Toshniwal Industries Pvt. Ltd.
Experience • Expertise
MG Toshniwal Group

Ball Mill Level measurement

(Electronic Ear)

Product Overview

The electronic ear system is an intelligent digital mill sound measuring instrument. It is used for monitoring the material level in the ball mill by the grinding ball hitting the ball mill lining and the material in the mill.Based on the output signal from the electric ear system, the mill operator will be able to control the material level in the ball mill on a constant level.

The electronic ear can sense the noise of the mill. This noise varies by product and the filling level of the mill.

The electronic ear system uses a microphone at the mill inlet, at the grinding ball impact point and as close as possible to the mill shell.

The microphone ear converts the mill shell sound into an electrical signal.The output signal from the microphone ear corresponds to the material filling degree in the ball mill. This signal could be connected to the control system in the process plant for displaying, recording and further treatment. For example , it could be used for supervision in connection with automatic control of the mill feed.

Technical Specifications

Parameter	Description
Measurement Range	0~100 db and 0~100%
Detect head impedence	About 600
Frequency Range	20~20,000Hz
Display of detect head and display panel	<100m
Output signal (according to sound level)	4-20mA
Tolerance	_0.1db
Workable time	Continuous 24 hrs per day
Environment temperature	-10~+55C
Environment humidity	<85%
Power	220V AC(-10~+10%), 50Hz or 60Hz
Weight	About 1Kg

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MILL SOUND MEASURING INSTRUMENT

(Electronic Ear)

The Electronic Ear System is an Intelligent digital mill sound Measuring instrument. It is used for monitoring the material level in the ball mill by measuring the sound caused by the grinding ball hitting the mill lining and the material in the mill. Based on the output signal from the electric ear System, the mill operator will be able to control the material level in the ball mill on a constant level.

The Elements Ear can Sense the noise of the mill. this noise varies by product and the filling level of the mill. The electronic ear system uses a microphone at the mill inlet, at the grinding ball impact point and as close as possible to the mill shell.

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Tolerance	_0.1db
Workable time	continuous, 24h per day
Environment temperature	-10~+55 C
Environment humidity	<85%
Power	220V AC (-10~+10%),50Hz or 60Hz
Weight	About 1kg

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Cat. No. 104029206
PAT. PEND

粉砕機の増産，省エネ，省力，品質向上と異状の監視，警報用

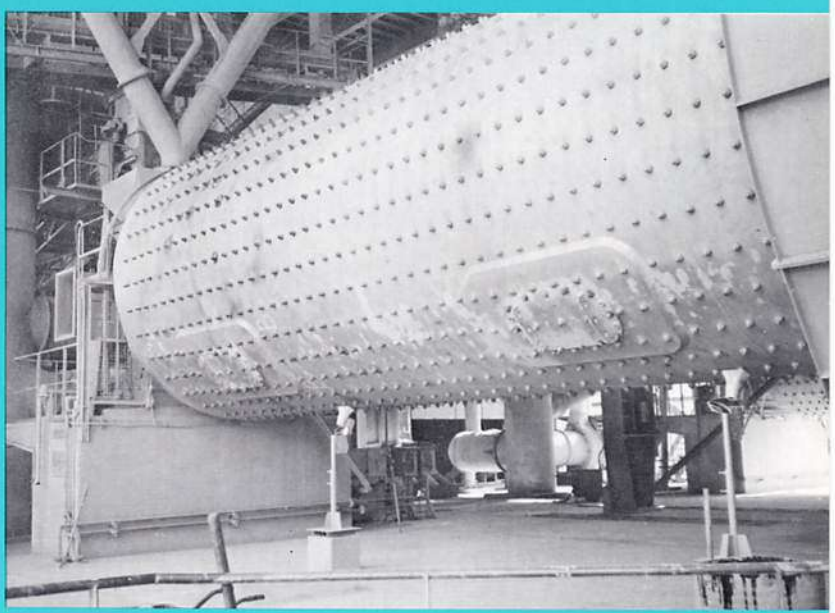
ミルコン

ミルコンは各種の粉砕機を効率よく運転し，高品質の製品を生産するためのもので，ファインセラミックス用ボールミルから，セメント用大型粉砕機にいたるまで，幅広く利用することができます。

