

**Reliability at work**



## Operating manual

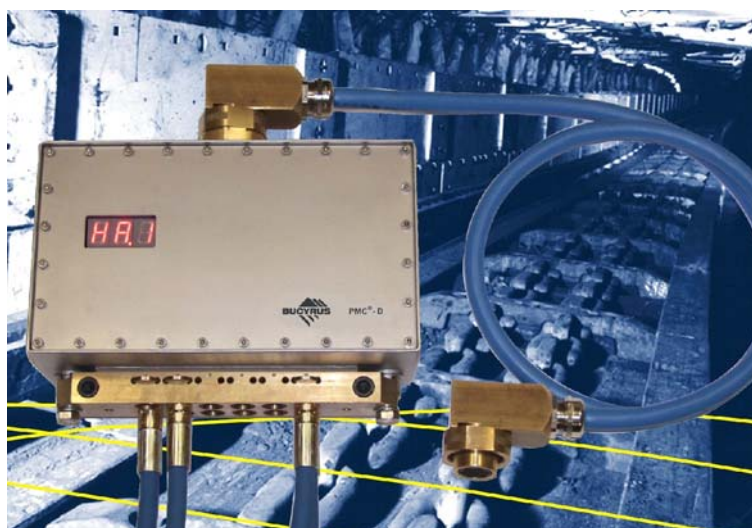
**PMC<sup>®</sup>-D**

**Drive Control System**

**Conveyor with CST gearbox**

**Doc. No.: 1999 001 009 BA 00**

Translation of the original operating manual



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# 2 Your safety





## Storage and transport

This chapter contains important information on the correct storage and safe transport of the PMC components. Observance of the instructions and manuals will increase the service life and reliability of the system components. Reading this chapter thoroughly will also help you to make your day-to-day work easier.

### Storage

#### Storing the equipment

<b>anticorrosion protection</b>	Components coated with anticorrosion protection are protected for about six months.
<b>no direct exposure to sunlight</b>	Protect the equipment from direct exposure to sunlight. Store the electrical equipment, electronic components and spare parts made of rubber or plastic, such as seals, cables and hose cables, only in closed rooms at temperatures between 15°C and 25°C.
<b>dirt and moisture</b>	Protect all equipment parts from dirt and moisture. In particular, do not remove any dummy plugs or temporary covers. Use the dummy plugs and canopies if you wish to put the equipment into storage after using it. Avoid any damage to the plug-type connections.
<b>storage</b>	<p>Never store electronic equipment outdoors.</p> <p>The computers should be checked after a storage period of five years, since the installed battery is discharged after this amount of time. It must then be replaced. The inspection and the battery replacement should be performed by Bucyrus service personnel. If the PMC component is used, the battery has a longer service life. A battery failure does not have any safety-relevant consequences.</p> <p>After a storage period of approx. two years, the system components must be checked for any resulting damage.</p> <p>Seals, hose lines and lines are subject to natural aging, even if they are stored properly. Do not continue to use these components, since malfunctions and ghost functions cannot be ruled out.</p>



#### Important!

**Make sure that incoming stock is stored separately from the old stock, notably in such a manner that computer components of the same age are stored together, to avoid conflicts between different types of programming versions.**

Make sure that display covers, keyboard protective covers and plug-type connections are not damaged during storage.



Fig. 9: PMC-D control unit with connection line



## Installing Profibus connections

The devices of the PMC Drive Control System communicate with each other via a bus system in accordance with the Profibus standard. In the connection line between the devices, two wires are required, which must be twisted together (twisted pair). This twisted pair must be maintained even in any intermediary distributors.



### Important!

**Only use twisted-pair lines for setting up Profibus connections. Other lines will lead to communication failure.**

To connect devices of the PMC Drive Control System to Profibus, special hose lines are supplied by Bucyrus, which are covered at both ends by a white shrink hose (about 10 cm long).



### Important!

**For connecting the devices to Profibus, only use the hose lines with white shrink hoses supplied by Bucyrus. Using other hose lines will lead to communication failure.**

On all devices, the connections for Profibus are labeled ST6 and ST12. It does not matter to which plug the incoming line from the previous device and the outgoing line to the next device are plugged. It is just important that a termination resistance be plugged into the free plug on both the first device and last device in the chain.



