# CFM-MX10N
# CFM-MX20N

Version 1.4.0
OPERATION MANUAL

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# 1 Safety Regulations

Please observe the following information:

- Knowledge of the basic safety notes and safety regulations is a prerequisite for safe and trouble-free operation of this system.
- This instruction manual contains the most important notes for operation of the system in accordance with safety requirements.
- This instruction manual and especially the safety notes contained herein must be observed by all the persons working with the system.
- In addition, all the rules and regulations for accident prevention and environmental protection applicable at the respective location must be strictly observed.

## Non-observance are a safety risk!

Our “general sales and supply conditions” always apply as these are available to the user. Any claims for warranty or liability in case of personal injury or property damage are excluded, if they can be traced back to one or several of the following causes.

- The equipment was not used according to the intended purpose.
- Improper installation, commissioning, operation, and maintenance of the equipment.
- Operation of the equipment with defective safety devices or with improperly mounted or non-functional safety and protection devices.
- Non-observance of the information in the operating instructions concerning installation, commissioning, operation and maintenance of the equipment.
- Unauthorized modifications of the equipment.
- Repair work performed improperly (no original spare parts) by unauthorized personnel.
- Events caused by the effect of foreign bodies and force majeure.

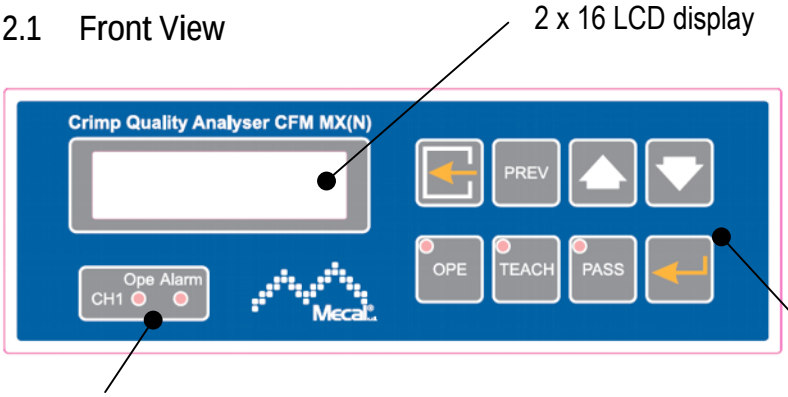
## Important!

Use according to the intendend purpose also includes:

- Observance of all the information from the operating instructions
- Observance and performance of all inspection and maintenance work.

# 2 View

## 2.1 Front View



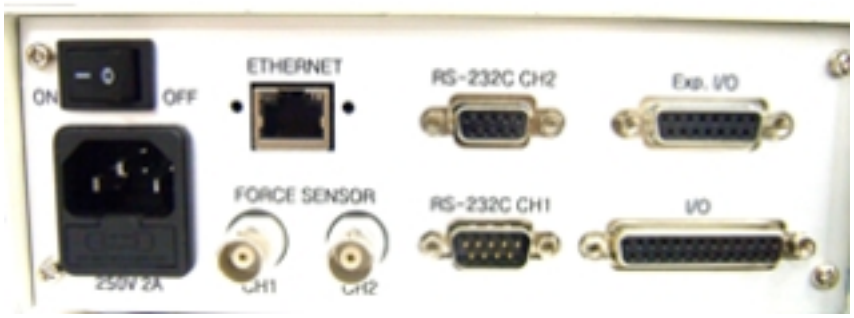

Mode Lamps

| Ope/Alarm lamp | LED display | Indicate status |
|---|---|---|
| CH1 (2) Ope | Green LED | System is normal. Crimp data is GOOD. |
| CH1(2) Alarm | Red LED | System is not normal. Crimp data is BAD. |

Keys

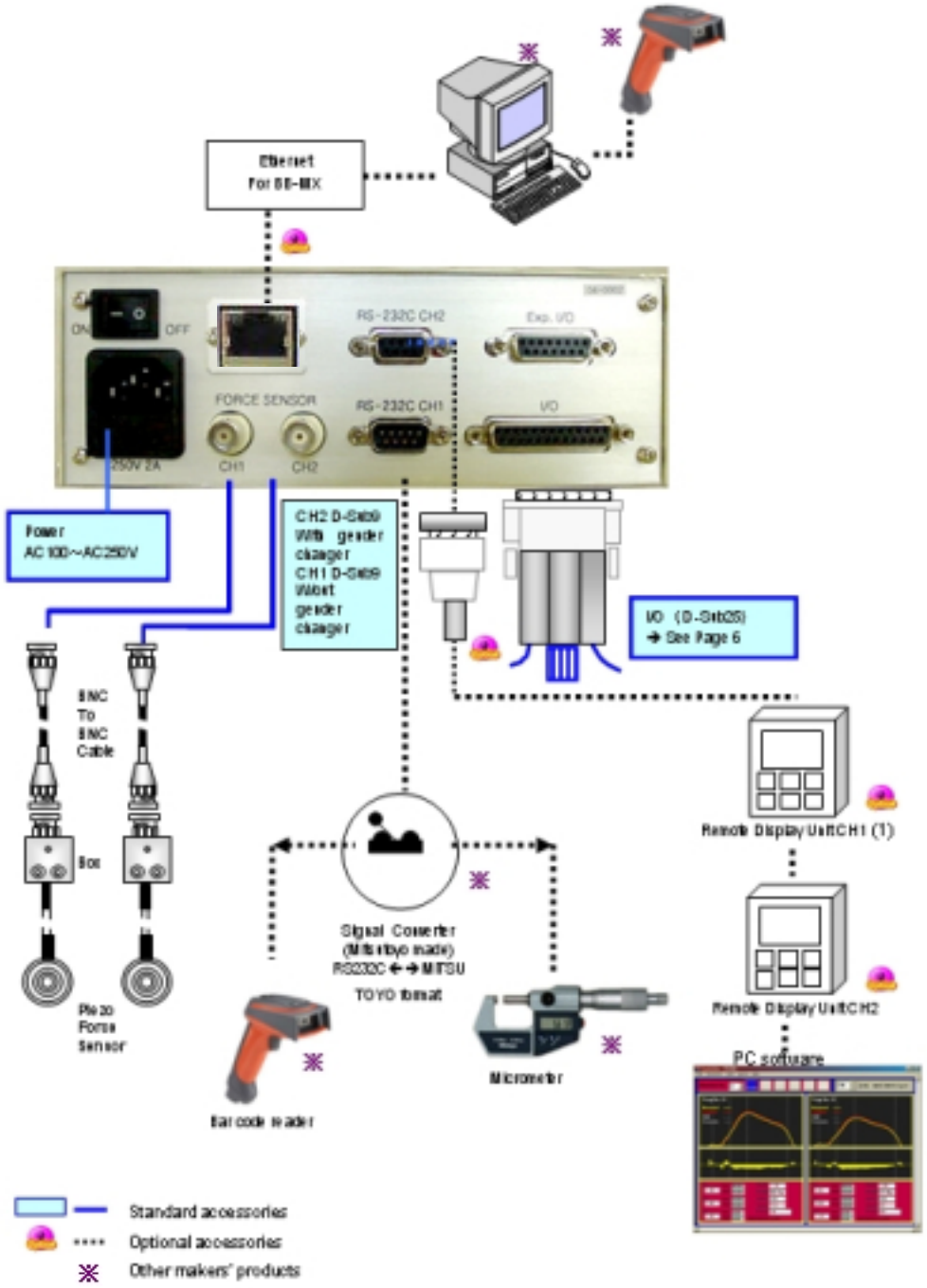
| Key | Function | Key | Function |
|---|---|---|---|
| OPE | Operationsmodus (monitor + control) | ENT | Set data. Reset alarm |
| PAR | Parameters/Menue | PREV | Data input cancel. One step back at mode change |
| TEACH | Teach | UP ▲ | Page increment. Data up at input |
| PASS | Pass (bypass) | DOWN ▼ | Page decrement. Data down at input. |

## 2.2 Rear View




| | Name | Function | Name | Function |
|---|---|---|---|---|
| | Power switch | Power switch | RS232C CH1 | DINSUB9P(F) for ProMX, MXD, Prog.load, Press Analyser |
| | Power inlet | 90-250VAC, 2A max. | RS232C CH2 | DINSUB9P(M) for Barcode reader, pull tester |
| *Option* | Ethernet | Connector for Ethernet LAN | EX I/O | Reserved for optional IO ports |
| | Force Sensor | BNC connector, channel 1 | I/O | DIN SUB25P standard IO ports |
| | Force Sensor | BNC connector, channel 2 | | |

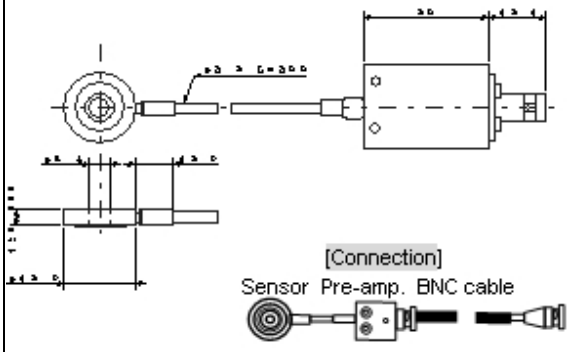
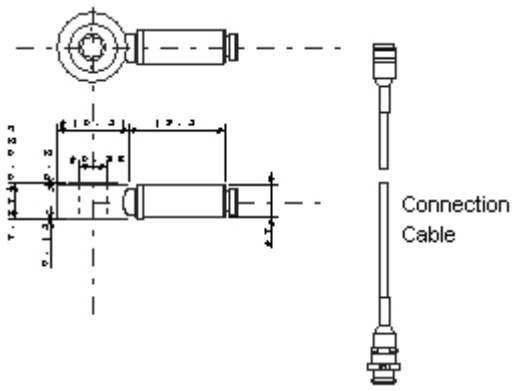
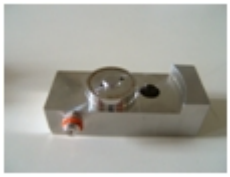
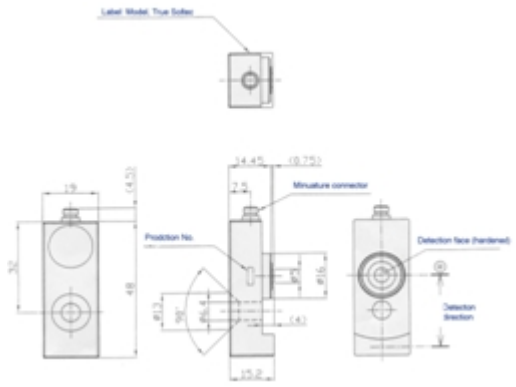
# 3 Connection



## 3.1 Piezo Force Sensors

All our force sensors can be connected to all CFM units with BNC shielded cables. They are all piezo effect type force sensors. FTW is the cable out type. Be careful of power and external noises interference because the amplifier circuit built in sensor is grounded directly to the sensor case, which means that machine should be perfectly grounded to the earth.


BNC cable connection to piezo force sensors

| Model | | Ex. FTW20 cable out type |
|---|---|---|
| FTW05<br>FTW20<br>FTW255<br>FTW50<br>FTW100 | 500 kg<br>2 t<br>2,5 t<br>5 t<br>10 t<br>  |  |
| FTC208<br>FTC408 | 2 t<br>4 t<br>  | Ex. FTC208 connector out type<br>  |
| PSS50<br><br>[PSS]<br>In case base plates or ram holders are not available, use this sensor. | The piezo ceramic type strain gauge translating the machine stretch to the force featurs high sensitivity and rigidity<br><br>Sensitivity: 50 mV/µstrain<br>(sensitive for elongation only)<br>  |  |

BNC cables
Standard length = 5 m
Manual press use = 1.5 m long

*Option:*
a more flexible type BNC-BNC cable will be available for the sensor mounted in the ram adaptor.