PRODUCTION INCREASE, ENERGY REDUCTION, QUALITY IMPROVEMENT, AND TROUBLE DETECTION IN GRINDING PROCESS

MILLCOM

MILLCOM is widely used for the efficient operation and increased production of various types of grinding machines; from small ball mills for fine ceramics to huge grinders for cement industry.



作業者の耳▼

- 原料投入流量決定
- 異状監視

Operator's Ears ▼

- Determination of raw material input flow rate
- Detection of abnormal operations

自動制御方式

マイクロホン
電力計
インパクトライン
調節計
フィーダー
▶
- 原料投入流量の自動制御
- 異状の自動監視

作業者は，原料の性状変化に常に注目し，調節計の設定値を手動で調整することが必要。

Automatic Control System

Microphone
Wattmeter
Impactline
Controller
Feeder
▶
- Automatic control of raw material input flow rate
- Automatic detection of abnormal operations

Operators are required to watch the changes in raw material characteristics at all times, and adjust manually the setting points of controllers.

ミルコン

マイクロホン
電力計
インパクトライン
マイコンライン
フィーダー
▶
- 原料の性状に最適な設定値を自動選定
- 原料投入流量の自動制御
- 異状の自動監視

完全な自動化，最高の増産，省エネ，省力等の達成と品質の向上，安定。

MILLCOM

Microphone
Wattmeter
Impactline
Micon-line
Feeder
▶
- Automatic selection of optimum setting point of Micon-line for the raw material characteristics.
- Automatic control of raw material input flow rate.
- Automatic detection of abnormal operations.

Realization of complete automation, increased production, reduced energy and man-power requirements, and also improved and stabilized quality.

sankyo Piotech

ミルコンの特長と効果　SPECIAL FEATURES AND EFFECTS

1. 負荷変動の確実な検出

空打ちあるいはオーバーロードなど，内部の負荷状況を検出し，警報を発信します。これによって，原料の投入流量を手動で増減します。このための最も簡単なモデルはS型です。

2. 異状の早期，適確な検出

詰まり，ボールのコーティング等の異状発生を検出します。これを原料の緊急停止に利用します。S型がこの最も簡単なモデルです。

3. 増　産

原料の粒度，被粉砕性あるいは温度などにより，原料の最適投入流量は変化します。マイクロコンピュータを内蔵したマイコンラインは，常時，原料投入流量をこの最適値になるよう自動制御します。これによって生産が増加します。このための最も簡単なモデルはSM型です。

4. 省エネルギー

増産と同時に，次ページの写真でわかるように，バケットエレベータの動力や，セパレータからのリターン量が安定します。このため，粉砕機および粉砕システム全体の電力が節約されます。モデルはSM型またはSFM型が最も簡単なモデルです。

5. 製品品質の向上と安定

適正負荷が維持されるため，製品の粉末度の変化幅は，より小さくなります。同時に品質の安定化が達成されます。モデルはSM型またはSFM型が最も簡単なモデルです。

6. 完全無人運転

原料の最適投入流量は自動的に維持されます。同時に各種の警報発信も行われます。したがって完全な無人運転が達成されます。SM型以上の各種モデルが利用できます。

1. Reliable detection of load variations

The loading conditions in the grinder interior, such as under-loading, over-loading, etc. are detected and alarm is sounded when abnormal operation is detected. By the alarm, the raw material input flow rate is controlled manually. The simplest model available for this function is Model S.

2. Early and dependable detection of abnormal operations

Such abnormal operations as clogging, coated grinding balls, etc., are detected for emergency stop of raw material input flow. The simplest model available for this function is Model S.

