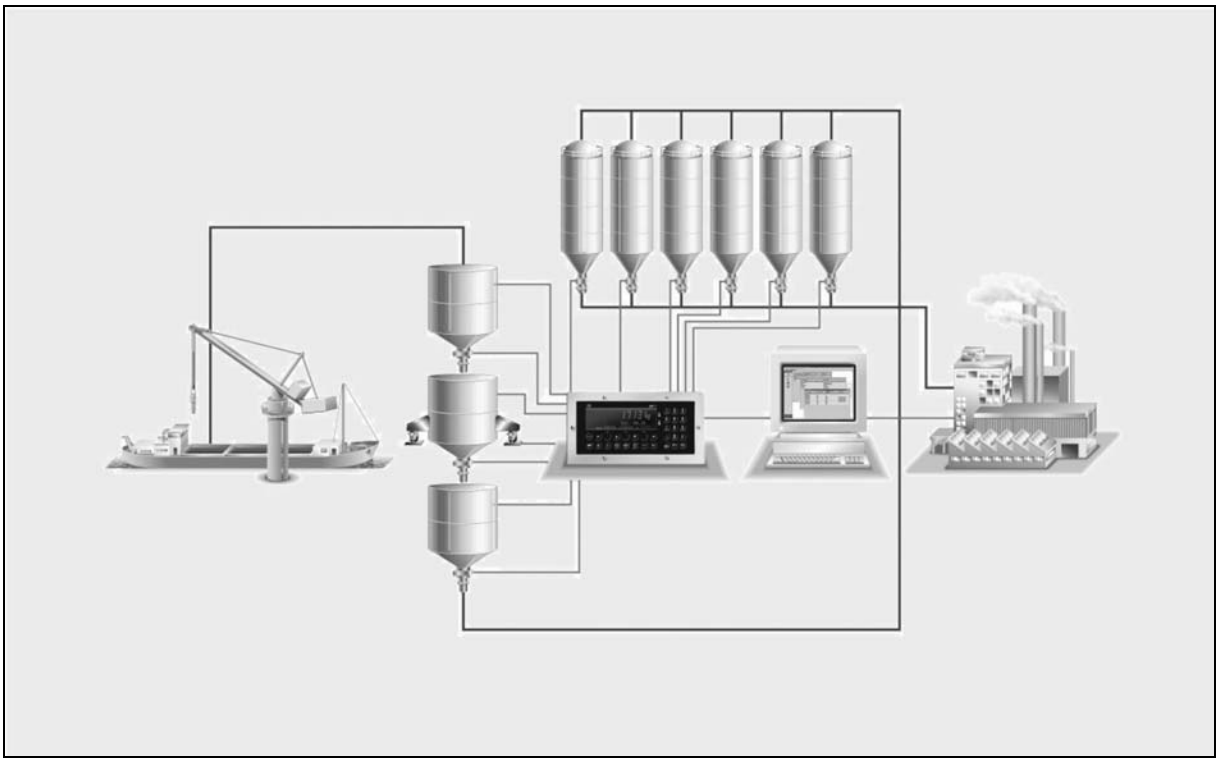
Operating Manual

BULK Controller
X5, X6 - Application



Operating Manual	**9499 050 61802**	**Edition 2**	**16.09.2009**
for PR5610/70	**Release: 3.00**		
for PR5710/70	**Release: 3.00**		

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Important

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Wichtig

Contents

1 Introduction

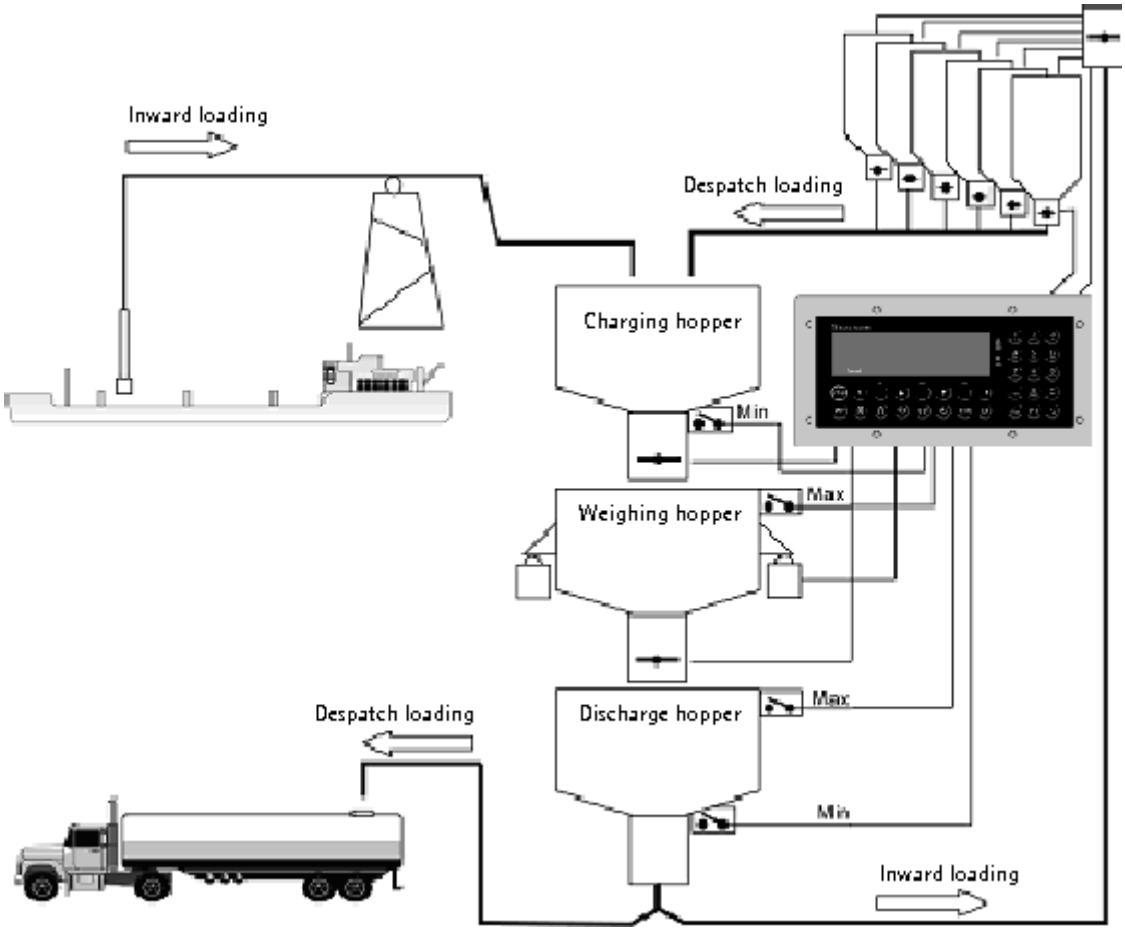
BULK, which is also called Circuit Scale, is used for weighing of large quantities of bulk material by splitting into small partial quantities.

For an optimum material throughput, i.e. loading and unloading of the transport vehicle at a high speed, a quick sequence of cycles is required. The single cycles are totalized. Optionally, a report can be printed out.

The advantage of this procedure is in the use of small hoppers and weighing facilities and the resulting low costs and low space requirements. A charging hopper and an (optional) discharge hopper are used as buffers for a continuous material flow for discontinuous weighing.