*Option:*
a more noise strong BNC-BNC cable will be available for the sensor under bad conditions.

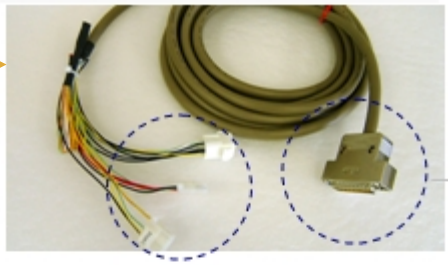
## 3.2 Trigger Switch

Trigger Switch: 12VDC power, NPN type

## 3.3 I/O Cable (DIN Sub25P)

| | Function | I/O | Wire color/Function |
|---|---|---|---|
| 01 | Ext. reset | in | ORG w. BLCK dot |
| 02 | Ext. teach | in | ORG w. RED dot |
| 03 | Ext. bypass | in | YLW w. BLCK dot |
| 04 | Remote/Local Prog. Selection | in | YLW w. RED dot |
| 05 | CH1 trigger | in | GRN w. BLCK dot |
| 06 | CH2 trigger | in | GRN w. RED dot |
| 07 | Prog.No. Bit 0 | in | GRY w. BLCK dot |
| 08 | Prog.No. Bit 1 | in | BRY w. RED dot |
| 09 | Prog.No. Bit 2 | in | WHT w. BLCK dot |
| 10 | Prog.No. Bit 3 | in | WHT w. RED dot |
| 11 | Prog.No. Bit 4 | in | ORG w. BLCK dots (d) |
| 12 | Prog.No. Bit 5 | in | ORG w. RED dots (d) |
| 13 | +12V power | | XLW w. BLCK dots (d) |
| 14 | Crimp bad | Stop | YLW w. RED dots (d) |
| 15 | Crimp good | Relay | GRN w. BLCK dots (d) |
| 16 | COM | | GRN w. RED dots (d) |
| 17 | Eject CH1 | Relay | GRY w. BLCK dots (d) |
| 18 | Eject CH2 | | GRY w. RED dots (d) |
| 19 | Teach mode | out | WHT w. BLCK dots (d) |
| 20 | CH1 sub | in | WHT w. RED dots (d) |
| 21 | CH2 sub | in | ORG w. BLCK dots (3) |
| 22 | Ack. Signal | out | ORG w. RED dots (3) |
| 23 | 2 way stop | out | YLW w. BLCK dots (3) |
| 24 | 0V | | YLW w. RED dots (3) |
| 25 | 0V | | GRN w. BLCK dots (3) |

IN and OUT Relay — NPN Open Collector micro relay



CH1 trig.
CH2 trig.
Eject, Stop, etc.
[Cable End]

Din sub25P I/O

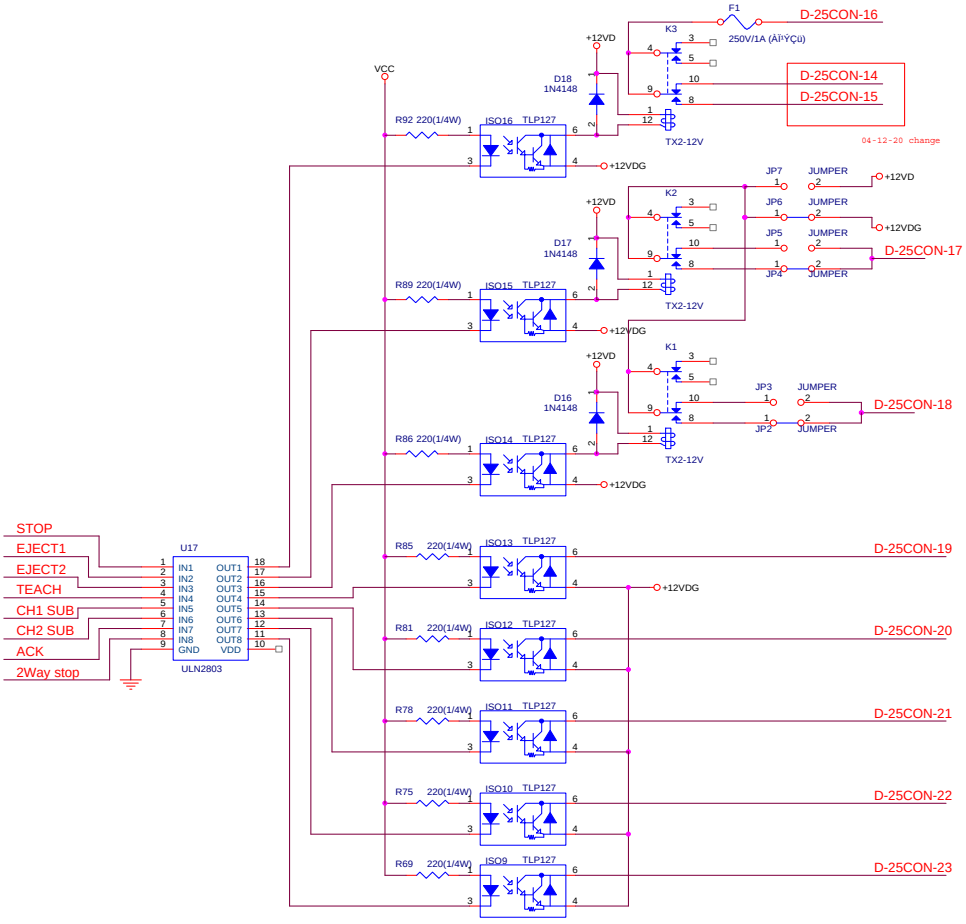
Check and identify wires of cable by insulators color and dots (color & Nos.)

Dot single dot

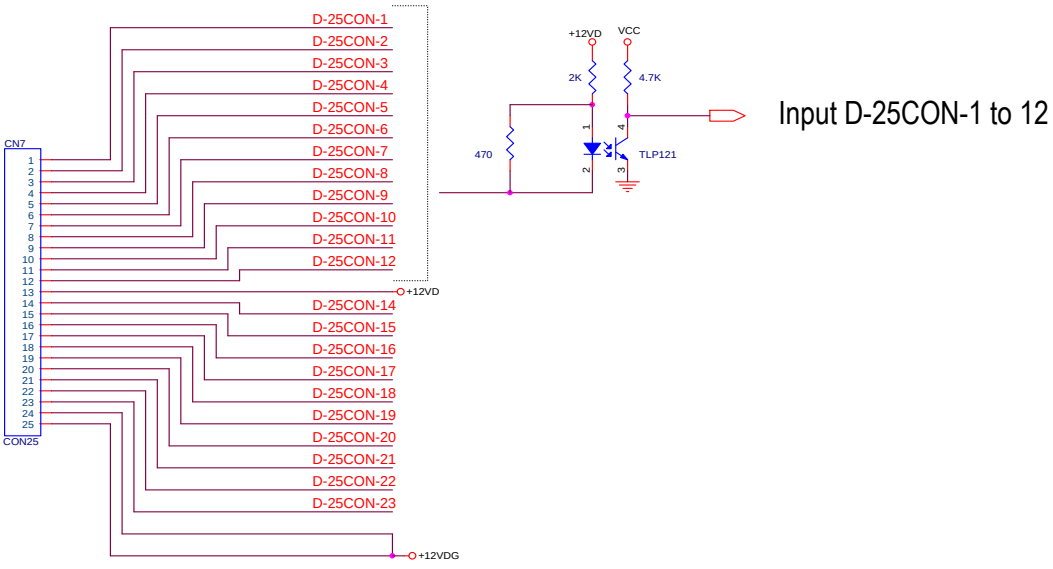
Dots(2)

Dots(3)

## The circuit diagram of I/O



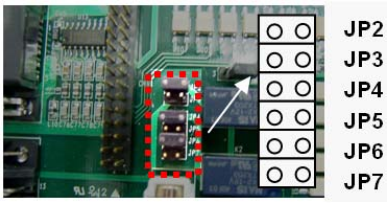

## DIN SUB25P assignment



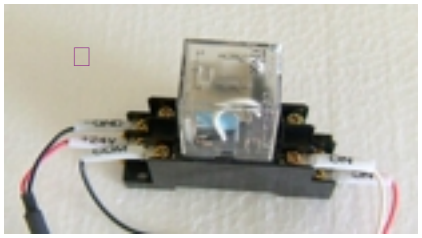
Eject output employs the relay. It is set as normally open as default.
Change the dip Switch position to switch it to the normally close,

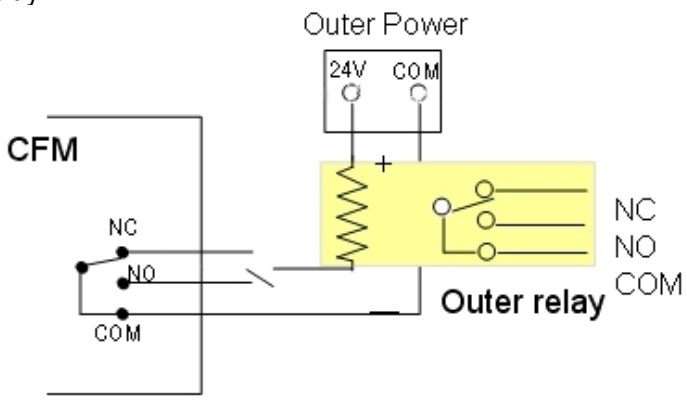
| | |
|---|---|
| JP2 | CH2 eject N.O |
| JP3 | CH2 eject N.C |
| JP4 | CH1 eject N.O |
| JP5 | CH1 eject N.C |
| JP6 | Common is ground |
| JP7 | Common is 12V |

circled position will be the default set




*Hint*
If a big power is required, add an outer big relay
[example: 200V 1A]



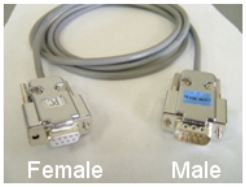



## 3.4 Pro MX (PC monitor software)

RS232C pin assignment

| CH1 | Function | | CH2 | Function |
|---|---|---|---|---|
| 1 | +18VDC | | 1 | NC |
| 2 | RxD | | 2 | RxD |
| 3 | TxD | | 3 | TxD |
| 4 | +8VDC | | 4 | NC |
| 5 | GND | | 5 | GND |
| 6 | GND | | 6 | GND |
| 7 | RTS | | 7 | RTS |
| 8 | CTS | | 8 | CTS |
| 9 | Dongle | | 9 | NC |

*Option*





Use our providing RS232C cable only for PC program ProMX and Display MXD.

*Hint*
If your RS232C cable has female connectors at both ends, put a gender changer for CFM-MXN side converting female to male pins

## 3.5 Barcode Reader

Code 39 read type. Both laser and infrared types are available. You can use it to read the program number for channel 1 and channel 2.

The bard code reader function will be expanded in the optional program for systematized control. For example, applicator & material numbers will be readout for central data control.

## 3.6 Dongle key for mode protection

*Option*

To protect modes from unwanted button touching, you can set the dongle key protection in Parameter. If you set ON for Reset, TEACH or PASS, respective modes cannot be accessed unless the dongle key is inserted at the RS232C port.