3. Increased production

The optimum raw material input flow changes depending on the grains, grindability, temperature, etc. of the raw material. Micon-line, housing a micro-computer, controls automatically and constantly to keep the optimum raw material input flow rate. This realizes increased production. The simplest model available for this function is Model SM.

4. Reduced energy requirement

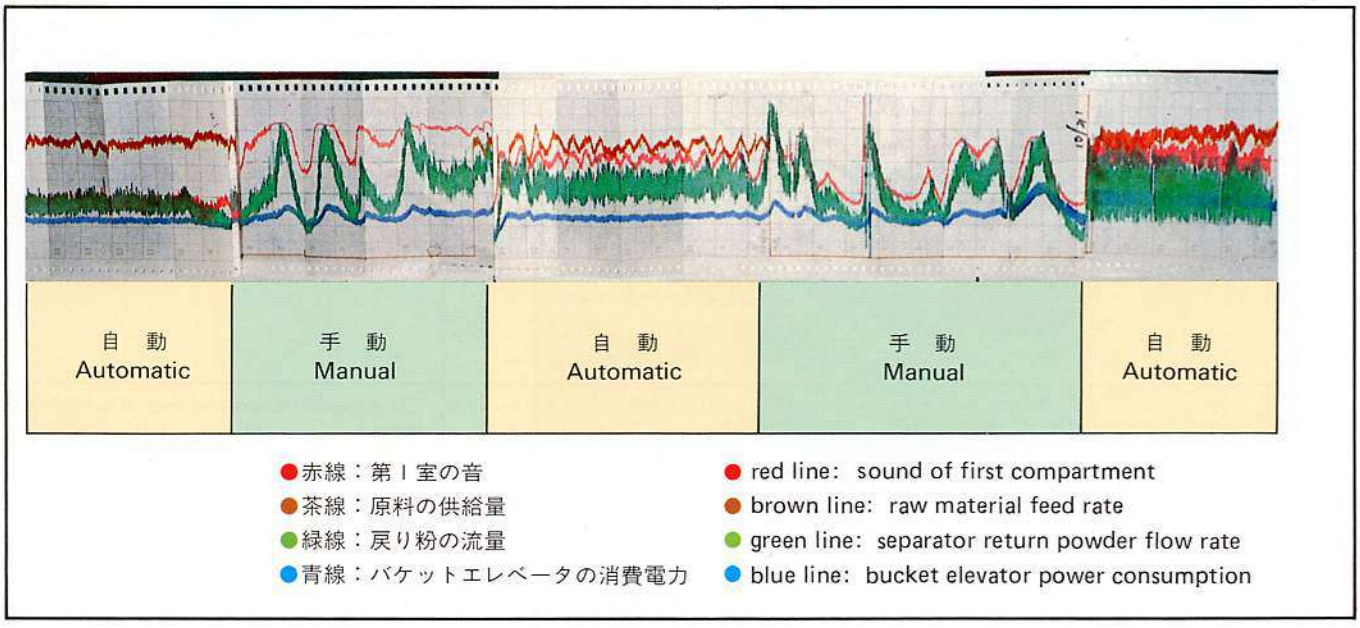
Along with an increased production, as shown in the photographs on next page, the bucket elevator power consumption and the flow rate of return powder from the separator are stabilized. This makes it possible to save the energy requirement of the grinder and the grinding system as a whole. The simplest model available for this function is Model SM or Model SFM.

5. Improved and stabilized product quality

Because the grinding system load is kept at the optimum value, the product grain variations are minimized, thus realizing stabilized product quality. The simplest model available for this function is Model SM or Model SFM.