Systems of this kind are used for both material loading (reception of incoming material) and material unloading (delivery of outgoing material).

The difference between loading and unloading is that loading requires weighing the material (e.g. until the ship is empty), whilst batching up to a defined setpoint out of a silo e.g. into a truck is required for unloading.

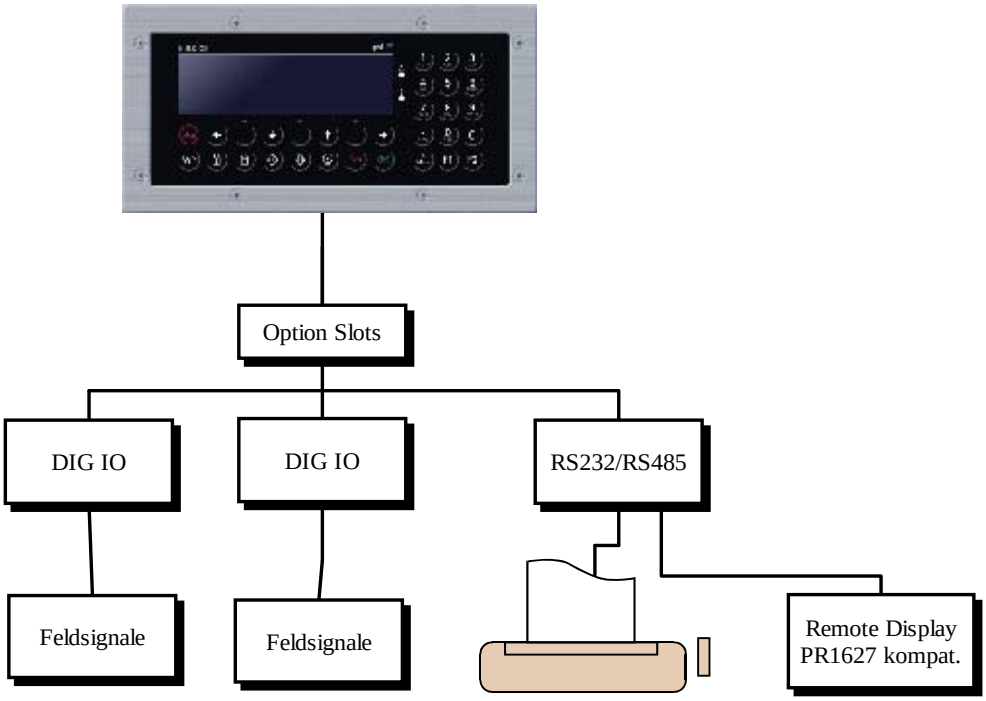


In case of material shortage, an optional charging hopper MIN signal prevents filling the weighing hopper partially.

An optional weighing hopper MAX signal prevents overflow of the weighing hopper.

If the material flow is blocked, an optional discharge hopper MAX signal prevents discharging or accidental movement of the valves. An optional discharge hopper MIN signal can be used to discharge the weighing hopper only, if the material volume in the discharge hopper is sufficient.

Silo selection is in binary code via 8 outputs; i.e. up to 8 silos (materials) can be selected directly without de-multiplexer. When using a de-multiplexer (internal PLC + fieldbus I/O or external PLC), selection of up to 255 silos is possible.



1.1 Delivery state

- X5 Controller (PR5610) / X6 Controller (PR5710) with application software BULK
- X5/X6 BULK licence
- Alibi memory program and licence
- 2x digital I/O PR1713/17 on slot 1 and slot 2
- PR1713/04 dual serial interface on slot 3
- PR1713/05 Memory Extension (1MB RAM)
- Manual CD, with operating manual, installation manual and datasheet

If a higher I/O capacity is required, or when using the internal PLC for tube/silo control, the 2nd I/O card can be mapped easily onto fieldbus modules by extending PLC program and SPM interface.

X5 or X6 requires:

- Firmware 2.20 or higher version
- The BULK application

2 Operating concept

Information on displays and controls is given in the relevant installation manual.

The BULK application uses 4 databases:

1. ALIBI memory
   for storage of the weight totals of load/unload steps in a ring memory of configurable size

2. System data
   are composed e.g. of information for print lay-out, physical system constants, information for software inversion of input signals, information on whether defined system components are provided, etc. The system data are stored in a database with only one data set to facilitate access by means of power tools AccessIt! and RecoverIt!.

3. Customer data (supplier data)
   consist of address data and other customer/supplier features. Customer data are stored as data sets in a database.

4. Material data
   comprise information on handled materials and silos and are stored in data sets in a database. Apart from material description and material number, material data also include information on density, material control code, etc.

Other temporary databases as buffers for e.g. print data are also used.

Customer, system and material data entry, deletion, handling and printing are in menu [Setup] [Config].

Operation of the ALIBI memory in starting position is dependent on the CAL switch position:

- CAL switch open: determination of the ALIBI memory size as a number of entries
- CAL switch closed: display, search, printing of the stored ALIBI memory entries

3 Menu trees

3.1 Menu tree 'Start'

[Start]	Details
- [Load]	
- Select Customer	Select customer by scrolling, short-cut selection by entry of number or name is possible. Storage is by pressing 'OK'. Standard default setting is Cust0
- Order	Order number, order name, etc.
- Truck	Truck ident, e.g. truck identification number
- Cell	Description of truck compartment
- Select Silo	Select by scrolling, short-cut selection by means of number or name is possible, storage is by pressing 'OK'
- Material description	If necessary, enter/change material description dependent on configuration
- Start Loading	Start loading operation yes /no
- [Unload]	
- Select Customer	Select customer by scrolling, short-cut selection by entry of number or name is possible. Storage is by pressing 'OK'. Standard default setting is Cust0
- Order	Order number, order name, etc.
- Truck	Truck ident, e.g. truck identification number
- Cell	Description of truck compartment
- Select Silo	Select by scrolling, short-cut selection by means of number or name is possible, storage is by pressing 'OK'
- Material description	If necessary, enter/change material description dependent on configuration
- Unload amount	Enter weight setpoint for unloading
- Empty Tubes	Dependent on configuration, discharge tubes after end yes /no
- Start Unloading	Start unloading operation yes / no
- [Manual]	
- Operate	
	In the upper text line, the actual feedback status of valves is displayed (manual enable input must be active, a password may be required)
- Fc chg	Change feed valve control signal
- Dc chg	Change discharge valve control signal
- Done	Finish manual valve operation
	When leaving, the valves are closed automatically
- Totals	
	Error message appears at interlock.*
- Print Mat bf. clear?	Select Yes/No.
- C1, C2, C3, all	Clear total(s) by pressing OK.
- Clear prod. total?	Select Yes/No.

* See chapter 11.