10. Dongl Ptotct

10. Dongl Ptoct Reset [OFF]

10. Dongl Ptoct PAR [OFF]

10. Dongl Ptoct TEACH [OFF]

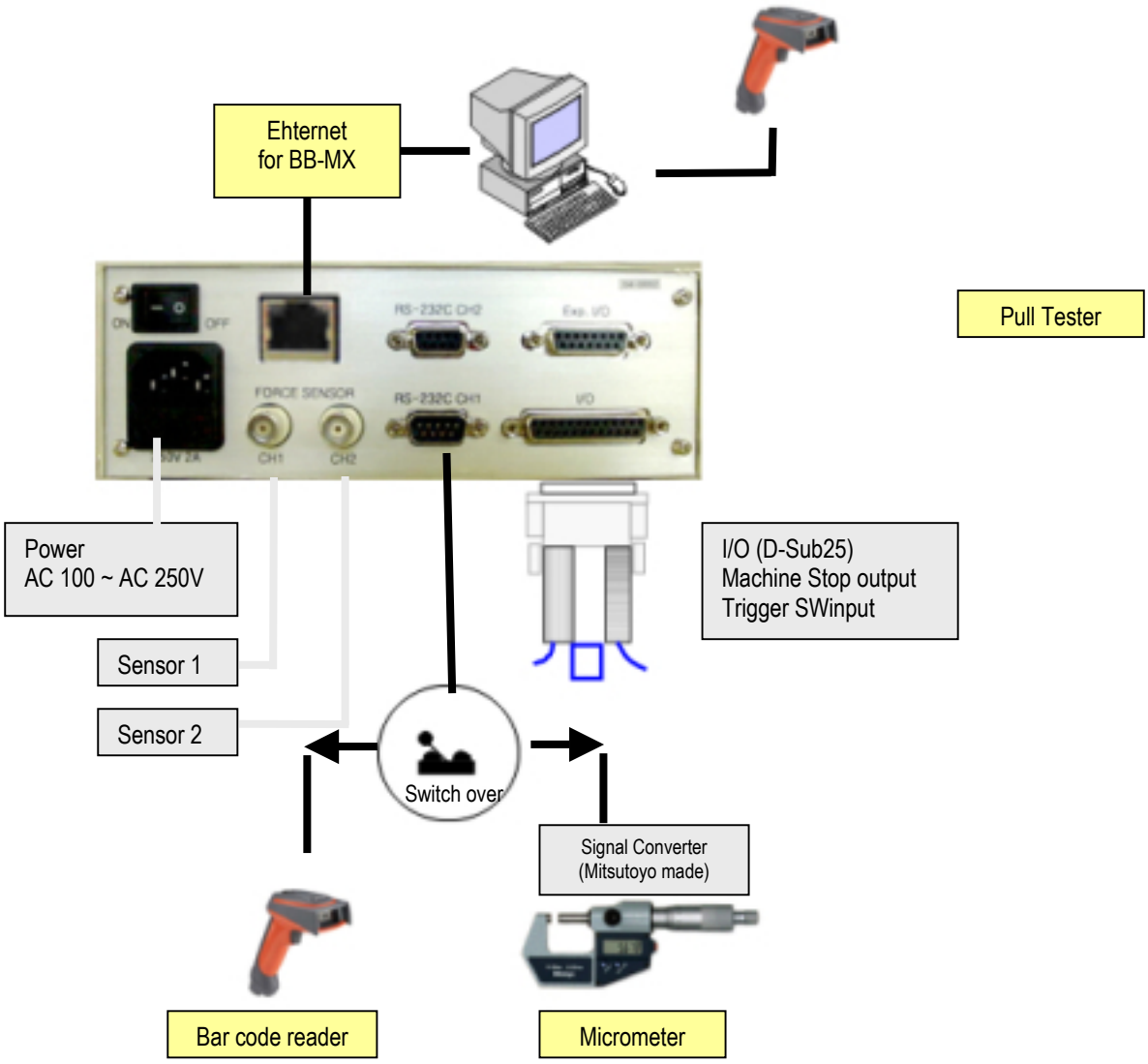
10. Dongl Ptoct PASS [OFF]

ON, OFF

REV

## 3.7 Expanded system

New connectors are added for CFM-MXN to expand its functions




Following optional accessories are prepared:

1. BBMX (LAN – Ethernet) system
2. Pull tester connection via PC
3. Micrometer connection

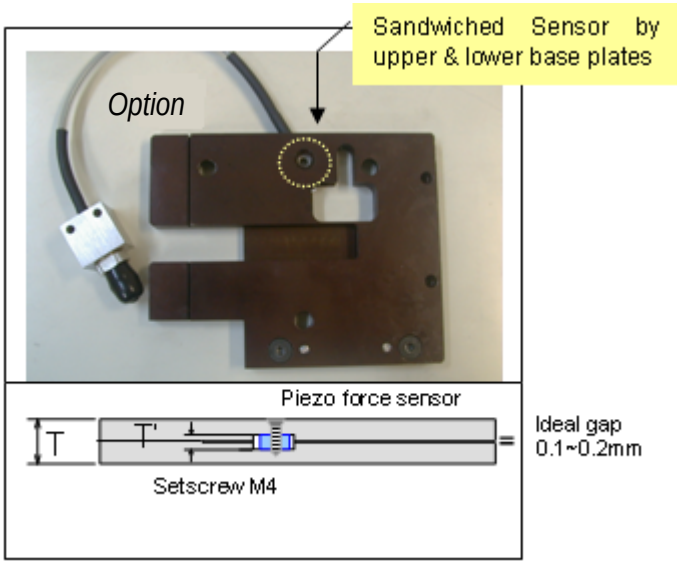
# 4 Installation

## 4.1 Set piezo sensor in the base plate

There are two ways for mounting the force sensor on the machine; sandwiching it by upper and lower base plates BMD and setting at the ram adaptor RMD. We recommend setting it in the RAM.

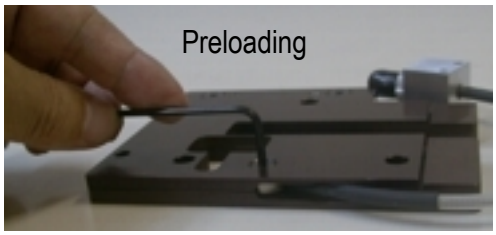
1st choice: RMD (Ram Measuring Device)
2nd choice: FMD (Frame Measuring Device)
3rd choice: BMD (Base Measuring Device)

1. The sensor is sandwiched between the upper and lower plates. Try to place it as near as possible under the cutter force. The gap between the upper and lower plates will be 0.2 = 0.3 mm. The sensor location hole grinding will be finished with □□□ or better.
2. The sensor thickness of FTW20 is designed as 4.00 ± 0.01 mm. The upper and lower base plates height is T = 10 mm. The sensor space height of T will be 3.96 ± 0.01 mm to receive a full crimp force.




<u>Sensor Pre-loading</u>

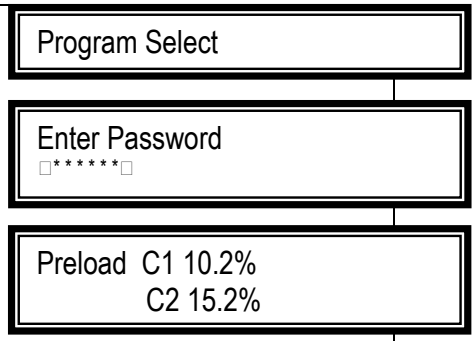
Apply pre-load force to fasten the sensor. The force sensor will output a linear voltage from small to high force level.



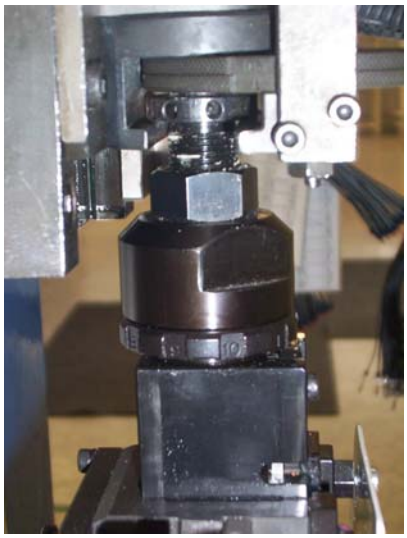

[Preloading work]

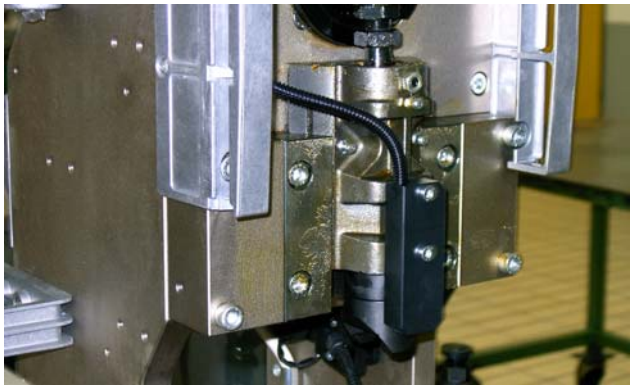
*Hint*
After pre-loading, the percentage (example: 15%) will slowly drop to return to zero (0.0%). Do not mind of it. Do not try to add another force.

1. Set the sensor in its position
2. Cover the upper plate, put the knock pins and set screws.
3. Connect the BNC cable. Connect it to CFM-MX.
4. Turn on the power.
5. Push  key
6. □******□ Password input (default = ↑↑↑↑).Click ↓ to enter [5 Sensor Set] then push  .
7. Proceed Unit [kg] → Peak force → Preload, then enter by  .
8. Apply the preload with screw until you get the 20 % to the attached list.



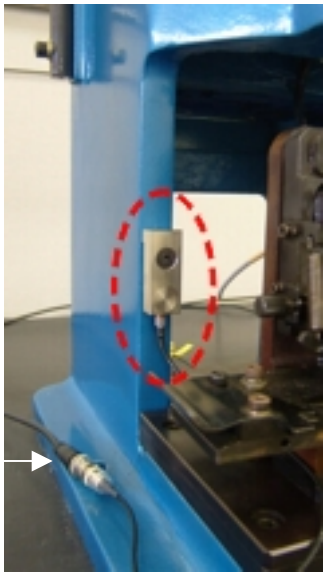
## 4.2 Set piezo sensor in the ram adaptor



## 4.3 Set piezo sensor on the press column

1. Find a flat surface on the right position of the machine wall.
2. Drill a hole and tap it with provided M6. Be careful not to damage the oil pipe or other machine parts inside the wall.
3. Scratch off the paint on the surface for good fit with the sensor.
4. Set the sensor at straight vertically, and fasten it with M6 screw with full strength.
5. Connect the cable and BNC cable between the sensor and the CFM-MXN unit.



Sensor cable is relayed to BNC-BNC cable for CFM unit

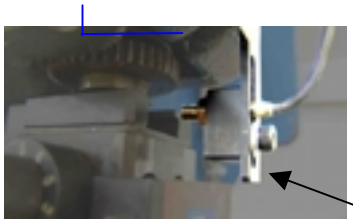
Sensor and connection cable

## 4.4 Set the trigger switch

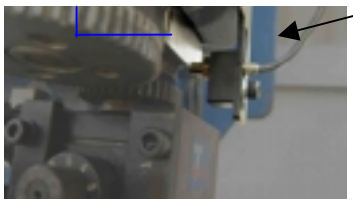

If you select the Trigger by switch in the parameter, you have to connect the switch on the machine side to detect the ram bottom at its lower dead point.

*Hint*
If you should select Trigger by AUTO, there is no need to set the switch.

*RAM UP*



*RAM DOWN*




*Remarks*

"Trigger Error alarm"
If the switch is defective or sensing gap is too wide, CFM-MXN will show this alarm and stop the machine after crimping.

Black line "Signal"
Blue line "Ground"
Brown line Power 12 – 24 V

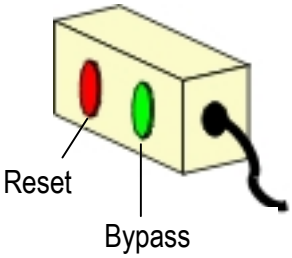
*Hint*
Sensor will turn ON when the ram approaches the lower dead center. Make sure that the holder plate is firmly set, and the sensor is close enough toward Ram (shorter than 2 mm)

*Check*
Check gap and connection of wire

# 5 Communication setup

## 5.1 Remote Control (Error resetting, Bypassing, Teaching)

| # | Function | I/O | Wire color/Function |
|---|---|---|---|
| 01 | Ext. reset | in | ORG w. BLCK dot |
| 02 | Ext. teach | in | ORG w. RED dot |
| 03 | Ext. bypass | in | YLW w. BLCK dot |
| 04 | Remote/Local | in | YLW w. RED dot |
| 24 | 0V | | YLW w. RED dots (3) |
| 25 | 0V | | GRN w. BLCK dots (3) |




[Remote box]

For remote reset, connect 01 and 24.
For remote bypass, connect 04 & 24 then connect 03 & 24.