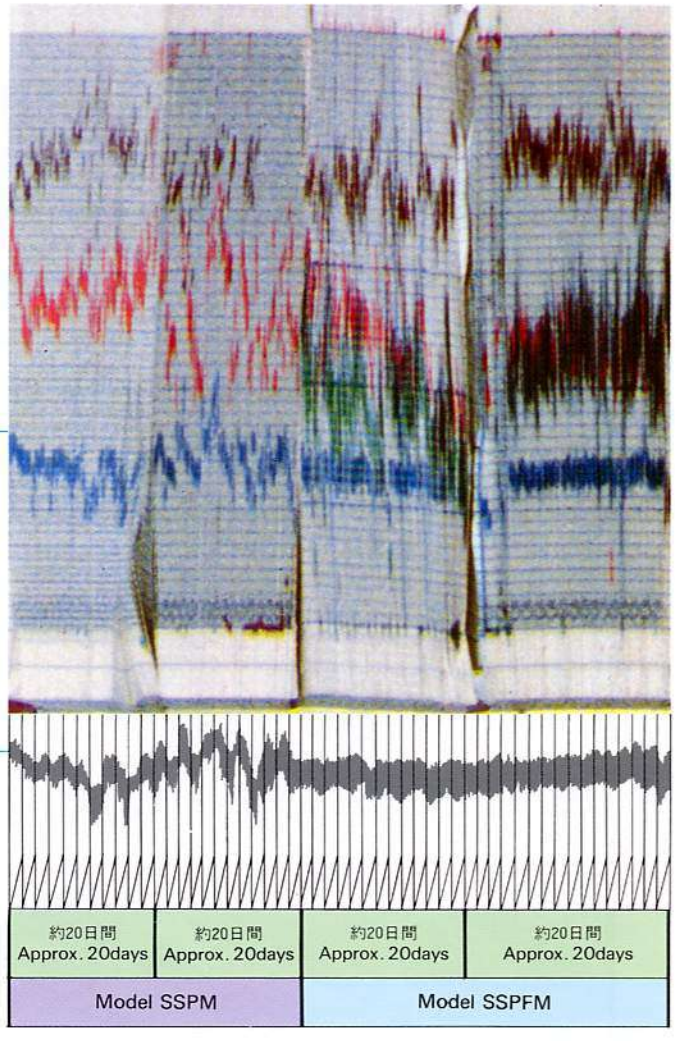
6. Complete operator-less operation

Raw material input flow rate is automatically maintained at the optimum value, and various alarms are sounded and displayed, which realizes complete operator-less operation. This function is available for models above Model SM.



セメント用仕上ミルを，ミルコンSSPFM型により自動運転した場合と，手動運転の場合の結果を示しています。自動運転の場合，バケットエレベータの電力および戻り粉の流量が安定しているのがわかります。

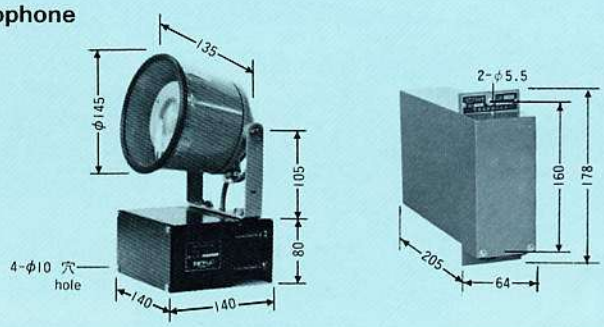
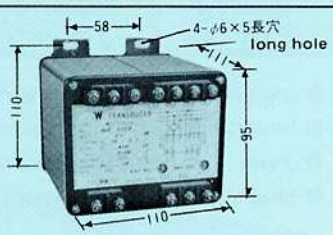
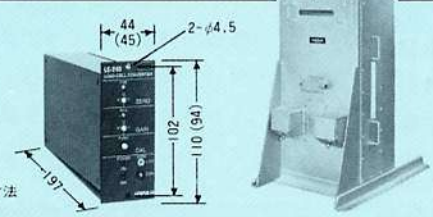
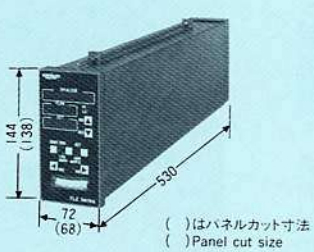
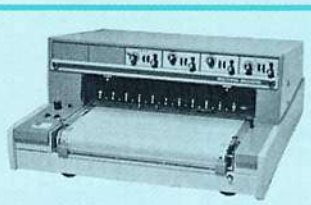
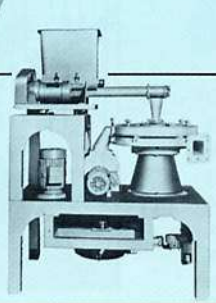
The photograph indicates the results of operating a finishing mill for cement plant manually and automatically using a MILLCOM Model SSPFM. The photograph for automatic operation shows that the power consumption of bucket elevator and the flow rate of return powder from separator are stabilized.