3.2 Menu tree 'Configuration'

[Config]	Details
- Mat	Material table
- Print	Print material table
- All	Print the complete material table
- Single	
- Select Material	Print a material description
- Edit	Edit material table
- New	Create a new material entry
- Material name	[20 characters]
- Material Ident	Material number [32-bit integer]
- Material description	[20 characters]
- Bin Full Weight	[Weight] Max. permitted material weight for the weighing hopper. Density-dependent material parameter
- OVS after coarse	[Weight] of material which is still in flight after the end of the coarse signal. Can be corrected automatically to compensate the system or material behaviour.
- Overshoot Fine	[Weight] As 'overshoot coarse', but for the fine flow signal
- OVS absolute Limit	Max. weight for overshoot limiting With automatic overshoot correction, the absolute overshoot value can never exceed this value.
- DC open min weight	Min. weight when opening the discharge valve If the weight is within minus tolerance, decision based on this weight is made, whether pulsed control of the valve is possible without exceeding the setpoint.
- Auto OVS correction	Automatic overshoot correction [yes/no] BULK can correct the overshoot automatically based on previous batches, in order to compensate system and material behaviour
- Auto OVS limit %	Overshoot correction limiting in per cent of the current overshoot. To prevent excessive changes of the overshoot, e.g. due to a single material lump, max. overshoot correction can be limited by a single cycle.
- Material in tube	Corrective value for discharge of the tube [weight] only for unloading: To discharge the material in the tube at the end of a production, the in-flight material weight in the tube can be specified in this parameter. During the last cycles, the material flow is de-activated in advance by this weight. With tube discharge activated, overshoot correction is omitted even in case of weight below setpoint, in order to avoid mixing of material.
- No flow alarm time	[time] *
- Actual shift total	[weight]
- Today total	[weight]
- Week total	[weight]
- Month total	[weight] *

- Tolerance over	[weight]
- Tolerance under	[weight]
- Silo code	[Byte] (1..255) When batching the material, this value is switched onto the material outputs as a binary bit pattern for material request.
- Save Material ?	Yes / no
- Edit	Edit existing entry
- Select Material	Select by scrolling, short-cut selection by entry of number or name is possible
- Del	
- Select Material	Select by scrolling, short-cut selection by entry of number or name is possible
- [Cust]	Customer table
- Print	Print customer table
- All	Print the complete customer table
- Single	
- Select customer	Print a customer description
- Edit	Edit customer table
- New	Create a new customer entry
- Customer name	[20 characters]
- Customer Ident	Customer number [32-bit]
- Customer Text 1	[20 characters]*
- Customer Text 2	[20 characters]*
- Customer Info	[20 characters]*
- Customer Adr Street	[20 characters]*
- Customer Adr City	[20 characters]*
- Customer Adr ZIP	[20 characters]*
- Customer locked	Is creation of a new order for this customer permitted [yes/no] ? At production start, only customers which are not locked are displayed for selection in the customer list. I.e customer data can remain in the database, if e.g. delivery is stopped only temporarily.
- Save Customer ?	Yes / no
- Edit	Edit an existing customer entry
- Select customer	Select by scrolling, short-cut selection by entry of number or name is possible
- Del	
- Select customer	Select by scrolling, short-cut selection by entry of number or name is possible
- [System]	System parameters
- I/O	

- Print	
-	Name and current settings of all system parameters are printed
- Edit	
- Bin Empty Weight	[Weight] With lower weight, 'hopper empty' is detected
- Start empty delay	[Time] max. permissible time until the hopper is empty (0 infinite)
- Fill clap Still wait	Waiting time from valve closing to Set tare
- Disc clap empty wait	Waiting time from hopper empty to valve closing
- Disc clap tare wait	Waiting time from valve closing to start filling
- Fill clap run time	Valve monitoring: max. permissible time from signal to feedback change. 0 means monitoring is omitted
- Disch clap run time	Valve monitoring: max. permissible time from signal to feedback change. 0 means monitoring is omitted
- Silo clap run time	[Time]*
- Max cycle time	[Time] Max. permitted time for filling. When exceeding, the process is halted and an error message is output. 0 ms means: monitoring is omitted.
- Pre-Bin sensor	[No/yes/yes inverse] An optional sensor in the charging hopper can be used for stopping the process, when a weight is below a min. amount.
- Bin full sensor	[No/yes/yes inverse] An optional sensor in the weighing hopper can be used to stop the process close the valve when exceeding a level.
- Out-Bin MAX sensor	[No/yes/yes inverse] An optional MAX sensor in the discharge hopper can be used to delay discharging of the weighing hopper with an excessively filled discharge hopper and closing of the discharge valve (which may be stuck in the material), until these conditions are removed.
- Out-Bin MIN sensor	[No/yes/yes inverse] An optional MIN sensor in the discharge hopper can be used to enable discharging of the weighing hopper only, if the empty volume in the discharge hopper is sufficient.
- Fill clap FB invert	Invert [Yes/no] valve feedback signal via software ?
- Disch clap FB invert	Invert [Yes/no] valve feedback signal via software ?
- Silo clap FB invert	[Yes/ no]*
- Use fine Dosing.	[Yes/no] If the system provides batching elements for fine flow signal, the fine signal can be used for line-out to the setpoint during the last two cycles for unloading.
- Timed MatSum reset	[Yes/no]*
- Request passw Manual	Permit manual operation only after successful password entry [yes/non]
- Allow spec. Customer	[Yes/no] If set to 'yes', entry of a customer name when starting an order and selection of customer number 0 are permitted. This facilitates e.g handling for passing customers, delivery of small amounts, etc., for which creation of a specific customer data set would be too expensive.
- Owner Info 1	[20 characters] Name, address for print-outs
- Owner Info 2	[20 characters]
- Owner Info 3	[20 characters]
- Owner Info 4	[20 characters]

- WWS Order No..	[UINT32] Current ALIBI or resource planning system identification number for production. The value adjusted in this parameter is used for the next start of production. Permits successive production IDs, e.g. when changing to another release.
- WWS Conn. active	[Yes/no] With the connection to the resource planning system activated, production data are buffered in a ring memory. This parameter activates or de-activates buffer and software components.
- Ticket line offet	[INT16] Number of empty lines before printing the ticket data for generation of an upper margin
- Ticket column offet	[INT16] Number of empty columns for generation of a left margin
- Ticket empty lines	[INT16]
- Ticket copies	[INT16] Number of tickets printed for a production. Permits using ink jet printers for generation of multiple copies
- Remote Display Type	[PR1628 | none]
- Remote Display Port	[TTYx]
- Remote Display Mode	[Gross weight S | Gross weight | Dif Soll] Determine the weight displayed on the remote display unit: - gross weight of each cycle - total gross weight - setpoint – total gross weight
- System Mode	[Load & Unload. | Only loading | Only unloading] Determine the system mode. To increase the safety of operation, only the permitted modes are displayed when starting.
- Print tolerance	[Yes/no] Should tolerances be printed explicitly or is print-out of setpoint and actual weight sufficient?
- Number order texts	[0..5] Number of order texts for reading at production start. The following input prompts are displayed: 1– Order 2- Truck 3- Cell 4-Best before date Prompt and entry are printed on the ticket.
- View/Empty Tube Empt.	[Yes/no] Is it necessary to display and correct the amount for tube discharge when starting unloading ?
- View/Edit Mat text	[Yes/no]
- Enable Simulation	[Yes/no] Is the system used in SPM simulation? (CAUTION: when selectinhg 'yes', the physical input signals are ignored !! This can cause fatal error with the system connected)
- Sum	Display the current total of all productions
- Delete	Delete the current total
- Exit	Exit from the sub-menu without changing the current total
- Passw	
- New System Password	(if necessary) enter the old and then the new system password

* Not used presently, provided for future developments.