For remote teach, connect 04 & 24 and connect 02 & 24 then input program numbers for channel 1 and channel 2 respectively. Normally we recommend making a PLC program for this purpose.
(See page 16)

## 5.2 Remote Teach and Program Selection

- Program number selection with digital I/O is available only when remote control is ON. (PL 04)
- Program number selection with digital I/O is available only at the teach in mode.
- When the external teach becomes ON, CFM-MX shows following display. After a new program number is transferred via DIO the "XX" part shows it.

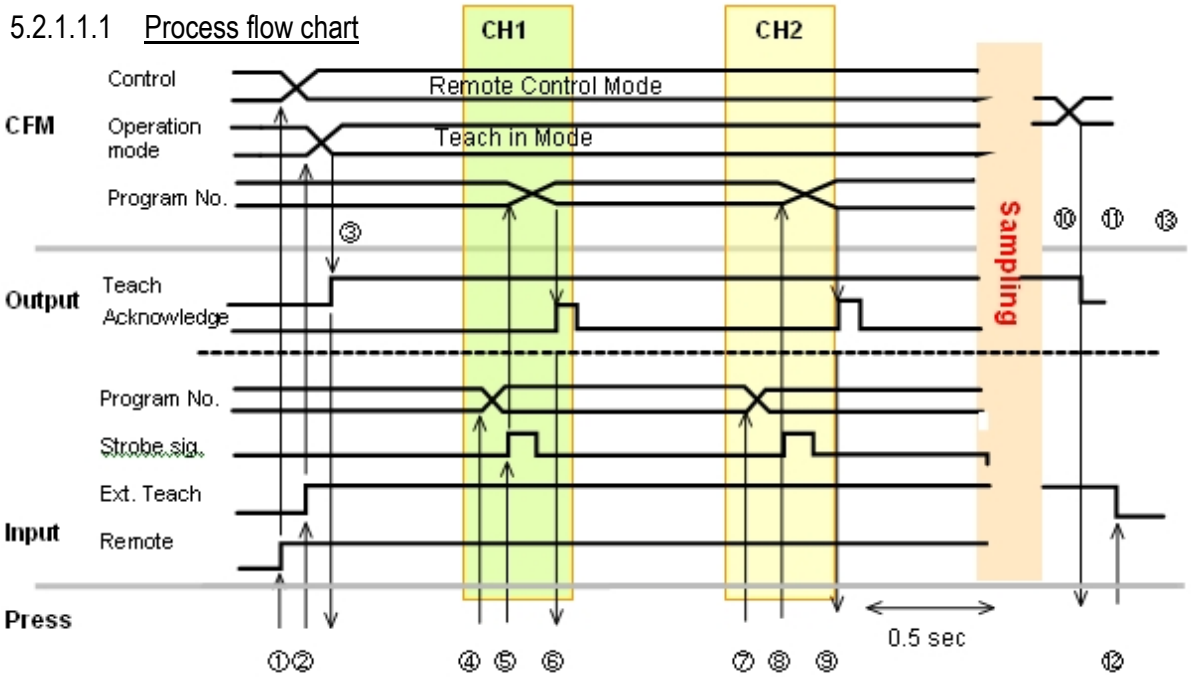
| | | |
|---|---|---|
| C1 | Prog. No | XX |
| C2 | Prog. No | XX |

- The program number is sent by D0 ~ D4 in binary mode.
- If the program number is set to "0", then the channel is disabled. No control is available.
- If the program number is set to "31", then the channel does not accept a new teach, and keeps operations mode.

[Sequence of remote teaching]

| | | | |
|---|---|---|---|
| 01 | Remote signal ON from Press (PIN 4) | 08 | Press will output the STROBE signal |
| 02 | Teach signal ON from press (PIN 2) | 09 | FM-MX will read-in the program number 1 |
| 03 | CFM will output TEACH signal ON (PIN 19) | 10 | Sampling |
| 04 | Press will set the program number of channel 1 (PIN 7-12) | 11 | CFM-MX will drop the teach-in signal |
| 05 | Press will output the STROBE signal | 12 | Press will drop the teach signal |
| 06 | CFM-MX will read-in the program number | 13 | CFM will change to OPE mode |
| 07 | Press will set the program number of channel 2 | | |

5.2.1.1.1 Process flow chart



## 5.3 ProMX installation

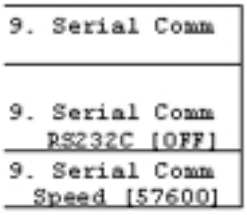
The ProMX is convenient PC software to monitor and control CFM-MXN.

Preparation

1. PC with Windows XP, Windows 2000
2. Install the program via attached CD-ROM. Click the Setup.exe file and installation starts automatically.
3. The RX232C connection cable is not the standard. Use only ours between CFM-MX RS232C CH2 and PC.
4. Run the program ProMX.

Run the software


Set the right port No. and speed ratio.




→ ON

→ 38400

Select RS232C [ON] and the same speed ratio as PC. Then click Log On to start monitor. The color will change to red.

*Hint*
For all operation of ProMX, refer to the manual of ProMX.

# 6 Operation Start

## 6.1 Power ON

Turn on the power switch at the rear panel.
The program version number appears first.
Then it turn to the operation mode.

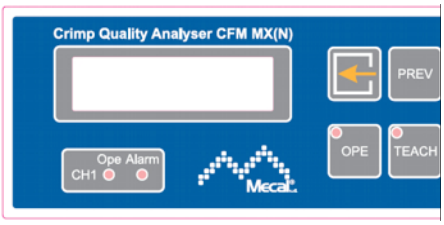

You can connect 100V ~ 220V freely and safely.

MXN2 / program version 3.12

*Hint*

Popular errors you may find at power ON are:

1. [Sensor Error] when the sensor power (24VDC) is missing. Check connection of the sensor.
2. [CPU error] at CPU trouble. Try to initialize parameters by depressing button while the power switch is turned ON. Don't forget to insert Dongle!!!
3. [System error] alarms at circuit trouble. Try to initialize parameters by depressing button while the power switch is turned ON. Don't forget to insert Dongle!!!




Push button while pushing power switch.

## 6.2 Call right program No. for CH1 & CH2 suitable for current combination of wire, Terminal and applicator.

Program number selection

Whenever you change combination of wire, connector and applicator, CFM controller draws different force curves. Therefore, the system must keep the best-fit conditions in the memory per combination. This is the program number.

Push button to enter Prog. Selection and push button to process it.


Push or to select the right channel (not needed for MX10N) Press to enable program selection

Push or button to select the program number you want push to set it.


Push or button to move to C2 (channel 2) push button and do the same as for channel 1.


You can select from program 1 to 30. Also, you can select OFF. Once you select OFF, this channel is disabled. Note: both channels can't be set to OFF at the same time.

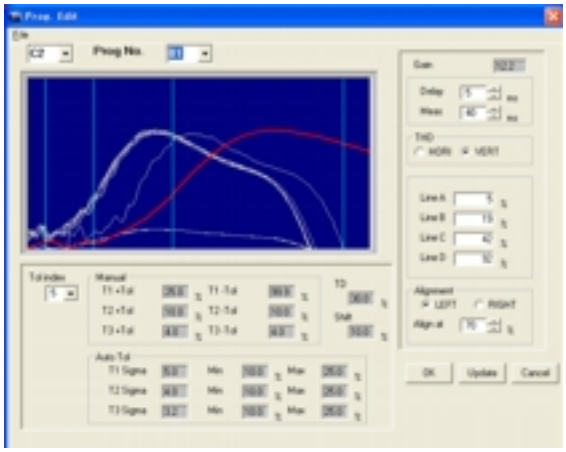

#1 when you cannot enter the Program selection mode with button (!?):

The dongle protection is "ON" in the parameter mode. You can however not enter parameter mode to change it for "OFF".

Enter de dongle and push  button.
Enter the parameter mode form the PC program, Pro-MX

#2 What parameters are included in the program number?

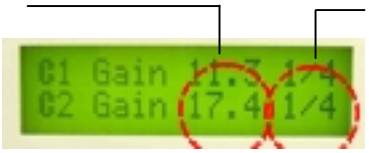
Except common parameters, all characteristic conditions of each measurement group will be set in a program number depending on combination of connector, wire and applicator. Even if the same connector and wire are crimped, a different program number can be set when a different applicator is used.



## 6.3 Teach in a reference force curve

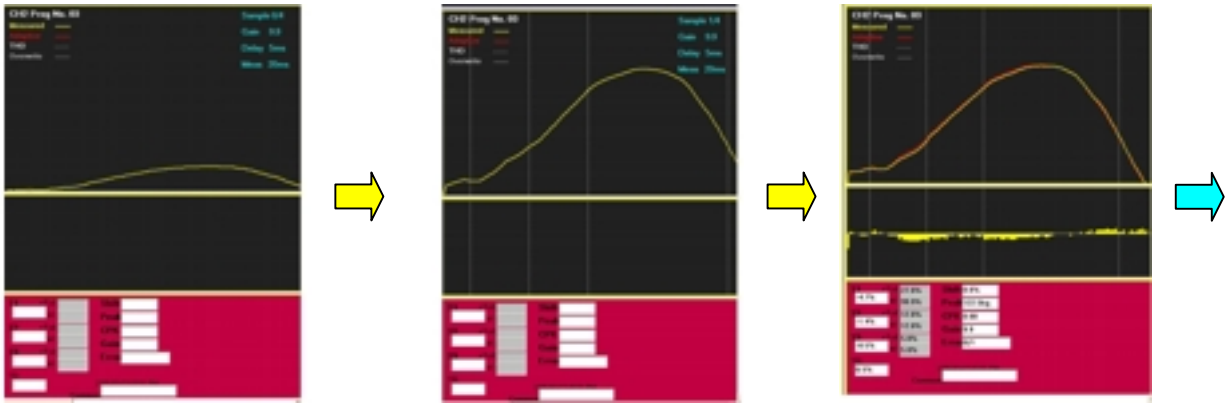
Push TEACH button to make CFM unit learn the reference force curve, by which next coming data will be compared and judged


Gain value is the amplification level of sensor signal




Start crimp (1/4…2/4…3/4…4/4 → complete) to form the reference curve.

Teach Start (normal)



Start with raw force curve. Gain level 9.9, Trigger delay 5ms & Measure time 20ms

Take sample pieces 1/4 to 4/4. They should be all good crimp and average for the reference.

Teach-in completes and operation (control mode) starts.

## # 3 When do you need Teach-in?

When you change the applicator or material (connector and cable), you have to teach the reference force curve to CFM-MXN. When you call the old program number, we recommend you to execute Teach-in. Because the shape of force curve may be different slightly at relocation of the applicator, it should be refreshed by a new teach-in.

### Troubles in Teaching

Why does *"Teach-in error"* happen?

If there should be a big force difference among teach-in pieces, CFM-MXN will alarm "Teach Error". The CFM system has internally the tolerance for teaching samples.

### [Typical Teach Errors]

### System does not enter TEACH mode

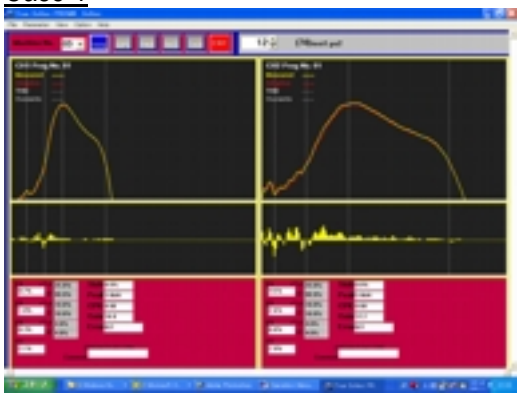
Check Parameter # 10 Dongle Protection. Perhaps TEACH is set to [ON]. If yes use Dongle and press TIN button.

