

Reliability at work



# Operating manual

chain tensioner with PMC<sup>®</sup>-R

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# 2 Your safety



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# 4 Installation





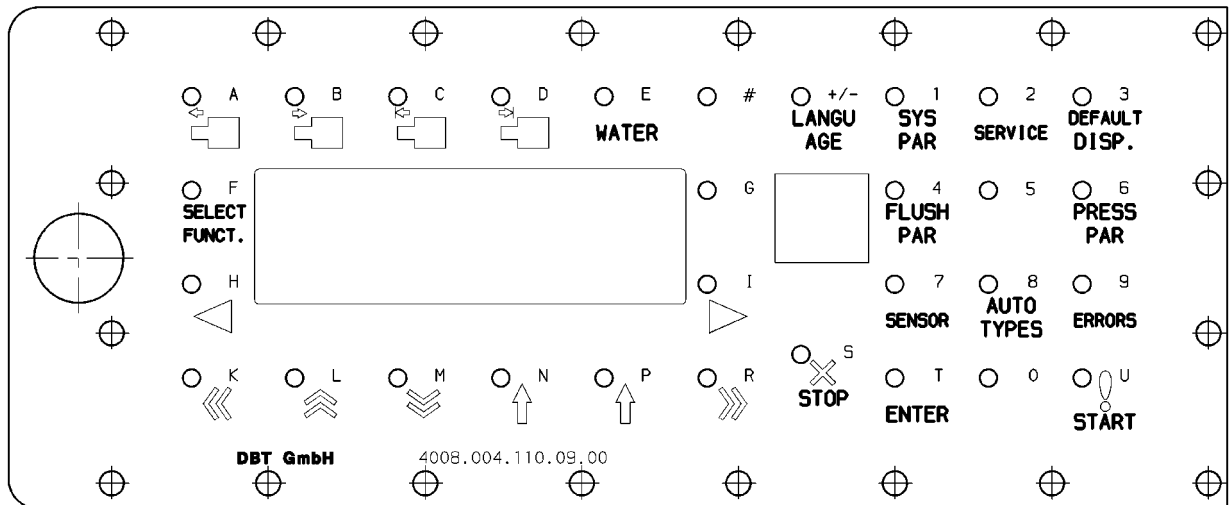
## Operation of the PMC®-R control unit

### The PMC®-R control unit; overview of the keyboard and menu functions

19 keys, a 2x22-digit alphanumeric display, a numeric keyboard with 10 keys, a local blocking switch, a local emergency shutdown switch, a warning LED and the stop pushbutton are placed at the front side of the control unit. A detailed description of the function of the individual elements follows below.

The operating panel consists of keyboard, display and LEDs.

Fig. 3: Operating panel of the PMC®-R as chain tensioning control unit



**Important!**  
Do not operate the PMC®-R until after you have first carefully studied the operating instructions!



☞ Actuate key M once in order to scroll down one menu line.

The P\_pretension parameter is reached.

In the display now is:

**P\_pretension \*100**

☞ Press key T [ENTER] in order to start the input mode.

The Pretens.press. parameter is password-protected, therefore the display now shows:

**Password: ?**

☞ Enter the password (e.g. 3333) using keys 0 to 9.

In the display now is:

**Password: ?!!!!**

☞ Actuate the key T [ENTER] to exit password entry. Now the parameter value can be changed.

In the display now is:

**P\_pretension ?**

☞ Entry of the new parameter value using keys 0 to 9 (e.g. 120).  
Display:

**P\_pretension ?120**

☞ Press T [ENTER] key to end the entry and to save the entered value.

The display now shows:

**P\_pretension \*120**

If no further key is pressed, then the display returns to the default menu column after a short period of time.