### Important!

**Terminate the Profibus line to the first and last device by plugging in a termination resistance. A missing termination resistance will lead to major communication disturbances.**



Fig. 16: System selection messages

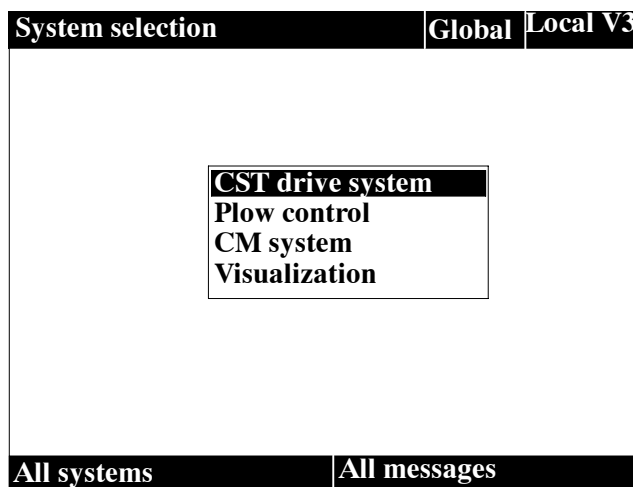
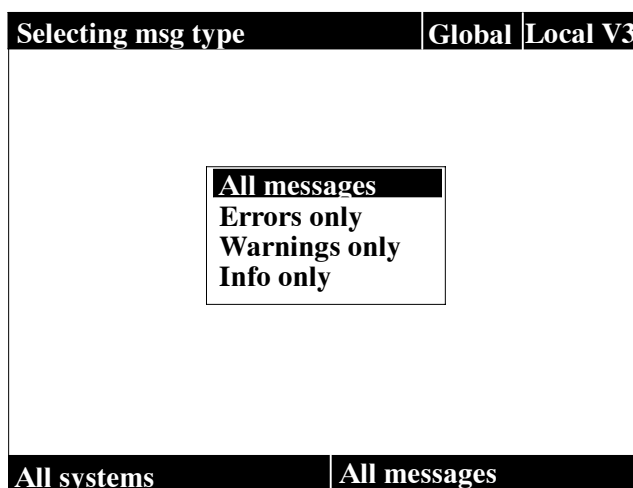


Fig. 17: Selecting the message type



The selections made on these two masks are retained in the local PMC-V unit even after exiting the display for the system messages. The current selection is displayed again in the bottom line of the masks when the system messages are activated again.

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## Global menu level, PMC Drive control

- **Component ser. no.**  
The serial numbers of the subassemblies which are installed in the unit. The following subassemblies can be displayed for the various units:
  - CPU (CPU32)  
This subassembly contains the complete computer of the units.
  - PMU (Power Management Unit Type 1)  
This subassembly provides the required voltages, carries the buffer battery for securing the parameters when switched off and limits the output currents to the external connections of the units.
  - D-IO (PMC-D I-O)  
The central subassembly of a PMC-D unit. All externally reachable inputs and outputs are integrated in this subassembly.
  - D-IO (PMC-VG I-O)  
The central subassembly of a PMC-V unit. All externally reachable inputs and outputs are integrated in this subassembly.
  - PVC (PMC-D Proportional Valve Control)  
This subassembly for actuating the valve for the pressure setting in the clutch of a CST gearbox.
  - 7-Seg (PMC® 7 Segment display)  
The display unit of a PMC-D unit.
  - VGA (PMC-VGA interface)  
The subassembly for actuating the screen unit of a PMC-V unit.
  - PCM (PMC® Profibus Com module)  
This subassembly allows communication with an external Profibus.
- **Software ID**  
The version numbers of the active software. The individual components can be exchanged on site except for the components designated CPLD.
  - Program  
The program which is run by the unit computer and defines the unit function. The date and time indicate the time this program was created.
  - FPGA1 and 2 (Field Programmable Gate Arrays)  
The hardware settings and the preprocessing of the measured values are adapted to the desired unit function using these programs.
  - CPLD (Complex Programmable Logic Device)  
Is loaded when the units are produced and sets functions which may not be modified.

**next unit / previous unit**

The next or previous unit can be switched to with the “F1” and “F2” function keys.

In the startup phase of a unit, it is checked whether the existing hardware and the FPGA programs are appropriate for the desired unit functionality. Here, non-existing as well as redundant hardware components and incorrect programs for the FPGAs lead to an error message on the local display unit and to the abort of the startup.



# Global menu level of the CST drive system

## Drive selection

A selection list is displayed in which the drive units reachable via the internal Profibus system are entered. Selecting a drive unit leads to the menu level of the individual PMC-D units.