写真は，セメント用仕上ミルの自動制御結果の記録で，左半分がSSPM型，右半分がSSPFM型によって制御したものです。記録紙は約20日間ずつ折りたたんだ状態です。戻り粉の流量も計測するSSPFM型のほうが，バケットエレベータの消費電力がより安定していることがよくわかります。

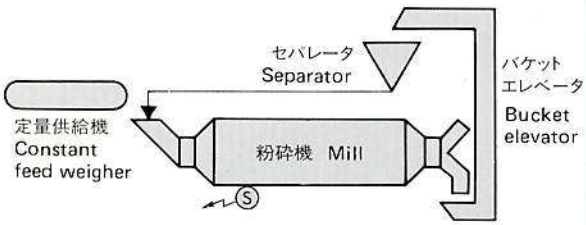
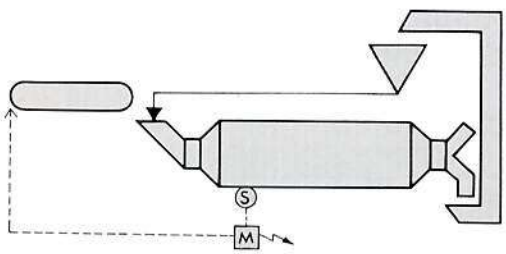
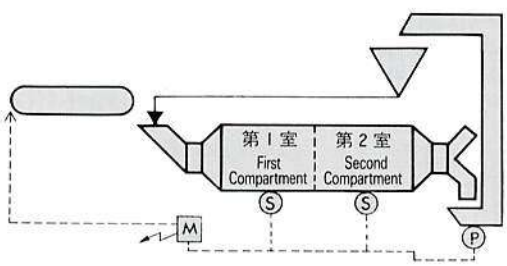
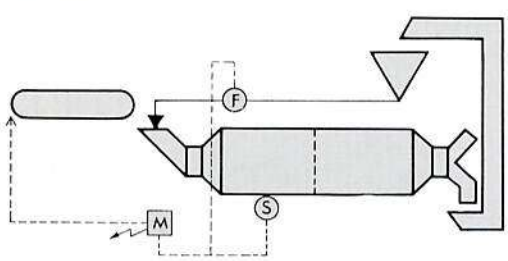
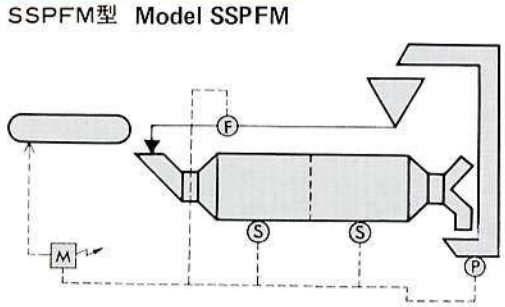
The photograph shows the records of automatic operation of finishing mill for cement plant; the left half is the case of Model SSPM, and the right half is the case of Model SSPFM. One fold of the recording paper is about a 20-day operation. It is easy to notice that the operation by Model SSPFM, capable of measuring the flow rate of separator return powder, shows stabler condition for the bucket elevator power consumption.