### TEACH does not start after crimping

[Automatic trigger mode] Perhaps Noise level is too high. Change it from 15 downward step by step.
[Manual trigger mode] Set the Parameter #8.system Trigger Error [ON]. Check the gap between sensor and ram (< 2mm) and the connection.

### Teach starts but get Error soon.

Case 1



Ch1 (left): Measurement time is too long

[Switch Trigger] The measurement time is too long and data accuracy is down. Set parameter #6 Teach In Auto Meas. [ON], then a suitable size of force curve will appear.

Case 2

CH1 (left): Measurement is too short

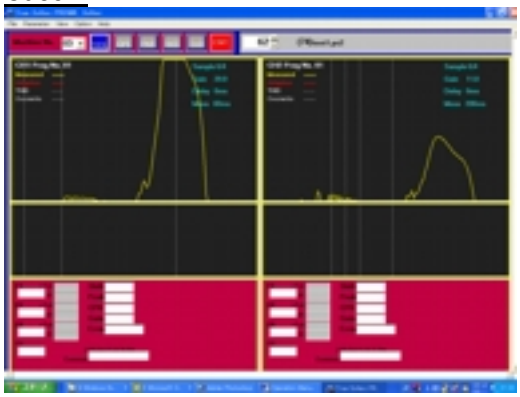
[Switch Trigger] The measurement time is too short and areas defined by threshold lines (A, B, C & D vertical one) are too tight.

Case 3

CH1 (left): Delay time too long and AB lines narrow

[Switch Trigger] The trigger delay time is too long. Also, the A-B area is too narrow.

Case 4



CH1 (left) Base plates setting is not rigid enough. The noise level is too low.

If the press force should be “soft” due to poor fixing of applicator or not clean base plate, curve jumps up & down. Also, if the noise level should be set at very low level, CFM will detect signal noise as a signal, causing unstable data capturing.

Case 5

CH1 (left): Peak alignment is missing

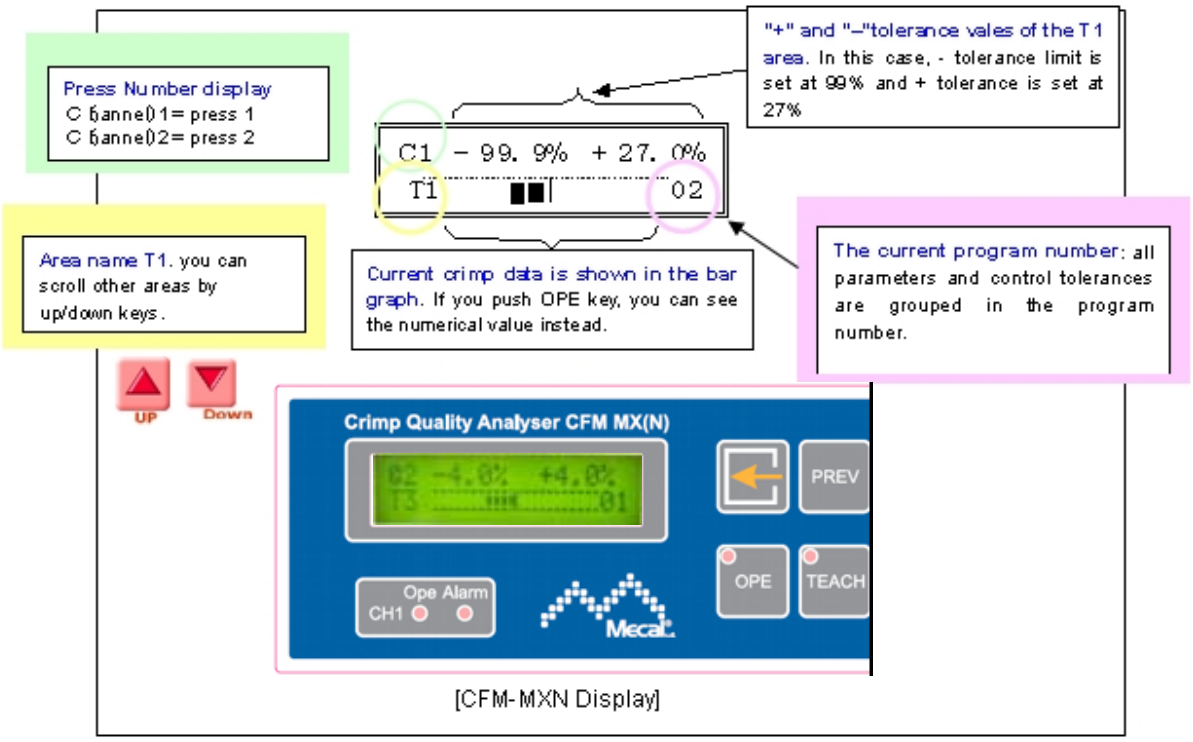
Normally the peak alignment is necessary to align force curves. Without it, the curve may shift right or left a little. Also, even if it should be set, for example, at 30% of the RIGHT, the CH1 curve is missing the right half and eventually the peak alignment is not effective at all.

And check the machine and material side, too.

- Check if the set tolerance is too tight?
- Check if machine condition is bad (wire location, terminal location)?
- Check if the application is infirmly?
- Check if the terminal and wire combination is adequate?

# 7 Operation

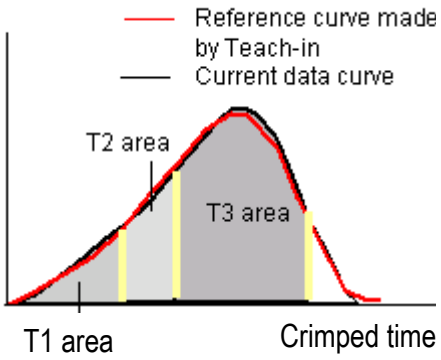
## 7.1 T1, T2 and T3 area control




[CFM-MXN Display]

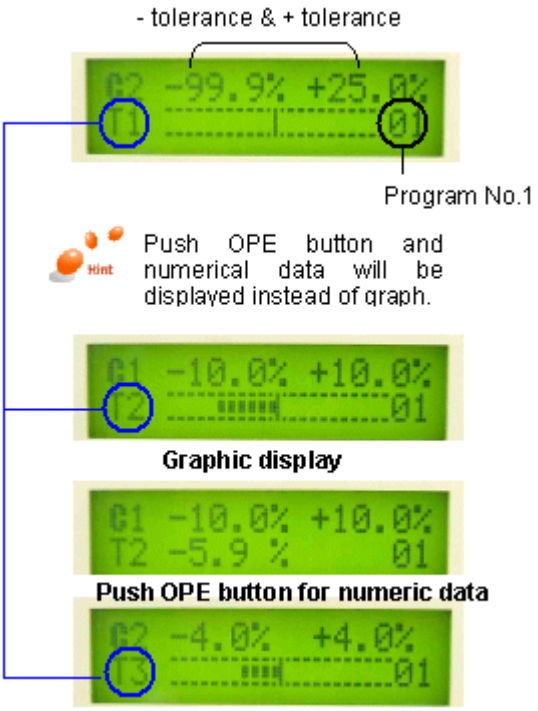
Use   bottoms to change display pages and display modes.

| | |
|---|---|
| -4.0% + 4.0% | Tolerance of T3 |
| C2 | Channel number 2 |
| T3 | T3 area bar graph |
| 01 | program number |

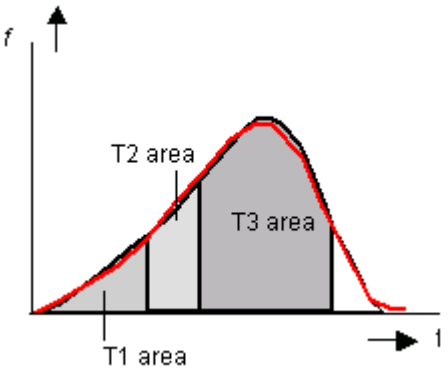



The data curve is divided to T1, T2 & T3 areas.
Each area is compared with those of the reference curve.

If one or more areas are out of the tolerance range, CFM will judge it as a bad crimp. It will output a stop signal and eject it as no good.



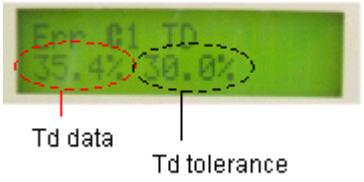

## 7.2 TD Control




TD = |T1| + |T2| + |T3|

TD is the absolute sum of differences from reference curve.

If T1 = -10.0 %,
T2 = -12.5 % and
T3 = -2.90 % the TD is 25.4%

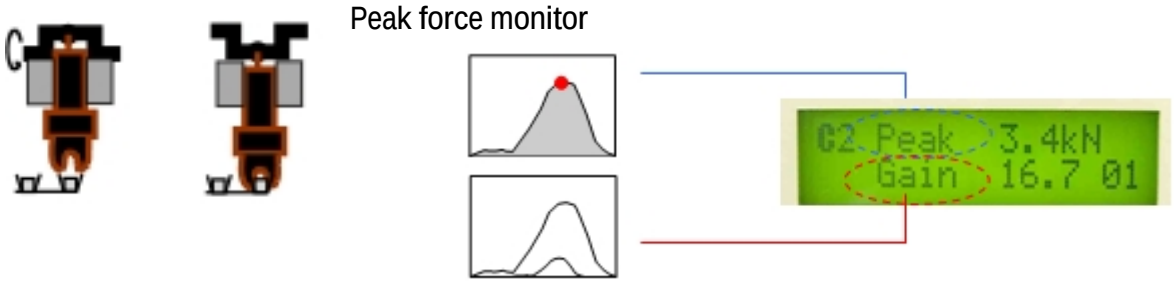



For example, a small short feed error is likely to show “faint” errors for all T1 to T3. They are all still within the tolerance.

However, if we should add up their absolute values, we can detect such an error. It is the TD error.

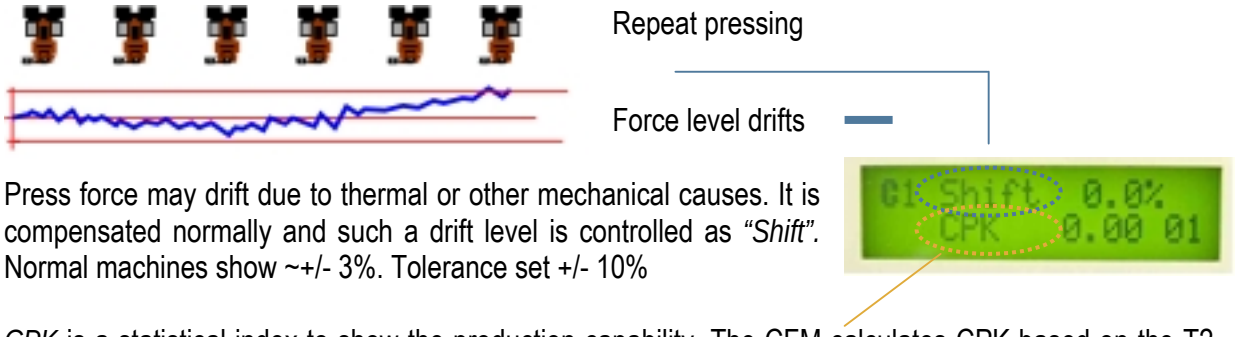
## 7.3 Peak Monitor, Gain Monitor

When crimping starts, force curve is generated.