## Measurement values

Tab. 7: Measurement values

English-language display	English-language meaning	German-language display	German-language meaning
Pressure: 135 Bar	This line displays the current pressure in the tensioner cylinder.	Zyl.Druck 135 Bar	Diese Zeile zeigt den aktuellen Druck im Spannzylinder an.
Targ.press: ~~~	This line displays the calculated target pressure for the tensioner cylinder. The pressure is directly dependent on the electrical current of the face conveyor. It can in addition receive a further dependency, namely that of the location of the mining machine. The display does not show valid values until an automatic sequence is active.	Zieldruck: ~~~	Diese Zeile zeigt den errechneten Zieldruck für den Spannzylinder an. Der Druck hängt direkt vom Strom des Strebförderers ab. Er kann zusätzlich eine weitere Abhängigkeit, nämlich die vom Standort der Gewinnungsmaschine erhalten. Die Anzeige zeigt erst bei einer aktiven Automatik gültige Werte an.
Cyl.path: 315 mm	This line displays the current extension distance of the tensioner cylinder. If no sensor (reed rod) is connected, then the value ~~~ is displayed.	Zyl.Weg: 315 mm	Diese Zeile zeigt den aktuellen Ausfahrweg des Spannzylinders an. Wurde kein Sensor (Reedstab) angeschlossen zeigt sich der Wert ~~~.
Mot.current: ~~~	This line displays the transmitted motor current of the face conveyor, which is sent by the higher-level control system. The targets are only visible when the "serial link" parameter is set to 1 or 2 and the parameter comTYP is set to 1.	Motorstrom: ~~~	Diese Zeile zeigt den übertragenen Motorstrom des Strebförderers an, der von der übergeordneten Steuerung gesendet wird. Die Zeile ist nur sichtbar, wenn der Parameter "serial link" auf 1 oder 2 und der Parameter comTYP auf 1 gesetzt ist.
LWC SGNL:	This lines shows the current status of the conveyor as a series of numbers. The following texts are possible: open ok (off) prewarn is running short The line is only visible when the "serial link" parameter is set to 0 and the comTYP parameter is set to 1.	LWC SGNL:	Diese Zeile zeigt den aktuellen Status des Förderers als Zeichenkette an. Folgende Texte sind möglich: offen ok (aus) vorwarn läuft kurz Die Zeile ist nur sichtbar, wenn die Parameter "serial link" auf 0 und comTYP auf 1 stehen.



**Tab. 9: Automatic pressure system parameters Part 2**

Display	English-language meaning	German-language meaning
0 x 0 d 0	<p>This line shows the data of a structure that can be used for testing the automatic sequence. The first value represents the sequential number of the variables in the structure, the second value the content of these variables in hexadecimal representation, the third value the content of the variables in decimal form. The keys "N" and "P" are used for navigation in the structure. The meaning of the parameters is as follows:</p> <ul style="list-style-type: none"> <li>0 Extension counter</li> <li>1 Automatic sequence mode                             <ul style="list-style-type: none"> <li>0 = M_IDLE</li> <li>1 = M_TIGHT</li> <li>2 = M_SLACK</li> <li>3 = M_EXTDIFF</li> <li>4 = M_RETDIFF</li> <li>5 = M_TENSION</li> <li>6 = M_AUTO</li> </ul> </li> <li>2 internal condition of the conveyor                             <ul style="list-style-type: none"> <li>0 = conveyor at rest</li> <li>1 = conveyor is running</li> <li>3 Marker for calculation of the path differential</li> <li>4 Position of the mining machine</li> <li>5 Current value range for calculation of the target pressure                                     <ul style="list-style-type: none"> <li>0 = less than I_SWITCH0</li> <li>1 = between I_SWITCH0 and I_SWITCH1</li> <li>2 = invalid range</li> <li>3 = invalid range</li> <li>4 = greater than I_SWITCH1</li> <li>5 = invalid range</li> </ul> </li> <li>6 Differential between the weigh factors of the range</li> <li>7 Differential of the path between start of the range and the end of the range</li> <li>8 Differential between the position of the mining machine and the start of the range.</li> <li>9 Target pressure because of the conveyor current</li> <li>10 Scaling of the shield range of the position of the mining machine                                     <ul style="list-style-type: none"> <li>1 = less than shieldno w1</li> <li>2 = between shieldno w1 and shieldno w2</li> <li>3 = between shieldno w2 and shieldno w3</li> <li>4 = greater than shieldno w3</li> </ul> </li> <li>11 calculated weigh factor in %</li> <li>12 target pressure on the basis of the weigh factor (position of the mining machine)</li> <li>13 quantity of structure data</li> </ul> </li></ul>	<p>Diese Zeile zeigt die Daten einer Struktur, die zum Testen der Automatik benutzt werden kann. Der erste Wert stellt die laufende Nummer der Variablen in der Struktur dar. Der zweite Wert den Inhalt dieser Variablen in hexadezimaler Darstellung. Der dritte Wert den Inhalt der Variablen in dezimaler Form. Zur Navigation in der Struktur werden die Taste "N" und "P" benutzt. Die Bedeutung der Parameter ist folgende:</p> <ul style="list-style-type: none"> <li>0 Ausfahrzähler</li> <li>1 Mode der Automatik                             <ul style="list-style-type: none"> <li>0 = M_IDLE</li> <li>1 = M_TIGHT</li> <li>2 = M_SLACK</li> <li>3 = M_EXTDIFF</li> <li>4 = M_RETDIFF</li> <li>5 = M_TENSION</li> <li>6 = M_AUTO</li> </ul> </li> <li>2 interner Zustand des Förderers                             <ul style="list-style-type: none"> <li>0 = Förderer steht</li> <li>1 = Förderer läuft</li> <li>3 Merker zur Berechnung der Wegdifferenz</li> <li>4 Position der Gewinnungsmaschine</li> <li>5 Bereich des Stromwertes zur Berechnung des Zieldruck                                     <ul style="list-style-type: none"> <li>0 = kleiner I_SWITCH0</li> <li>1 = zwischen I_SWITCH0 und I_SWITCH1</li> <li>2 = ungültiger Bereich</li> <li>3 = ungültiger Bereich</li> <li>4 = größer I_SWITCH1</li> <li>5 = ungültiger Bereich</li> </ul> </li> <li>6 Differenz zwischen den Wichtungsfaktoren des Bereichs</li> <li>7 Differenz des Weges zwischen Bereichsanfang und Bereichsende</li> <li>8 Differenz zwischen der Position der Gewinnungsmaschine und dem Bereichsanfang.</li> <li>9 Zieldruck aufgrund des Fördererstroms</li> <li>10 Skalierung des Schildbereiches der Position der Gewinnungsmaschine                                     <ul style="list-style-type: none"> <li>1 = kleiner shieldno w1</li> <li>2 = zwischen shieldno w1 and shieldno w2</li> <li>3 = zwischen shieldno w2 and shieldno w3</li> <li>4 = grösser shieldno w3</li> </ul> </li> <li>11 berechneter Wichtungsfaktor in %</li> <li>12 Zieldruck aufgrund der Wichtungsfaktoren (Position der Gewinnungsmaschine)</li> <li>13 Anzahl der Strukturdaten</li> </ul> </li></ul>