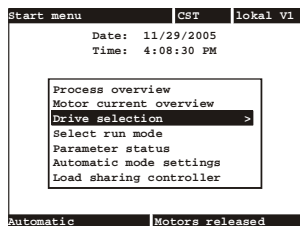
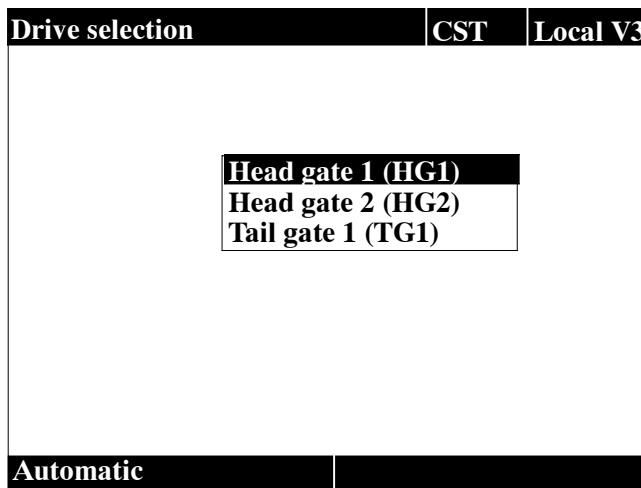


Fig. 34: Drive selection

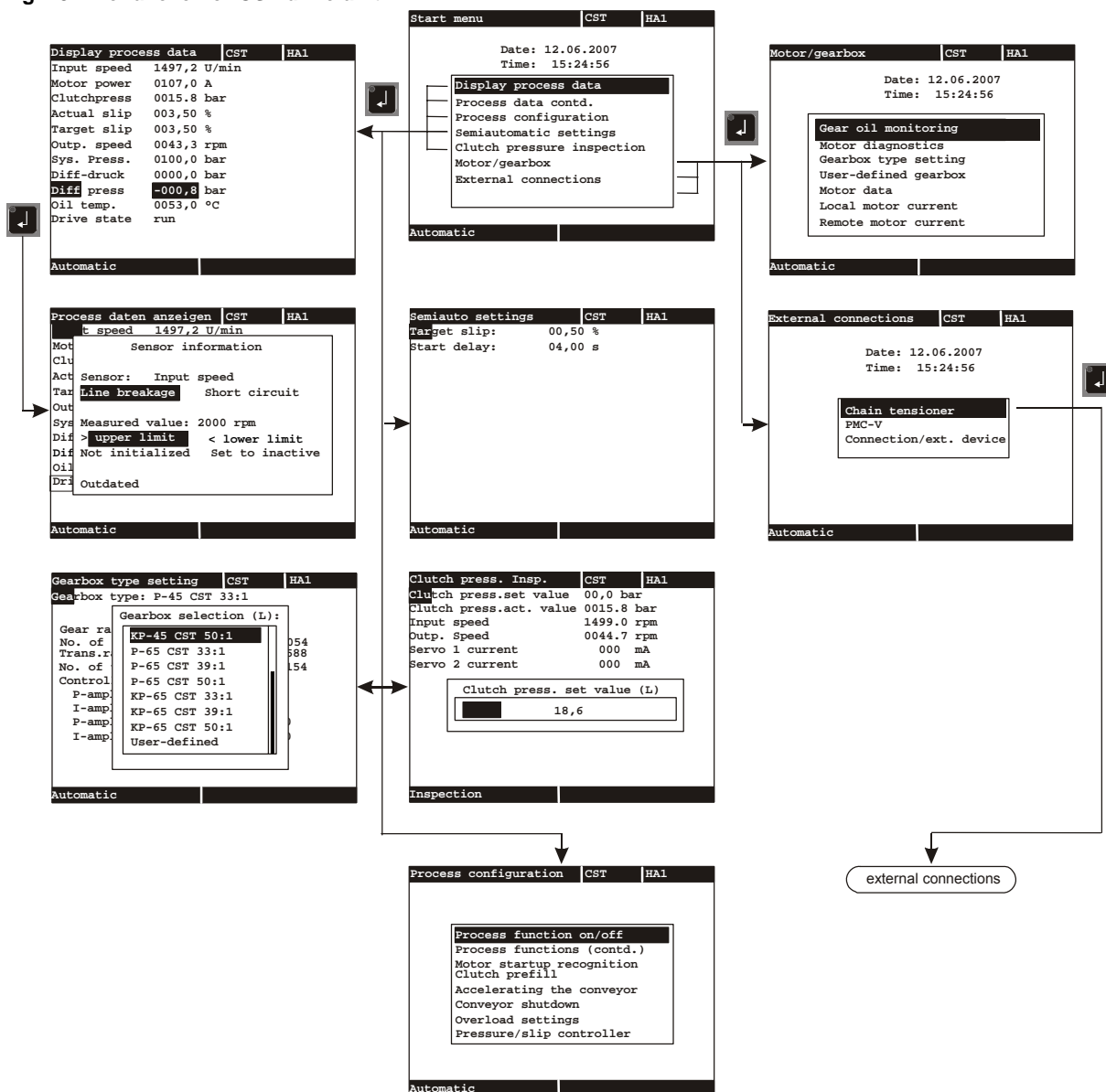


Here, functions can be activated which only affect the selected drive unit (Menu level of CST drive unit, page 5.39.)