Normally original force level is too low. It is amplified to a suitable level. This amplification ratio is called as Gain. Normal gain is between 5 and 15

## 7.4 Shift Control, CPK Monitor




Press force may drift due to thermal or other mechanical causes. It is compensated normally and such a drift level is controlled as *"Shift"*. Normal machines show ~+/- 3%. Tolerance set +/- 10%

*CPK* is a statistical index to show the production capability. The CFM calculates CPK based on the T2 area data.

## 7.5 Data Errors; Overload, Underload, Shift Error, No Data Error

Error happening at power ON. Check possible trouble causes and consult maker

| |
|---|
| Error System<br>C1 Sensor Error |

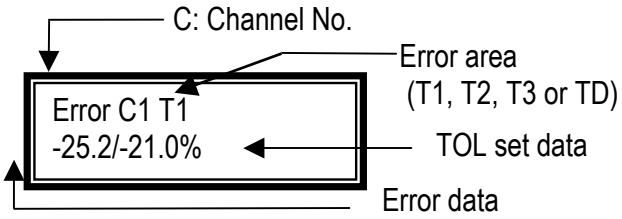
What's happened? Channel sensor is faulty.
Check if the sensor cable is removed or sensor cable is broken. Check sensor, perhaps to much force has damaged the crystal.

| |
|---|
| CPU Error 2 |

What's happened? CPU error happens.
External influence such as noise has interfered CPU or memories. The initialization of system is necessary.

Error messages and advises: Push button to reset the error and check possible causes.

Data error





*Hint*

- Before reset of the error, check the product, which is judged as error carefully.
- If judgment error taking "good" product for "bad" one should occur often, check condition of machine, terminal and wire carefully. If all are okay, then set one-step rougher tolerance number.

Error C1 OverLoad

*Overload:* more than +40% change from the teach-in force level
*Underload:* less than -40% changes from the teach-in force level.

What's happened? Over (or Under) load error happened.
*Analysis*
Very big force change has happened. Check if double terminals, crimp level change, no wire or no terminal, crimper error was happened. This is very dangerous error. Check carefully before resetting.

Error C1 shift
-10.5/10.0%

What's happened? Adaptive shift of force level has exceeded limit
*Analysis*
CFM program is designed to compensate mild force level change due to machine's thermal elongation. But, old machine or improper applicator positioning may cause bigger shift than the limit of +/- 10% (programmable). It may cause the shift error. Check applicator setting and oil sticking at force sensor hole. Reset by the key.

Error C1 T1 2/4
-25.2/-21.0%

What's happened? Teach in data error
*Analysis*
While in teaching process, 2/4piece has been judged as out of tolerance. The teach-in tolerance is programmed in parameter #6 Teach-in. Check teach-in sample pieces quality. If they are okay, then apply rougher tolerances (higher Tol. Index)

Error C1
NO DATA

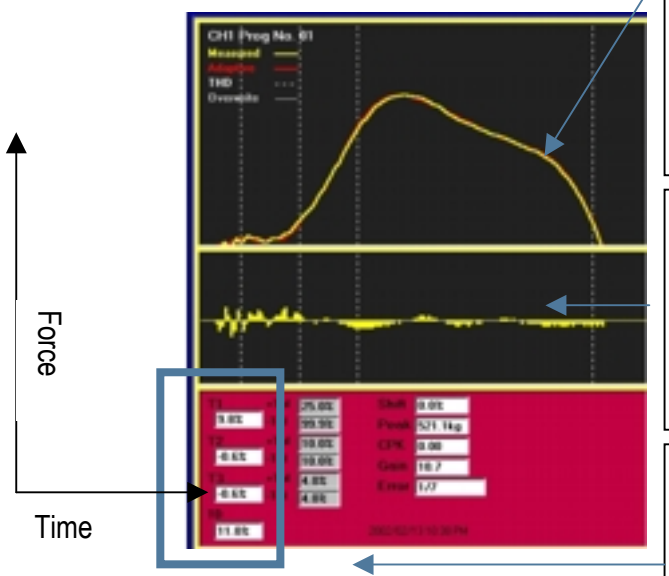
What's happened? No force signal is found
*Analysis*
When the trigger mode is set as "SWITCH", the system alarms this error at finding no force signal after the trigger switch. Check if there is no terminal, manual pressing causing very weak pressing or wrong trigger sensor position. Reset by key.
If "AUTO" trigger is set, the system cannot find crimp starting if no force is found. To prevent it normally automatic press is programmed to receive "good pulse" after crimping occurs. Set the parameters as EJECT pulse is output a "Good" crimp. The CFM does not output pulse at no-force. Eventually the press

will avoid not force trouble.

## 7.6 What is data error?

Measurement employs the relative comparison system. Taking good samples to from a master-reference curve in Teaching, next coming crimp data are controlled in Operation mode.

How to read force curve display on ProMX



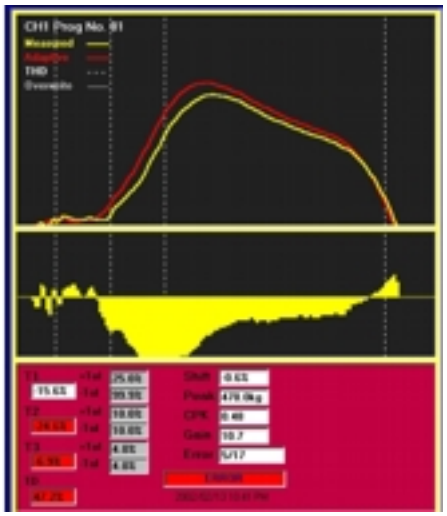

Teach in (reference) curve
Current data curve

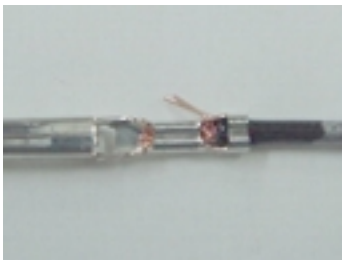
Difference of current data curve from Teach in one is the error. Such errors are checked at T1, T2 and T3 area.

Stretching the Teach-in (reference) curve horizontally straight, data line is overlapped in the same manner. The difference is error and shown in yellow color.

T1, T2 and T3 areas are compared with the teach-in curve. TD is the sum of all errors (TD = |T1| + |T2| + |T3|) in the absolute form.

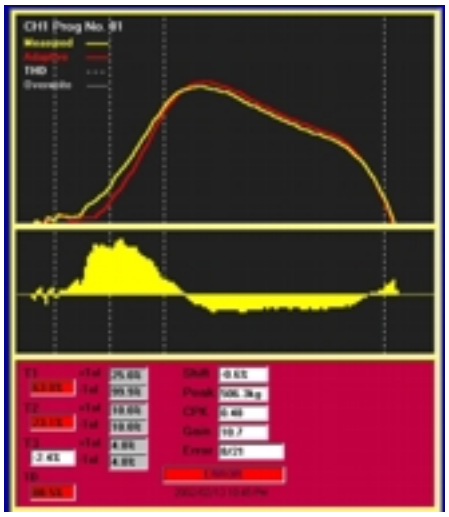
## 7.7 Data Errors and Defective Crimps (typical examples)

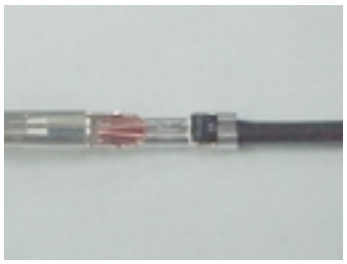




The error force curve drops for whole area normally. But, force shape does not distort so much. Similar curves appear at wire strands missing.

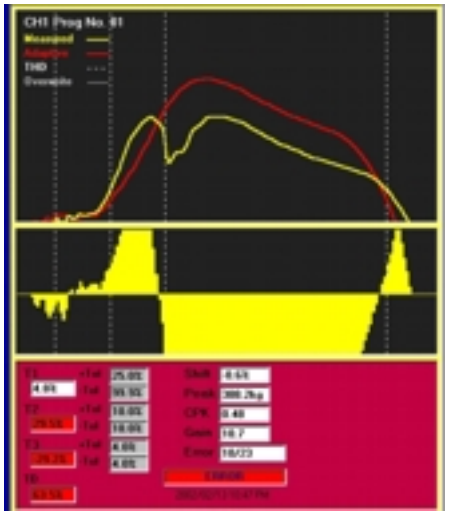
## High insulation (0.5mm insulator inside crimp)

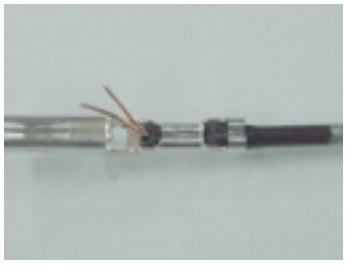




The peak level is normal but T1 or T2 area is abnormally high because conductor barrel has crimped the insulator together.

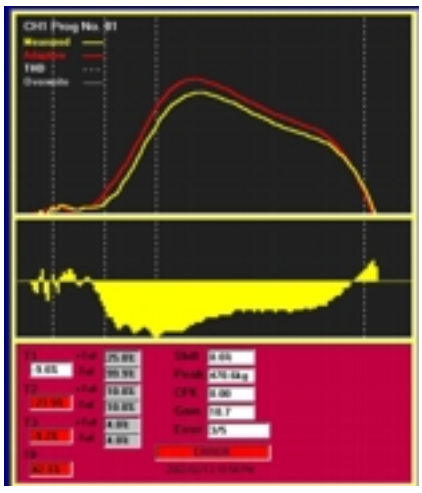
## Insulation very high





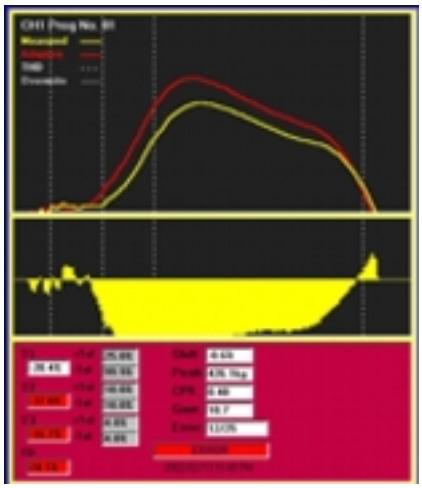
When the insulator enters crimp too much, the conductor barrel has broken strands before the lower dead point. So, the peak force drops drastically. This sudden change is clearly observed in the force curve.

## Low Conductor (1mm)



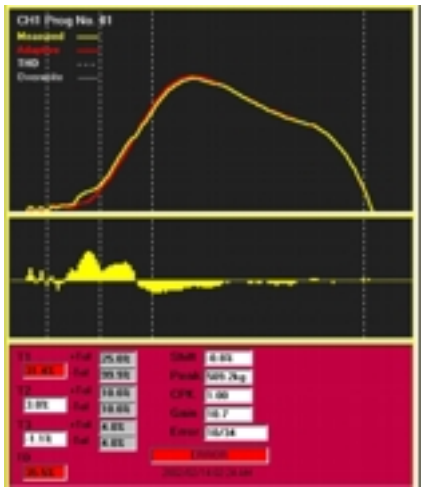
Low conductor of about 1mm behind the bell mouth forms a very identical but small force curve to the teach-in curve.

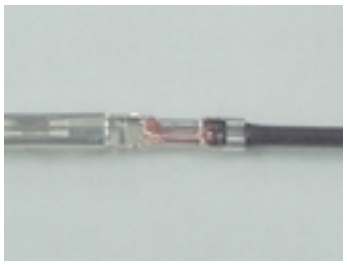
Wire strands “hanging”

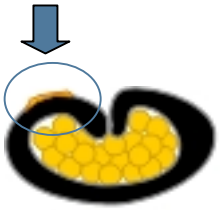


An extremely low strand is called as “hanging”. The force curve drops very much.