PI-T 0 0 0 0	This line displays the current reception buffer. The description of the individual values corresponds to the previous line. The complete telegram can however be viewed here, even if it consists of more than 20 words. One can also modify the adjustment parameter with the keys N and P.	PI-T 0 0 0 0	Diese Zeile zeigt den aktuellen Empfangspuffer. Die Beschreibung der einzelnen Werte entspricht der vorherigen Zeile. Hier kann jedoch das komplette Telegramm angeschaut werden, auch wenn es aus mehr als 20 Worten besteht. Die Stellungsparameter kann man ebenfalls über die Tasten N und P verändern.
PO-T 0 0 0 0	This line displays the current transmission buffer. The description of the individual values corresponds to the previous line. One can also modify the adjustment parameter with the keys N and P.	PO-T 0 0 0 0	Diese Zeile zeigt den aktuellen Sendepuffer. Die Beschreibung der einzelnen Werte entspricht der vorherigen Zeile. Die Stellungsparameter kann man ebenfalls über die Tasten N und P verändern.
AS9 0 0 0 0	This column displays the status of the serial communication at Port C2 (ACD). The significance of the individual values corresponds to that in the DUST description	AS9 0 0 0 0	Diese Spalte zeigt den Status der seriellen Kommunikation an Port C2 (ACD). Die Bedeutung der einzelnen Werte entspricht der in der DUST-Beschreibung
AI-ID-No. *20	See DUST description	AI-ID-No. *20	Siehe DUST-Beschreibung
AI-T 0 0 0 0	See DUST description	AI-T 0 0 0 0	Siehe DUST-Beschreibung
AO-T 0 0 0 0	See DUST description	AO-T 0 0 0 0	Siehe DUST-Beschreibung
TA1 R: 0T: 6		TA1 R: 0T: 6	
TF1 R: 0T: 6		TF1 R: 0T: 6	
A1 0 0 0		A1 0 0 0	
F1 0 0 0		F1 0 0 0	
R_INT 0 0		R_INT 0 0	
E_A1F1 0 0		E_A1F1 0 0	
E_RDX_INT 0		E_RDX_INT 0	
E_HIL 0 0		E_HIL 0 0	
E_HIR 0 0		E_HIR 0 0	
Cl.hdlc (N)		Cl.hdlc (N)	
Cl.hdlc_all (N)		Cl.hdlc_all (N)	
Copy.HDLCINF (N)		Copy.HDLCINF (N)	
A1S 0 0 0		A1S 0 0 0	
F1S 0 0 0		F1S 0 0 0	
1<F 2 A> 0EQ:2 NEQ: 0		1<F 2 A> 0EQ:2 NEQ: 0	
\FlashBooter-R_00_05_03.d btPMC		\FlashBooter-R_00_05_03.d btPMC	
20/04/05 17:07 BOOTERCRC: e963		20/04/05 17:07 BOOTERCRC: e963	
\universell_01_01_00.dbtpm c		\TwentyMile_01_01_02.dbtpm c	
15/12/05 11:20 APPL.CRC:d15a		15/12/05 11:20 APPL.CRC:d15a	
Date: 15/12/2002 Time: 12:15:30		Date: 15/12/2002 Time: 12:15:30	