ミルコンの構成要素 COMPONENT ELEMENTS OF MILLCOM

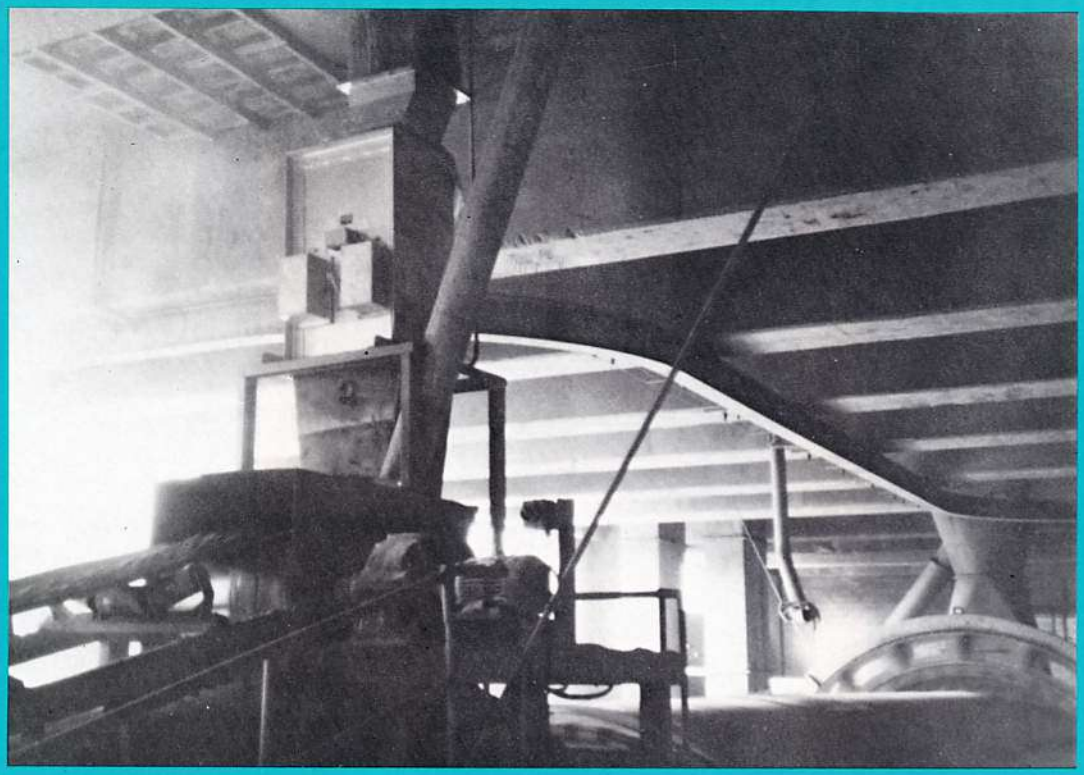
	外　形 General View and Dimensions	記号 Symbol	使用目的 Application	
検出部 Sensor	マイクロホン Microphone 	S	粉砕機の粉砕音を検出。	音響変換器はマイクロホンで検出した音のうち，指定周波数成分のみを選択増幅し，同時に詰まり，コーティング，空打ちあるいはその他の異状現象の警報を発信します。
		So	粉砕機の周囲の雑音を検出。	
	電力計 Wattmeter 	P	粉砕機出口のバケットエレベータ等の消費電力を検出。	
	インパクトライン流量計 Impactline Flow Meter 	F	セパレータからの戻り粉の流量を検出。	
調節部 Controller	マイコンライン Micon-Line 	M	各検出部の出力信号を入力信号とし，粉砕機の生産量を最大に維持するように，内蔵のマイクロコンピュータを使用して，供給機のセットポイントを自動的に選定し，操作信号および警報を発します。	
操作部 Actuator	原料定量供給機 Constant Feeder of Raw Materials	B	マイコンラインの操作信号に従い，粉砕機へ原料を定量供給します。既設の定量供給機でも，同様の機能があれば使用できます。	
その他の機器 Others	記録計 Recorder 	Re	試運転時に，各検出部およびマイコンラインの出力信号の記録を必要とします。また常設すれば，運転経過の記録を取ることができ，合理化等に役立ちます。	
	ターボパウサイザ Turbo Powsizer 	TP	製品の粒度(3μmまで)をオンラインで計測します。さらに製品の粉末度を自動制御することができます。ミルコンと併用で使用すれば増産に役立ちます。	