Strands out and crimped on the barrel



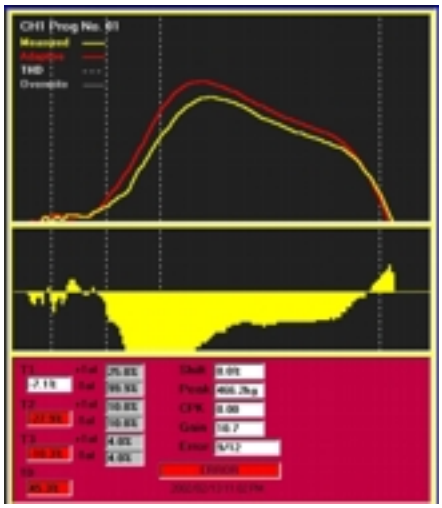




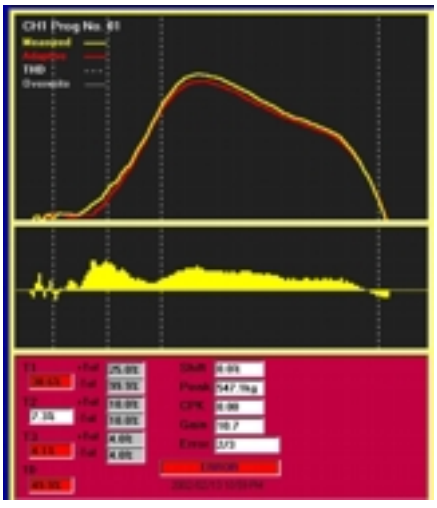
If the strands are coming out and crimped on the barrel, the total force doesn’t change. Only crimp timing changes delicately. So, the start part of the force curve is higher a little. In the measurement area, T1 is high but T2 and T3 are normal.

Height change +/-0.03 mm

Height -0.03 mm



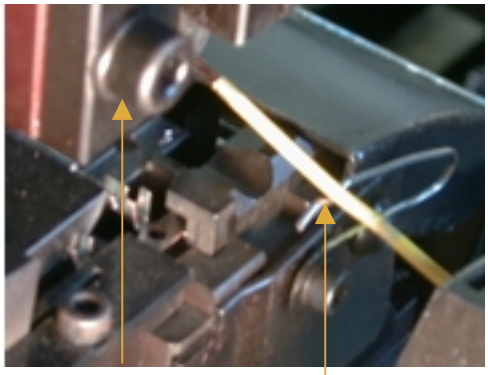
Height +0.03 mm



## 7.8 Daily maintenances to increases detection sensitivity

Followings are typical examples of daily checkpoints. You can expect to reduce misjudgment very much if daily checks points are maintained well. Press, applicator, connector and wire must be conditioned well.

Example: Terminal is located at the center and wire is aligned stably.



Terminal position

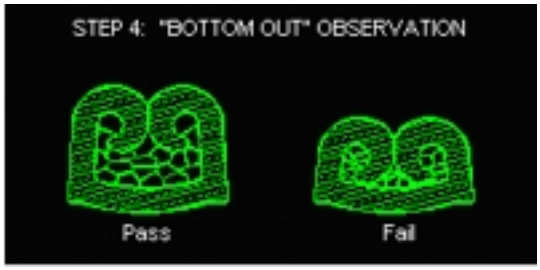
Straight wire and position

If good products data should vary too much, you have to set a rough tolerance eventually. Eventually bad crimp data will be kept inside this wide tolerance range. So, maintain daily check-points and keep machines & applicators clean and keep materials in normal condition. If not, you cannot expect a good effect by introducing CFM units.

### Connector & Terminal relative location

Terminal rolling, Bell mouths missing, Conductive barrel bottom out, etc will influence measuring data.

○ X




Bad crimp height and dull slide cutter cropping Terminal from the carrier may cause the barrel Bottom out. It is judged as bad crimp through Outlook seems okay.


Unstable punching of small wires may miss one bell mouth. It will create a big force drop and result data error. This trouble happens at small connector crimping.

# 8 Useful Parameters

## 8.1 Tolerance change (1) call a different program number

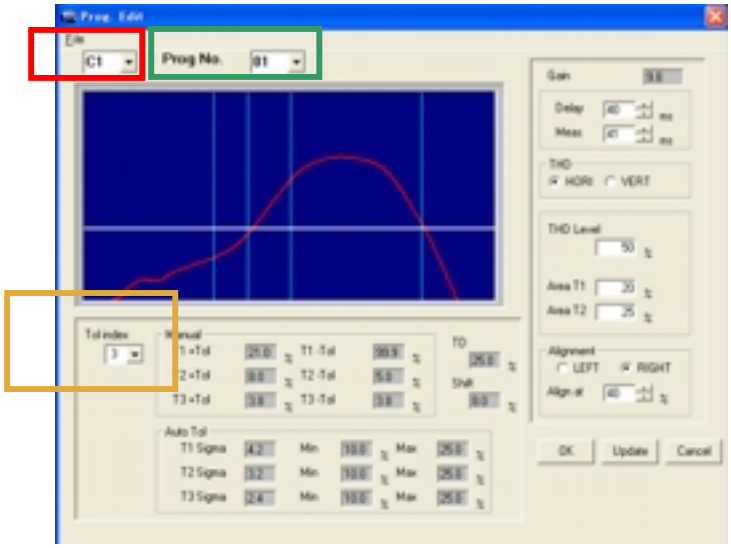
To change tolerance for ±T1, ±T2, ±T3, Td and Shift, call a suitable program number which contains the demanded tolerance number. (See tolerance table for details. 2 Tolerance in Parameter)

Relation of [Channel] – [Program No.] – [Tolerance number] will be explained in the following ProMX display.

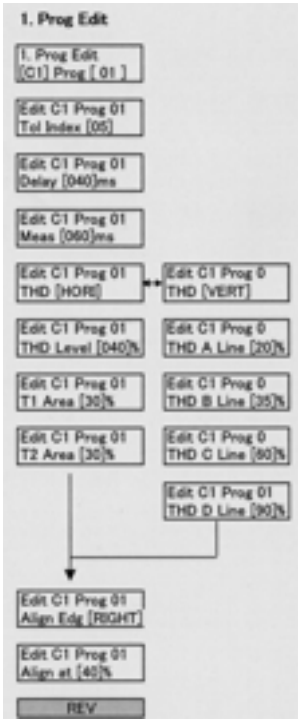
[Channel] Sensor of press 1 is C1 (Channel 1) the sensor of press 2 is C2 (Channel 2)

[Program No] 30 program numbers can be used for C1 and C2 respectively.

[Program Edit menu in ProMX]




[Program Edit menu in Parameter of CFM]




[Tolerance No] All tolerance values are set in a tolerance number. There are total 20 patterns prepared in the tolerance table.

| | | |
|---|---|---|
| Channel | C1 | |
| Program No. | Prog. 1 | Prog 2 Prog 3……. Prog 30 |
| Tolerance No. | Tol No. 1<br>T1, T2, T3 & Td tol.<br>Shift limit value<br>Auto Tol values | Tol 2 Tol 3……..……Tol 20 |

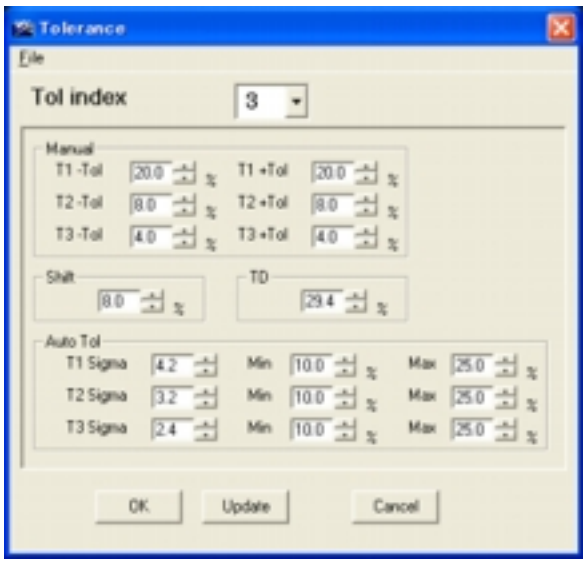
## 8.2 Tolerance change (2) tolerance edit in the tolerance table

You can set a special tolerance value in the tolerance table. Enter the parameter mode and select [2. Tolerance]. Chose the [Tol. Index] (tolerance number) and set suitable values in the menu pages. No.1 to No.15 tolerance numbers have default values. No.1 is the tightest tolerance, No.5 is standard, No.7 is a little rough and No.15 is the roughest tolerance. From 16 to 20 are reserved for free programming by users.

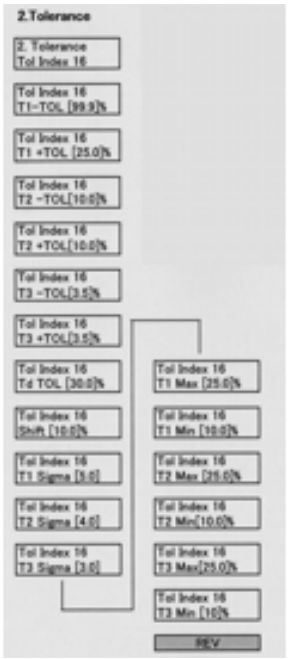
Standard values are set before delivery.

| Table tolerance | [Manual set] | | | | | |
|---|---|---|---|---|---|---|
| No. | Manual Tol. (%) | | | | | |
| | +T1 | +T2 | +T3 | TD | Shift | |
| 1 | 17.0 | 6.0 | 2.0 | 25.0 | 8.0 | |
| 2 | 19.0 | 7.0 | 2.5 | 25.0 | 8.0 | |
| 3 | 21.0 | 8.0 | 3.0 | 25.0 | 8.0 | ⇦ Tight tolerance |
| 4 | 23.0 | 9.0 | 3.5 | 30.0 | 8.0 | |
| 5 | 25.0 | 10.0 | 4.0 | 30.0 | 10.0 | ⇦ Standard |
| 6 | 26.0 | 11.0 | 4.5 | 30.0 | 10.0 | |
| 7 | 27.0 | 12.0 | 5.0 | 30.0 | 10.0 | ⇦ Rough at little |
| 8 | 28.0 | 13.0 | 5.5 | 35.0 | 10.0 | |
| 9 | 29.0 | 14.0 | 5.5 | 35.0 | 12.0 | |
| 10 | 30.0 | 15.0 | 6.0 | 35.0 | 12.0 | |
| 11 | 32.0 | 16.0 | 6.0 | 40.0 | 12.0 | |
| 12 | 34.0 | 17.0 | 6.5 | 40.0 | 12.0 | |
| 13 | 36.0 | 18.0 | 6.5 | 40.0 | 14.0 | |
| 14 | 38.0 | 19.0 | 7.0 | 45.0 | 14.0 | ⇦ Very rough |
| 15 | 40.0 | 20.0 | 8.0 | 50.0 | 14.0 | |
| 16 | | | | | | Free set by user |
| 17 | | | | | | |
| 18 | | | | | | |
| 19 | | | | | | |
| 20 | | | | | | |

[Tolerance Index table in ProMX]




[Tolerance set in Parameter of CFM]

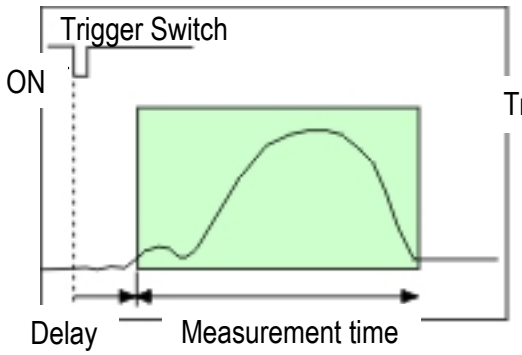


Auto tolerances

Calculating deviation of coming samples date in FIFO, standard deviation values at T1, T2 and T3 respectively are monitored. You can set a factor to multiply it and the standard deviation to form the + and – tolerance for T1, T2 or T3 respectively. The Min% and Max% are limits to prevent tolerance values go beyond the start level.