## Technical data

### The PMC<sup>®</sup>-R control system

Every shield is equipped with a PMC<sup>®</sup>-R - Shield Control Unit (SCU), which is the heart of the electrohydraulic control system. The single control system acquires measurement values such as pressure, movement and switch settings in its own shield. The PMC<sup>®</sup>-R calculates from this data the required commands for the single shield- and automatic sequence functions, and allows them to be executed by the connected hydraulics valves. The PMC<sup>®</sup>-R can control and display all functions of a shield and is, simultaneously, the interface between operator and machine. The PMC<sup>®</sup>-R system can, based on a reliable network, control all individual shield functions. As an interactive system, it allows the user to execute single shield functions as well as automatic sequence functions. Important process values are continuously displayed as an acknowledgement for the operator.

Fig. 11: Front view of the PMC<sup>®</sup>-R



### Design suitable for mining

The PMC<sup>®</sup>-R control device is constructed with a housing made from stainless steel, which is hermetically sealed due to its design. The PMC<sup>®</sup>-R housing is produced with no seam with a flange upon which the keyboard bottom plate is mounted. Furthermore, it contains the emergency stop and shield supports-blocked unit. An O-ring seal under the flange provides for consistency against water up to 3 bar external pressure. The plug side for the connection between I/O unit and electronic accessories is secured three times with the O-ring. The robust housing unit promises additional protection against external influences and a long service life with less maintenance.



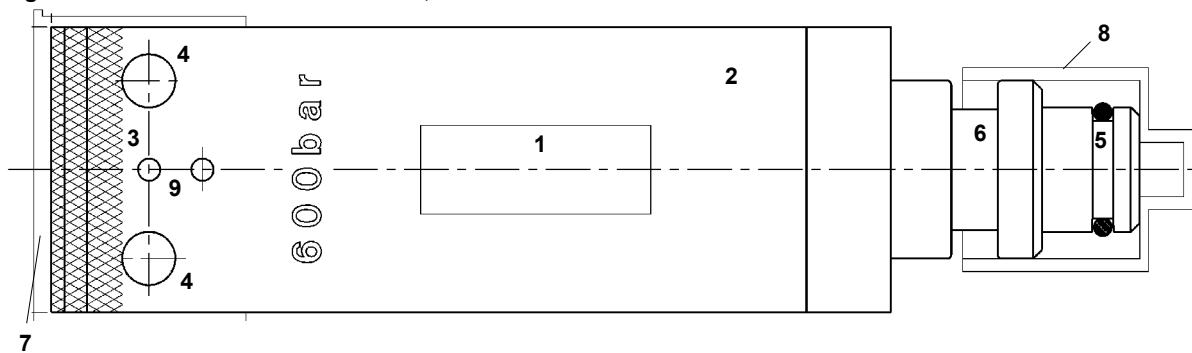
## Sensors

A variety of sensors are available in order to utilise all of the possibilities of the PMC<sup>®</sup>-R individual controls. Analogue sensors exist for pressure measurement and step distance measurement.

### Pressure sensor

A pressure sensor with a very low current consumption was developed for the PMC<sup>®</sup>-R system. Basis of the pressure sensor is a "Wheatstone" measuring bridge which is attached to a ceramic membrane. A measurement-value booster, which generates a measuring voltage from 0.5 to 4.5 V for a measuring range from 0 to 600 bar, is installed in the pressure sensor housing. The hydraulic side of the pressure sensor (plug-type connector DN10) is directly connected with the measuring body of the sensor. The electrical side has an SKK24 coupler for the electrical connection between the PMC<sup>®</sup>-R and cylinder - using SKK24 hose cables or lines. For reasons of safety in the face of mechanical loads, these cable connections should be made with hose cable. The measured values of the sensor allow simple measurements such as for shield setting, as well as special automation tasks such as automatic readjustment sequences, shield pulling under roof contact or adjustable setting pressure, etc.

Fig. 21: PRESSURE SENSOR IPS 600; ATEX



- 1 Name plate, if not lasered
- 2 Position of the lasered name plate details
- 3 SKK24 coupler
- 4 Bore holes for SKK24 clamps
- 5 Sealing groove on the hydraulics with O-ring
- 6 Groove for hydraulic clamp
- 7 Protective cap SKK24-side
- 8 Protective cap on the hydraulics
- 9 Bore holes for guide pins

Fig. 22: Illustration of the pressure sensor



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