		配　線 Wiring	発　信 Signal Generation
Detection of grinding sound from the grinder Detection of noise from the surrounding of grinder	Only the specified frequency component from the noise detected by the microphone is amplified selectively by audio signal converter. The converter gives out alarms indicating occurrence of clogging, balls being covered with material, the phenomenon of balls hitting directly the inside surface of the grinder, and other abnormal operating conditions.	マイクロホン本体と音響変換器間は専用ケーブル（2芯シールド）。最大距離300m。 電源100V，50/60Hz，15VA，2芯ケーブル。 Exclusive-purpose cable (2-core, shielded) between microphone proper and audio signal converter. Maximum distance 300m. Power source 100V, 50/60Hz, 15VA, 2-core cable.	Hi-Lo警報用トランジスタ出力（設定任意）。 Transistor output for Hi-Lo alarm. (setting optional).
Detection of power consumption of bucket elevator at the grinder discharge side.		消費電力計とCT間は各2芯ケーブル，PT間は3芯ケーブルで接続。なるべく接近して設置。 電源100V，50/60Hz，1.5VA，2芯ケーブル。 Connection of wattmeter and CT with 2-core cable, and wattmeter and PT with 3-core cable, as nearer as possible. Power source 100V, 50/60Hz, 1.5VA, 2-core cable.	4-20mADC。 4～20mA DC.
Detection of flow rate of return powder from separator.		発信器と前置増幅器間は専用ケーブル（8芯シールド）。最大距離150m。 電源100V，50/60Hz，25VA，2芯ケーブル。 Exclusive-purpose cable (8-core, shielded) between transmitter and preamplifier. Maximum distance 150m. Power source 100V, 50/60Hz, 25VA, 2-core cable.	4-20mADC。 4～20mA DC.
Output signals from the various detecting points are used as input signals to the Micon-line so as to maintain the maximum production rate of grinder by selecting automatically the setting point of Micon-line. And Micon-line gives out operation signal to the constant feed weigher for material and the alarms.		入力信号1点当り2本（1.25mm²）。最大入力信号5点。CFWとは2芯ケーブルで接続。各最大距離300m。 電源100V，50/60Hz，25VA，2芯ケーブル。 Two cables (1.25mm²) for each input signal point. Connection with constant feed weigher by means of 2-core cable. Maximum distance respectively 300m. Power source 100V, 50/60Hz, 25VA, 2-core cable.	操作出力1点（4-20mADC）。警報用トランジスタ出力（Hi-Lo）4点。表示は各入力信号の計算結果値（4桁），セットポイント値（4桁），操作出力サンプリング値（4桁）2点，および操作出力（アナログ）1点。 One point for control signal output (4～20mA DC). Four points for transistor output (Hi-Lo) for alarm display. Display of calculated result of input signals (4-digit display), setting point values (4-digit display) at two points, and control signal output (analog) at one point.
In proportion to the operation signal of Micon-line, the constant feed weigher feeds material into the grinder. The existing feeder can be applied when it has the same flow control mechanism.			
During the test operation, a recorder is required for the output signals from various detecting points and Micon-line. When this recorder is installed permanently, it can record various operating conditions, and give data for rationalization of operation.			
Particle sizes up to 3 μm of the finished product can be measured on-line. The fineness of the finished product can be automatically controlled. Production can be increased when MILLCOM is used in combination with Turbo Powsizer.			