## Menu level for CST drive unit

Fig. 43: Menu level for CST drive unit



The menu tree shown in Fig. 43 shows the screen masks which can be used to change the local settings of the selected drive unit. This menu tree can be reached from the global menu level of the CST drive system by selecting a drive unit. The name of the drive unit is displayed in the right column of the first screen line.

The start menu offers the following selection options:

- Display of the most important process parameters of the drive unit. → Display process data.
- Selection of a subordinate menu tree for setting the local control and regulation process. → Process configuration (page 5.57).
- Settings for “Semiautomatic” mode. → Semiautomatic settings (page 5.43).



Fig. 57:

Gearbox type setting	CST	HG1
<b>Gearbox type: P-45 CST 33:1</b>		
<b>Gear ratio:</b>	<b>33.353</b>	
<b>No. of teeth input meas. wheel:</b>	<b>054</b>	
<b>Trans.ratio motor/meas. wheel:</b>	<b>01.588</b>	
<b>No. of teeth output meas. wheel:</b>	<b>154</b>	
<b>Controller basic settings</b>		
<b>P-amplif. pressure ratio:</b>	<b>1000</b>	
<b>I-amplif. pressure ratio:</b>	<b>0000</b>	
<b>P-amplif. slip control:</b>	<b>07.00</b>	
<b>I-amplif slip control:</b>	<b>35.00</b>	
<b>Automatic</b>		

- Gearbox type  
The gearbox type used by the control system.
- Gear ratio  
Exact ratio of the gearbox between the input and output with a rigid clutch.
- Number of teeth, input measuring wheel  
Measuring wheel for determining the input speed.
- Trans. ratio, motor/meas. wheel  
Exact ratio between the drive shaft of the motor / gearbox and the measuring wheel for measuring the input speed.
- Number of teeth, output measuring wheel  
Measuring wheel for determining the output speed.
- Controller basic settings

Basic settings for the pressure and slip controls implemented in the PMC-D units are allocated to each gearbox type. The values set in the "Pressure/slip control" screen mask are based on these specifications (Pressure/slip control, page 5.68).

The gearbox type is set by selecting it from the list, which is displayed after pressing the "Enter" key (Fig. 58). All gearboxes with CST clutches manufactured by Bucyrus are given in this list. Furthermore, a user-defined gearbox can also be selected (User-defined gearbox, page 5.50). After selecting the used gearbox and confirming with the "Enter" key, this gearbox type is accepted by the control system. The data allocated to the gearbox is displayed in the basic mask.



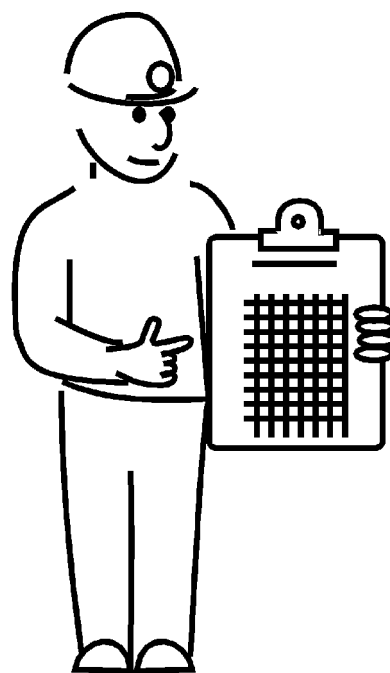
- **Monitoring**
  - **Motor overload**  
The drive motor is no longer protected from an overload by monitoring the current consumption.
  - **Conveyor blockage**  
Both methods for detecting blockage, monitoring the drive speed and the detection of a speed breakdown on the drive of the gearbox are deactivated. The chain is therefore no longer protected.
  - **Chain tensioner**  
Pre-tensioning the chain is monitored by the PMC-D unit, to which the tensioner is connected. To prevent the conveyor from being shutdown due to tensioner errors, the monitoring function can be deactivated. The signaled errors are then only rated as a warning in the CST system. These warnings continue to be displayed on the PMC-V units, but are ignored by the control and regulation process. However, the time window in which the tensioning procedure must be completed, at latest, is still taken into consideration in the startup phase of the conveyor. This waiting time is added both in "Automatic" mode as well as "Semiautomatic" mode before the startup is continued with prefilling the clutches. PMC-D units, to which no tensioner is connected, ignore the selected setting.

Fig. 70: Process functions (cont.)

Process functions 2	CST	HG1
<b>Monitoring</b>		
PVC coil 1	.	
PVC coil 2	.	
Synchronize motor enable	.	
2nd differential pressure	.	
XXXXXXXXXXXX	XXXXXXXXXXXX	

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# 6 Technical data



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