4 System behaviour

4.1 Cycle

A cycle is the operation from checking, if the weighing hopper is empty (<configured min. weight), filling, taring and discharging to totalizing of the bulk weight into the current production total. For filling the hopper optimally, i.e. using the lowest possible number of few cycles, a maximum hopper filling weight, calculated from material density and hopper volume, must be specified.

4.2 Production

The sum of all cycles into an order is the production total. For every order, a production report with weight setpoint, actual weight, time and further optional data is sent to a serial interface. Typically, a printer is connected to this interface (TM29511 ASCII line printer) .

For checking, the output/print-out of the bulk weight can be activated/de-activated by pressing key  with the production running.

4.3 BULK Cycle Procedure

The description of the cycle procedure and the following diagram relate to the input/output signal designations as used in chapter 11.

At the beginning of a production cycle, 'ext. PLC enable' respectively ‚EnRun' must be active.

Now the system checks, if the weight in the hopper exceeds the configured min. weight. If configured, supervision times and delay times are taken into account.

If e.g. 'timeout cycle' supervision time 'cycle alarm time' is set to 0 ms, it is disabled and the system waits until the weight in the hopper is below the min. weight without generation of an error message.

Now the cyclical cycle sequence is started:

- Calculation of the filling weight for the current cycle dependent on operating mode and on which cycle is currently handled.
- Determination of the bulk weight setpoint from: current gross weight, filling weight, overshoot (coarse/fine), cycle sequence.
- If necessary, stop for verification/checking e.g. W&M Stop/check stop.
- filling of the weighing hopper in coarse and/or fine flow with 'cycle timeout' ‚cycle alarm time'.
- If configured: waiting, until 'Fill clap Still wait' has elapsed.
- W&M taring
- If necessary W&M Stop/check stop.
- Discharge, until min. weight is exceeded, with 'discharge timeout' runtime supervision ‚cycle alarm time'.
- If configured: waiting, until 'Disc clap empty wait' has elapsed.
- Closure of discharge valve with runtime supervision.
- If configured: waiting, until ' Disc clap tare wait' has elapsed.
- Determination of the actual bulk discharge weight. totalizing, overshoot correction, if necessary.
- If necessary, W&M stop.
- Reset tare.
- Depending on production mode, decision about further cycles or production end.

4.4 Overshoot optimization

Overshoot optimization can be enabled in the system parameters during configuration.

At the end of a cycle, the difference between weight setpoint and actual weight of previous cycles is used to form an optimized overshoot value automatically. Optimization can be influenced by various parameters:

The first cycle of a production is without overshoot correction, because the first cycle is mostly started and finished with an empty charging hopper. For this reason, system behaviour and overshoot values are different from the numerous following cycles.

Overshoot optimization is omitted also with cycles which are terminated by system error or operator intervention.

The overshoot can be limited to a maximum value (independent of polarity sign, amount) e.g. 30 kg.

During each cycle, the difference from the setpoint is determined and the overshoot is corrected by a fraction of the difference specified in per cent in [Config][Material].

4.5 Load

Loading is done by cycles in coarse flow with setpoint = hopper_maxweight, until the operator terminates the production or a material flow error or timeout (dependent on parameter setting) occurs and the operator cancels the production.

4.6 Unload

For unloading, a weight setpoint is defined. After each cycle, the number of remaining cycles to reach the setpoint is calculated. The bulk weights of the last two cycles of a production are done with fine flow, provided that system parameter "Fine flow possible" is set to 'Yes' .

This discharge strategy optimizes the process for the lowest possible number of cycles (= time) and by minimizing the batch error.

4.7 Calibration by means of function W&M Stop

With the CAL switch in the controller open, the calibration procedure can be simplified by halting the cycles on various occasions and while showing the weight on display as well as output on a serial interface (e.g. a printer) for report purposes. The sequence can be continued by pressing a key. Optional weight display with a tenfold resolution is possible.

W&M mode may be switched on/off directly before production start or whilst the production is running, by pressing key 

. This is followed by display of the newly selected mode during 2 seconds: 'W&M Stop On' or 'W&M Stop Off'.

Whilst the production is running and during W&M stop, key 

can be pressed to switch between normal and increased display resolution.

4.8 Alibi memory

As standard, BULK is supplied with the ALIBI memory software module. For set-up, the required number of production entries is determined in the ring memory with the CAL switch open.

With the CAL switch closed, i.e. during normal operation, every production is stored with time, date, production weight and ID in the ALIBI memory.

From the main menue position, [Alibi] can be used to check, display and print this memory according to various criteria.

4.8.1 Configuration of the alibi memory

The memory is configured during commissioning and cannot be deleted or changed in size subsequently, if the CAL switch is closed. A cold start or re-configuration deletes the memory and its configuration. A data set has 64 bytes.

The application memory requirement (all databases !) must be taken into account by the user himself.

4.8.2 Data in the alibi memory

- Weight value, contains the weight, the weight type and the weighing point identification (WEIGHT).
- Date **&** time (DT)
- Operation number within 1 and 999999 (DINT).
- Modified CRC-16 (WORD). The type of modification is not specified. I.e. stored data cannot be changed also by application programming. Records with faulty CRC check contain a sequence of minus signs instead of a weight.

The data are stored in a ring memory. After the memory is full, further new data shift the earliest data out of the memory. The function is transparent for the user.

4.8.3 Size of the alibi memory

100 kbytes for the dynamic memory, e.g. databases, are reserved for the application program. Dependent of firmware release, approx. 200 kBytes are occupied by system and application.

During database creation, the entry is limited to the actual conditions due to already occupied memory space, i.e. the actual memory extension and the firmware memory requirement are taken into account.

An own main program which can be called up at the uppermost PR5610/10 operating level is used for operation. It includes the following functions:

- Configuration, if the CAL switch is open.
- Search and print-out of data sets, if the CAL switch is closed.

4.8.4 Use of the alibi memory

An own main program which can be called up at the uppermost operating level is used for operation. This function is available also during operation of the application.

4.8.5 Printing the alibi memory contents

The print function of the alibi memory uses two different printers: Print-out from the started program ('Alibi') is on the ticket printer (PRN:).

When printing from the application ('Start – <User> - More – More – Alibi'), the configured log printer is used.

4.8.6 Time behaviour of the alibi memory

As the database can contain several thousand entries, handling times in the range of seconds must be expected. The time requirement for handling a database operation increases with the number of possible entries. For this reason, no more than the indispensable number of entries should be made available by configuration. During searching in the database, 3 dots are shown in the upper left corner of the two-line display.

4.9 Computer connection

With the connection to a resource planning system activated (WWS), write access to a subset of material data by means of DDE or OPC is possible via serial interface or TCP/IP network, e.g. for changing the silo material allocation.

Accordingly, a subset of the production ticket is buffered for reading by the resource planning system. In particular, the included items are:

DB field name	Description
nAlibi	Production ALIBI ID
nMode	ASCII character : 86 = U = Unload, 65 = L = Load
nSilocode	Silo code for material control
nMatId	Material ID
nCycles	Number of cycles during a production
nCustId	Customer ID
tStartDt	Start time stamp
tEndDt	End time stamp
wSetPoint	Weight setpoint (! only valid for unloading!)
wTotal	Actual production weight
sMatName	Material name
sMatDesc	Material description
sCustName	Customer name
sOrderName	Order text
nOrderStat	Order status: -1::Abort 1::OK, 2:: overbatch, no tolerance, 3:: tolerance exceeded

nXxxx : Integer ; sXxxx : String20 ; wXxxx : weight; tXxxx : date and time

The connection to a resource planning system is described separately in conjunction with the description of a program for testing the connection in the electronic document 'BulkWWSTest_D.pdf'.