ミルコンの機能選択 SELECTION OF FUNCTION OF MILLCOM

型　式 Model	異状警報 Disorder Alarm	監視および測定 Monitoring And Measuring
S型　Model S 	●粉砕機の異状 ● Disorderly conditions of grinder	●粉砕機内の負荷 ● Load in grinder
SM型　Model SM 	●粉砕機の異状 ● Disorderly conditions of grinder	●粉砕機内の負荷 ● Load in grinder
SSPM型　Model SSPM 	●第 I 室の異状 ●第 2 室の異状 ●バケットエレベータの異状 ● Disorder at first compartment ● Disorder at second compartment ● Disorder at bucket elevator	●第 I 室と第 2 室の負荷 ●バケットエレベータの消費電力 (粉砕機の排出流量) ● Load in first and second compartments ● Bucket elevator power consumption (discharge flow rate of grinder)
SFM型　Model SFM 	●第 I 室の異状 ●戻り粉の異状 ● Disorder at first compartment ● Disorder at return powder	●第 I 室の負荷 ●戻り粉の流量 ● Load in first compartment ● Return powder flow rate
SSPFM型　Model SSPFM 	●第 I 室の異状 ●第 2 室の異状 ●バケットエレベータの異状 ●戻り粉の異状 ● Disorder at first compartment ● Disorder at second compartment ● Disorder at bucket elevator ● Disorder at return powder	●第 I 室と第 2 室の負荷 ●バケットエレベータの消費電力 (粉砕機の排出流量) ●戻り粉の流量 ● Load in first and second compartments ● Bucket elevator power consumption (discharge flow rate of grinder) ● Return powder flow rate

原料投入 Raw Material Charging	効　果 Effect	適　用 Application
●手動 ● Manual	●粉砕機の適正負荷運転 ●異状警報と事故防止 ● Optimum load operation of grinder ● Disorder alarm and prevention of trouble	ファインセラミックス用などの小型ボールミルより大型ミルにいたるまで，異状監視と適正運転のために使用。 Disorder detection and optimum operating condition of small ball mills for fine ceramics up to large mills.
●自動 ●最適制御 ● Automatic ● Optimum control	●粉砕機の適正負荷と安定運転 ●増産，省エネ，省力 ●製品粉末度の安定 ●異状警報と事故防止 ● Optimum loading and stable operation of grinder ● Increased production, power saving and manpower saving ● Increased stabilization of product fineness ● Disorder alarm and trouble prevention	小型ボールミルよりセメント用大型原料ミルおよび仕上ミルにいたるまで使用。簡易自動運転と異状の監視および事故防止。 Applicable from small ball mills to large raw mill and finishing mill for cement industry. Regular automatic operation, detection of disorder, and prevention of troubles.
●自動 ●最適制御 ● Automatic ● Optimum control		
●自動 ●最適制御 ● Automatic ● Optimum control	●粉砕機のより適正負荷と安定運転 ●バケットエレベータの電力および戻り粉流量のより安定化 ●より増産，省エネ，省力 ●製品粉末度のより安定化 ●異状警報と事故防止 ●以上の効果はSSPFM型のほうがSSFM型よりも大きい。 ● Better loading and stabilized operation of grinder ● Better stabilization of bucket elevator power consumption and return powder flow rate ● Increased production, power saving and manpower saving ● Increased stabilization of product fineness ● Disorder alarm and trouble prevention ● Better results are expected from Model SSPFM than Model SSFM.	各種ボールミルなどの高度の自動運転用。 High grade automatic operation of various types of ball mills.
●自動 ●最適制御 ● Automatic ● Optimum control		



写真は，セパレータからの戻り粉の流量を検出するインパクトライン流量計ILS型発信器です。

Photograph shows a transmitter of Impactline flow meter, Model ILS, to detect the flow rate of return powder from separator.

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