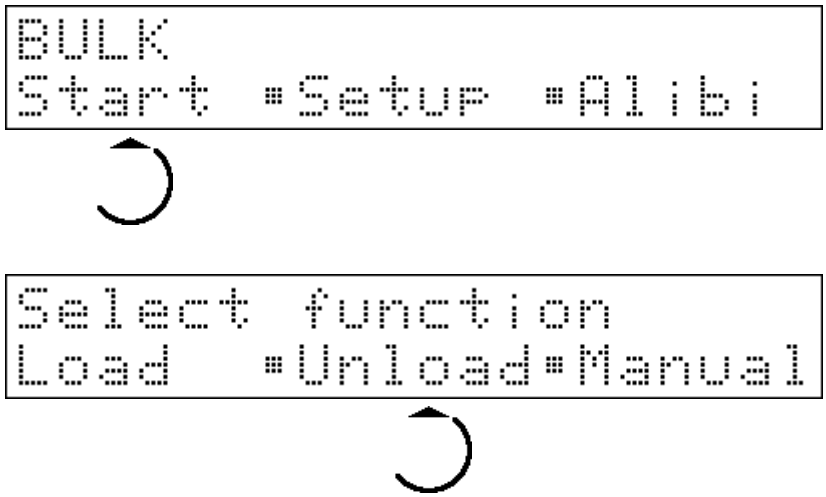
Please contact us if you need this document.

5 Start unloading

5.1 Main menu

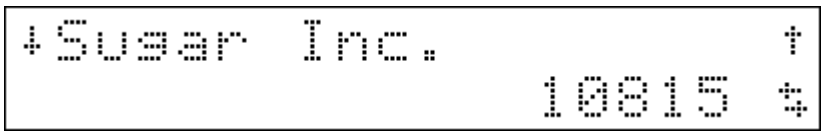
Pressing key Exit for cancellation is possible at any time until starting definitely.

5.2 Start production



Note: Dependent on configuration, display of 'Load' can be omitted.

5.3 Selecting a customer



A list with customer name on the first line and customer number on the second line is displayed.

↑ ↓	Scrolling in a customer list
0 .. 9	Short-cut selection of a customer number (entry of only 1 character possible)
A .. Z	Short-cut selection of a customer name (entry of only 1 character possible)
OK	Selection of displayed customer or positioning for short-cut selection

5.3.1 Special case:

If enabled by configuration: By selection of customer number 0, a customer name which is not contained in the database can be entered. The name entered in the following step is buffered under customer number 0 in the customer table, until it is changed.

5.4 Order-related entries

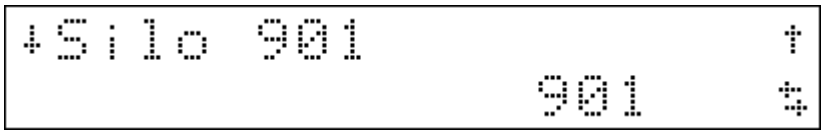
Prompts for up to 4 order-related texts can be configured. Termination and storage of the entry are always by pressing key OK

Entries are buffered, printed on the ticket after completion of the order, and proposed as default when starting the next order.

Examples:Order number, truck ident, truck cell, driver's name

In the above display example, an order number is specified.

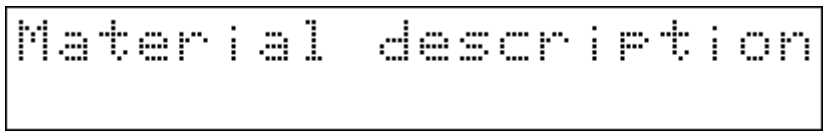
5.5 Material / silo selection



A list with silo or material name on the first line and silo or material number on the second line is displayed.

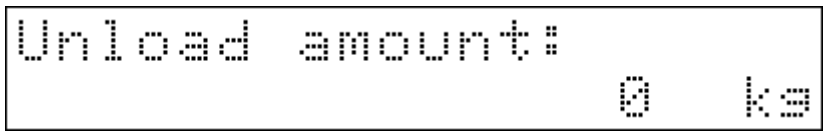
↑ ↓	Scrolling in the silo or material list
0 .. 9	Short-cut selection of a silo or material number (entry of only 1 character possible)
A .. Z	Short-cut selection of a silo or material name (entry of only 1 character possible)
OK	Selection of the displayed silo or material, or positioning for short-cut selection

5.6 Entry of the material description



This entry is requested only, if configured. The material description can be 20 characters long. The already existing material description is displayed and can be taken over, overwritten or changed. Press OK to select the existing, or to store the changed material description. When storing, the material description is stored/updated for the selected material/silo in the material table for subsequent productions.

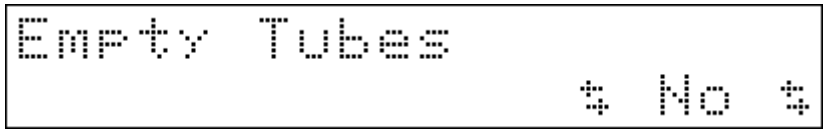
5.7 Entry of the unload amount



Dependent on scale calibration, the unit and/or number of digits behind the decimal point can be different.

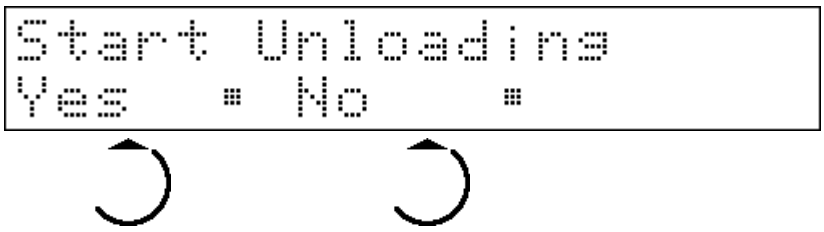
Enter the required unload amount by means of the numeric keys and the comma key. Press OK to complete and store the entry.

5.8 Empty tubes

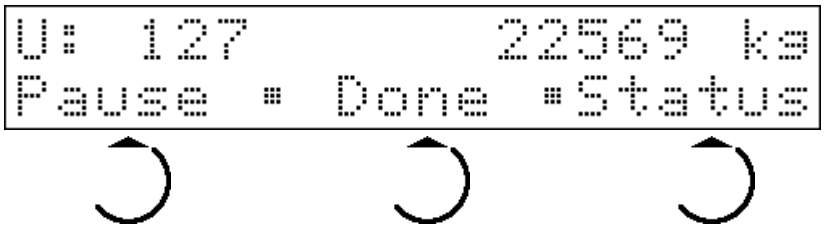


Empty tubes? Select **[Yes]** or **[No]** by pressing ← or →. Press OK to store and continue.

5.9 Starting



5.10 Monitoring during unloading



The large display shows the current bulk weight (gross) when filling and the net weight when discharging.

In the middle, U: for Unload, number of completed cycles and the already discharged total weight are displayed.

The functions of the softkeys are:

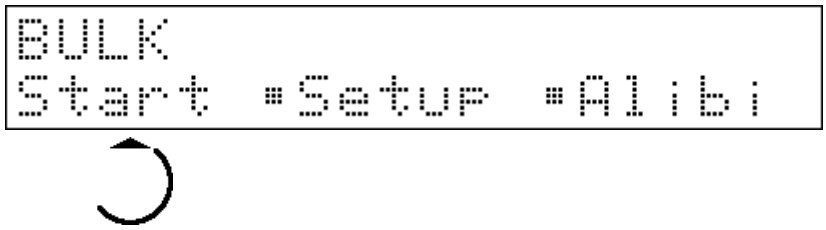
Pause	Stop unloading temporarily when stabilizing for the next time and continue via softkey.
Done	Complete cycle and terminate the overall production with a normal bilance.
Status	After pressing once, unloaded weight (total - setpoint) and internal status of the bulk PLC are displayed in the middle line. Press twice to display the material or silo in the middle line. After pressing again, the initial condition is displayed again.

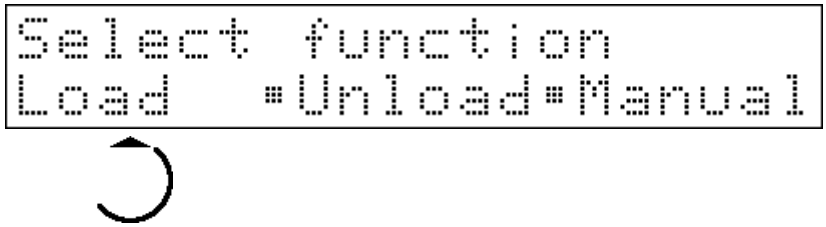
6 Start loading

6.1 Main menu

Pressing key  for cancellation is always possible until starting definitely.

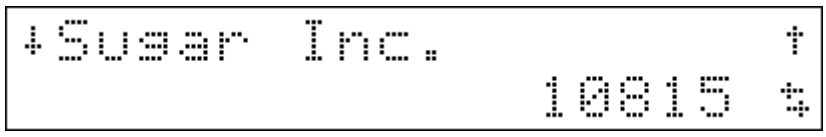
6.2 Start production





Note: Dependent on configuration, display 'Unload' may be omitted.

6.3 Selecting a customer



A list with customer name on the first line and customer number on the second line is displayed.

	Scrolling in the customer list
0 .. 9	Short-cut selection of a customer number (entry of only 1 digit possible)
A .. Z	Short-cut selection of a customer name (entry of only 1 character possible)
	Selection of the displayed customer or positioning for short-cut selection

6.3.1 Special case

If configured, selection of a customer name which is not stored in the database is possible by entry of customer number 0. The name entered in the following step is buffered under customer number 0 in the customer table, until it is changed.

6.4 Order-related entries

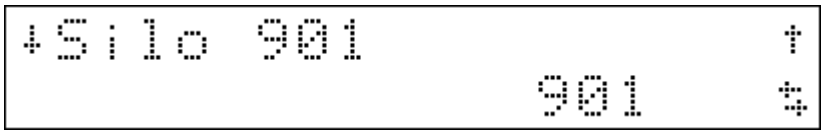
Specification of up to 5 order-related texts with a prompt can be configured. Press key OK to complete and store the entry.

Entries are buffered, printed on the ticket after the order end and proposed as default when starting the next order.

Examples: Order number, truck ident, truck cell, driver's name

In the above display example, an order number is entered.

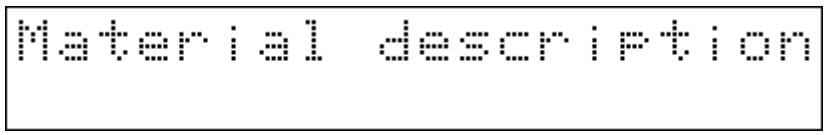
6.5 Material/silo selection



A list with silo or material name on the first line and silo or material number on the second line is displayed.

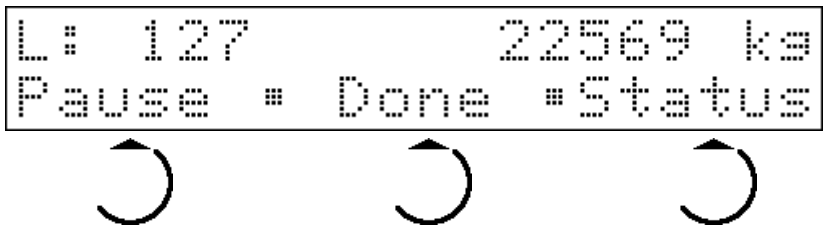
↑ ↓	Scrolling in the silo or material list
0 .. 9	Short-cut selection of a silo or material number (entry of only 1 character possible)
A .. Z	Short-cut selection of a silo or material name (entry of only 1 character possible)
OK	Selection of displayed silo or material, or positioning for short-cut selection

6.6 Entry of the material description



20 characters for material description are available. The existing material description is displayed and can be taken over, overwritten, or changed. Press OK to select or store the changed material description. When storing, the material description is stored under the selected material / silo in the material table for subsequent productions.

6.7 Monitoring during loading

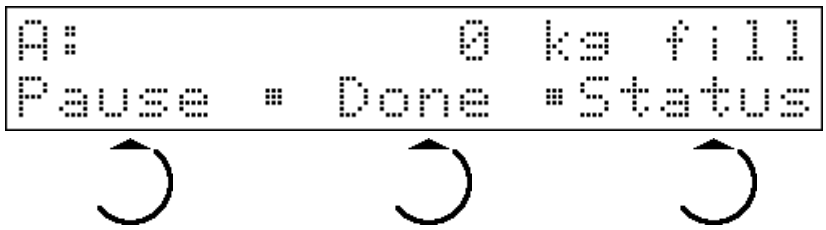


The large display shows the current bulk weight (gross) when filling and the net weight when discharging.

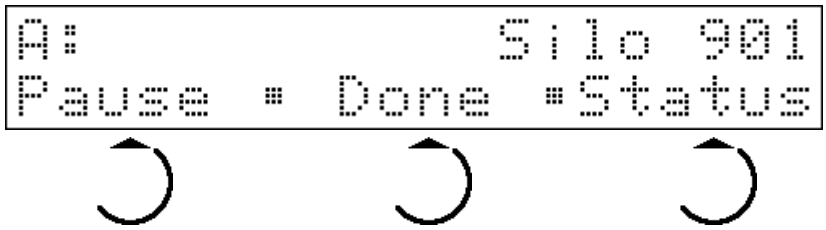
In the middle, L: for Load, the number of completed cycles and the already discharged overall bulk weight are displayed in the middle.

The softkey functions are:

Pause	Halt unloading temporarily when stabilizing for the next time, and continue via softkey.
Done	Complete the cycle and finish the overall production with a normal balance.
Status	After pressing once, L: and the internal status of the bulk PLC is displayed in the middle.



After pressing twice, material or silo are displayed in the middle.



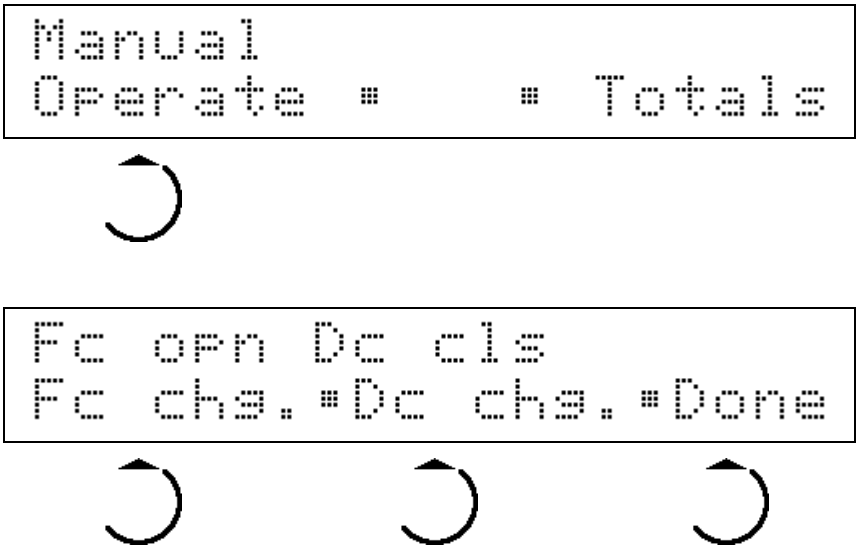
After pressing three times, the initial status is displayed again.

7 Manual operation

This operating mode is intended for exceptional system conditions. As material can be removed or added without balancing in this mode, this part of the application can be protected by setting a password during configuration.

7.1 Setting feed valves and discharge valves

Manual operation permits opening and closing of the filling (Fc: feed valve) and discharge (Dc: Discharge valve) valves via front panel entries.

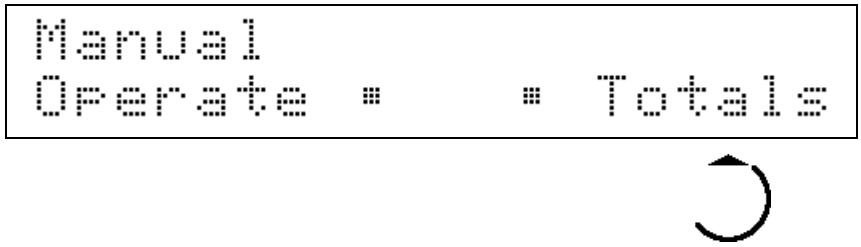


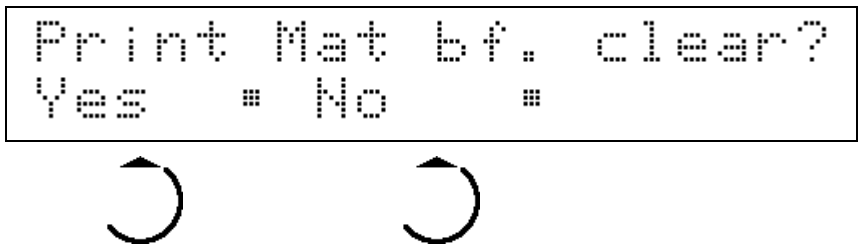
The status determined by the feedback signals is displayed in the upper text line. The softkeys can be pressed to change a valve control signal. The first line is updated at intervals of approx. 300 milliseconds.

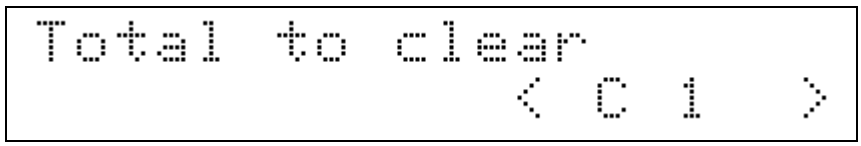
Press softkey [Done] or key Exit to complete this menue item. The valves are closed automatically.

7.2 Clear material totals

This function can be executed only, if the input signal 2.3 (see chapter 11) is activated e.g. via key switch. If it is not active, error message 'Tot. delition locked' is displayed.



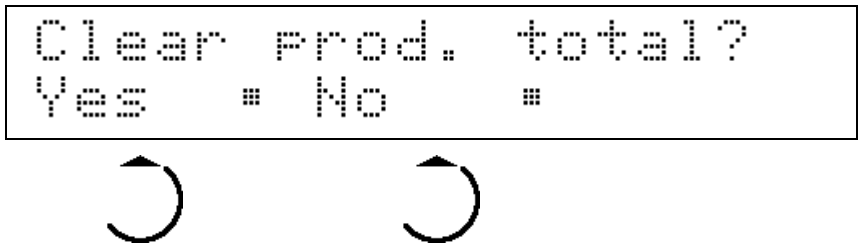




Select the counter by pressing ← or →.

Clear the selected counter by pressing OK.

‚Counter modified!' is displayed for a few seconds.



Select [Yes] or [No] to complete this menue item.

8 Options

8.1 Remote operation

PowerTool DisplayIt! can be used for complete remote operation of one or several BULK controllers using OPC via a serial interface or a TCP/IP network.

8.2 Data back-up

Back-up and restoring of databases and calibration data in the EAROM are possible by means of power tool RecoverIt.

8.3 Database access

PowerTool AccessIt! can be used for access to the databases of the BULK application via serial or TCP/IP connection. Material and customer data can be handled.

With connection to a resource planning system (WWS) activated, access to production reports is possible, i.e. production reports are available directly in MS-Access databases.

8.4 Simulation

Using a simulation tool for Windows™ 32-bit systems, simulation of the system behaviour related to digital inputs and outputs can be activated. Moreover, display of outputs and internal PLC status is possible also with the simulation de-activated e.g. during commissioning.

8.5 WWS test

For application programmers, a tool to simulate the connection to the resource planning system and the related interface documentation in PDF format are available. Please contact us for this document.

9 Error codes and description

Code	Signification
E01	The external enable input signal [EnRun] is inactive. The current cycle was interrupted, valves were closed. Activate the signal by correct process operation or correction of external error statuses and press softkeys for 'Repeat' to continue or 'Abort.' to abort the overall production.
E02	Input 'MIN sensor discharge hopper' [OutMIN] is active and signals that the discharge hopper is not empty. I:e. the weighing hopper cannot be discharged.
E03	Input 'MAX sensor discharge hopper' [OutMAX] is activated and signals that the discharge hopper is full. I.e. the discharge valves cannot be closed.
E04	Filling valve runtime error. The adjusted max. runtime from the signal for control of the filling valve until filling valve feedback signal [FbFillClap] was exceeded.
E05	Discharge valve runtime error. The max. runtime from the discharge valve control signal until discharge valve feedback [FbDisClap] adjusted during system configuration was exceeded.
E06	Silo control signal runtime error. The max. configured runtime from silo control signal until silo feedback [FbSiloClap] was exceeded.
E07	Weighing hopper overflow. Signal 'Weighing hopper sensor' [MainSens] was activated.
E08	The configured max. cycle time was exceeded
E09	Printer error – an error during access to the configured printer occurred.
E10	An invalid password was entered. The data in the Config menu are protected partly against unauthorized access by means of a password.
E11	The 'manual enable [EnManual] input signal is inactive, i.e. manual operation is not permitted.
E12	Tolerance alarm – (only during unloading) the permitted tolerance limits were exceeded. This error must be acknowledged to continue.
E13	Weighing hopper is not EMPTY, i.e. the min. weight was not exceeded during the defined time. Acknowledgement by entry is necessary.
E14	Input signal 'Min' [PreSens] is active and signals that there is 'no material in the charging hopper'. No cycle is started.
E15	Set tare in standstill was not possible (e.g. due to mechanical oscillations). If this error occurs frequently, configured waiting times should be adapted, or mechanical faults should be corrected.
E16	Determination of net weight with standstill by scale was not possible (check for mechanical problems such as oscillation or insufficient calming times) or net weight is negative (W&M violation)
E17	Input signal 'MAX sensor discharge hopper' [OutSens] is active and signals: The discharge hopper is full, discharging is not possible.
E18	The buffer memory for connection to a resource planning system is full. Check and disable the connection in the configuration, if necessary.
E19	Scale error* when filling (overload etc.)
E20	Scale error* when calculating the discharge setpoint (overload etc.)
E21	Scale error* when checking if the hopper is empty (overload etc.)

* The system repeats faulty scale operations several times. Only with repeated error, an error message is generated. Frequent scale errors should be considered as a first hint to mechanical problems of the weighing installation. As the repeated scale operations always imply an increased duration of the single cycles, frequent errors mostly indicate ineffective discharge operations.

10 Print-outs

```
Test-Company
Start: 2004-09-09-09:12:52
End:   2004-09-09-09:14:11
Set                0 kg
Material:      SILO 901
Descript: H-Schrot 4711
Cycles:       2
Total:    A        0 kg
---------------------------------
Alibi:  # 23
Customer: 0     Cust0
Order   : Order12
Truck   : Truck1
Cell    : Cell54
Best by : 31.12.2004
: id5
```

Print-out 1: Production ticket for unloading

```
Test- Company
Start: 2004-05-26-12:55:34
End:   2004-05-26-12:57:56
Set              300 kg
Material:      SILO 901
Descript: H-Schrot 4711
Cycles: 2
Total:   A       263 kg
-----------------------------
Alibi:  # 27
Customer:    2    Cust2
```

Print-out 2: Minimum production ticket

```
--------------------------------
Material
Name:                    SILO 901
Ident:                        901
Description:        H-Schrot 4711
Full Weight:               270 kg
OVS coarse:                 30 kg
Coarse/Fine:      A          0 kg
OVS Fine:         A          0 kg
OVS corr:                   Yes
OVS opt limit:              50 %
Mat in tube:      A          0 kg
Flowalrm ti:                   0
Shift total:             -898 kg
Day total:               -898 kg
Week total:              -898 kg
Month total:             -898 kg
Tol pos:          A          0 kg
Tol neg:          A          0 kg
Silo code:                   128
OVS abs Max:                30 kg
FK min Wgt:                 30 kg
```

Print-out 3: Material record print-out

```
Cycle 1   EStop Empty
 2004-05-27-01:12:32.05
 B   A       <005 kg>
 B X A       005.2 kg
Cycle 1   EStop Full
 2004-05-27-01:12:57.35
 B   A       <245 kg>
 B X A       244.8 kg
Cycle 1   EStop Dischrg
 2004-05-27-01:13:23.25
 B   A      <001 kg>
 B X A      000.6 kg
```

Print-out 4: W&M Stop print-out

11 Pin allocation

PR1713/17	Colour	Description		
Slot	Pin			
1	A1	QX 1.0 coarse		
1	A2	QX 1.1 fine		
1	A3	QX 1.2 discharge		
1	A4	QX 1.3 overshoot (silo valve)		
1	A5	QX 1.4 trouble		
1	A6	QX 1.5 production active		
1	A7	Reserve		
1	A8	Reserve		
1	B1	IX 1.0 FB discharge valve (outlet)		FB: Feedback
1	B2	IX 1.1 FB filling valve (inlet)		
1	B3	IX 1.2 FB silo valve		
1	B4	IX 1.3 charging hopper sensor		
1	B5	IX 1.4 discharging hopper sensor		
1	B6	IX 1.5 weighing hopper sensor		
1	B7	0 V/slot 1 inputs		
1	B8	0 V/slot 1 outputs		
2	A1	QX 2.0 material code 1		
2	A2	QX 2.1 material code 2		
2	A3	QX 2.2 material code 4		
2	A4	QX 2.3 material code 8		
2	A5	QX 2.4 material code 16		
2	A6	QX 2.5 material code 32		
2	A7	QX 2.6 material code 64		
2	A8	QX 2.7 material code 128		
2	B1	IX 2.0 enable manual mode	EnManual	
2	B2	IX 2.1 ext. PLC enable	EnRun	
2	B3	IX 2.2 min. discharge hopper sensor		
2	B4	IX 2.3 slot 2 input		
2	B5	Reserve		
2	B6	Reserve		
2	B7	0 V / slot 2 inputs		
2	B8	0 V / slot 2 outputs		

12 Glossary

The following terms are used in this manual:

ADC	Analog/digital converter, internal ADC (load cell signal converter)
CAL	SIL switch in the instrument (see chapter 2) for data protection
COLDstart	(COLD) All programs and tables loaded in the RAM memory are deleted.
Warm start	All data remain unchanged. Safe condition after power failure
ERASE	The calibration data are reset to default
DDE	Microsoft communication program (Dynamic Data Exchange)
OPC	Microsoft communication program (Dynamic Data Exchange)
PR1791	Additional Sartorius product: DDE server (see data sheets, available on request)
PR1792	Additional Sartorius product: OPC server(see data sheets, available on request)
Hyper Terminal	Microsoft terminal emulation (VT100) (accessory program)
EW protocol	The serial communication protocol for batching systems, version V1/ V2/ V3
Flash	Program loading (also parts)
P8001	Additional Sartorius product: power tool (see data sheets, available on request)
FlashIt	Additional Sartorius product as part of P8001: tool for loading the operating program
DisplayIt	Additional Sartorius product as part of P8001: front-panel display
RecoverIt	Additional Sartorius product as part of P8001: data back-up tool
LayoutIt	Additional Sartorius product as part of P8001: report format tool +NiceLabelExpress (SAG)
TranslateIt	Additional Sartorius product as part of P8001: tool for translation of prompt texts
AccessIt	Additional Sartorius product as part of P8001: tool for database loading/reading in *.mdb-file
PR5610/05	Additional Sartorius product:
FSD	(SKE) fullscale value
GND	Zero potential, ground or earth connection
InBatch	Wonderware batch control system
Interbus-S	A standard communication protocol
ISA S88.01	ISA standard related to Batch Control (phase control, single component batching)
IEC 61131	Standard PLC programming language for resources PLC, OPR, REC
PR1750	Additional Sartorius product: programming tool for internal PR5510 PLC to IEC61131
Profibus DP	A standard communication protocol
Recipe	Recipe (see ISA S88)
PR1740	Additional Sartorius product: recipe and report manager (see data sheets, available on request)
SPM	Internal PLC memory area (Scratch Pad Memory)
EAROM	Non-volatile special memory for calibration, configuration and licence data
RAM	Volatile working memory (with back-up battery)

12.1 Legend of symbols

Symbol		Example
	Caution: danger to life	Safety notes
	Caution: risk of damage	
	Note:	
	Action: must be done	
☑	Action: please, check, if OK	
	Already provided: no further action	

[Setup]-[Weighingpoint]-[New]	Select NEW via softkeys in the following order: Setup -> Weighingpoint -> New
< xxx >	Default settings (factory settings after ERASE)

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