## 8.3 Delay and Measurement time [Switch Trigger] [Auto Meas. [OFF]]

"Delay" will adjust the measurement start time. Set the trigger switch near at the RAM bottom position and finally adjust the start time by setting "Delay" time from 0 to 10ms. Longer "Delay" Time is not recommended. Set the measurement time from 15 to 150ms. Short measurement time will bet a large force curve and long time will get a small curve.


Trigger

[Trigger and measurement mode]
AUTO → Auto Measurement only
Delay time cannot be set
→ Switch → Auto Measurement ON
Delay time cannot be set
Measurement time set automatic
→ Auto Measurement OFF
Delay time can be set
Measurement time can be set

## 8.4 Full curve and half curve measurement

Almost crimp data errors happen in the first half part of the crimp force when the crimper goes down and apply force to crimp wire strands and insulators with conductor and insulation barrels. And error will not happen when the crimper is to leave from the lower dead point. Therefore, if you want to control the error more precisely, select the "half-curve" measurement.

Half curve: 24ms
Delay: 0ms

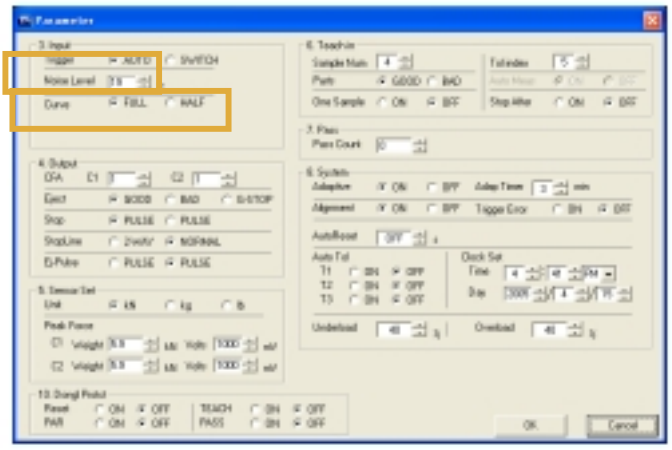
[Switch trigger]
[Auto Meas. ON]

Full curve: 67 ms
Delay: 7ms

[Switch trigger]
[Auto Meas. OFF]

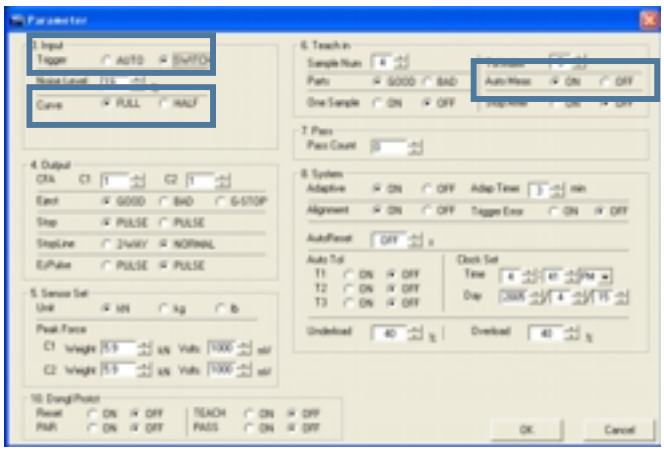
Auto trigger mode can select only the automatic measurement mode.

And Auto trigger mode can select Full or Half curve mode.



Switch trigger mode can select the automatic measurement mode. And it can select Full or Half curve.

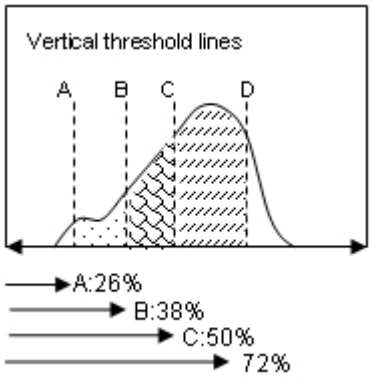
However, if it should select as [Auto Measurement OFF], you have to set the delay and measurement time manually.



## 8.5 THD: Threshold lines

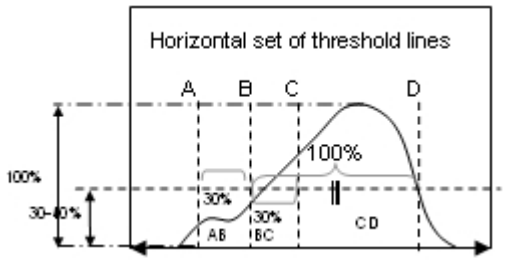
To increase measurement accuracy, area is divided to 3 areas, T1, T2 and T3. Dividing lines are called as THD (threshold) lines. There are two possible ways to set THD lines.

HORI: Horizontal set of threshold lines
VERT: Vertical set of threshold lines




The whole x-axis 100% wide, and A to D lines are addressed by percentage (00%) in this coordination. Left edge is set as 0% and the right one is 100%. In this case you have to understand the force curve size before drawing A – D lines. For example, you have to monitor the force curve on ProMX before teach-in.

HORI: Horizontal set of threshold lines
VERT: Vertical set of threshold lines




Taking the force curve's height peak as 100%, draw a horizontal line at its 30-40% height. Next, taking the curve crossing points at left and right, whose width is counted as 100% long. Then stretch 30-35% to the left from the left crossing point and draw a vertical line, which is A line. And stretch 20-30% to the right from the left crossing point and draw a vertical line, which is C line. Draw a vertical line at left cross point, which is B line. Draw a vertical line at the right cross point, which is D line.

THD [HORI]

THD Level 50%
Area T1 30%
Area T2 30%

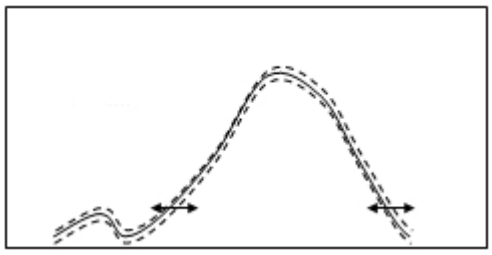
The advantage of the horizontal THD: you can set A – D lines suitably regardless curve size.

## 8.6 Peak Alignment

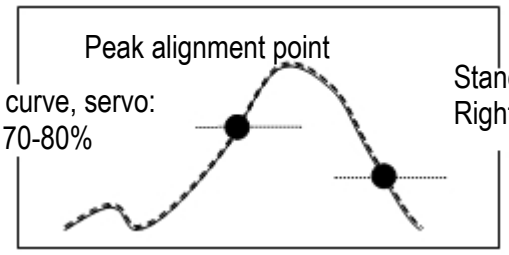
Force curves may drift slightly left and right. We recommend setting the peak alignment as [ON].
For full curve monitor of mechanical press, set the alignment at 30-35% of the right side.
For half curve monitor or curves of servo press, set the alignment at 70 to 80% of the left side.

Alignment
Left ○ Right
Align at 75 %

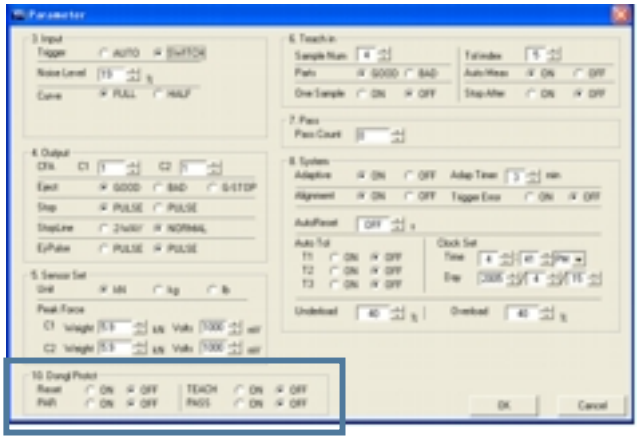
(First, set Alignment ON in 8. System of Parameter)



Force curves are likely to drift slightly, which affects measurement.




## 8.7 Dongle Setting

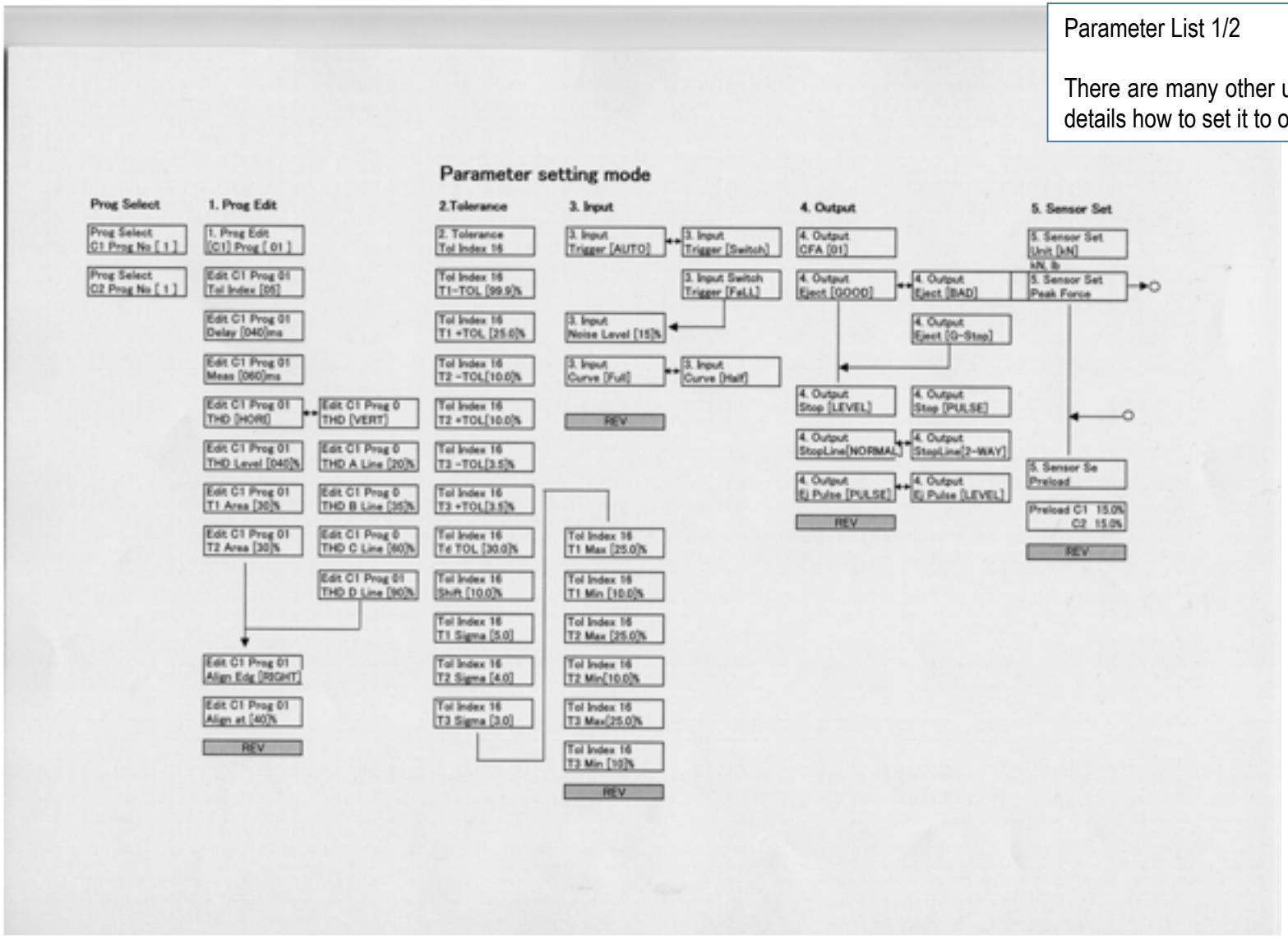


With the dongle key, you can program what function should be protected. For example, make RESET and TEACH as □ OFF to prevent Pass and Parameters.

# 9 Parameter List

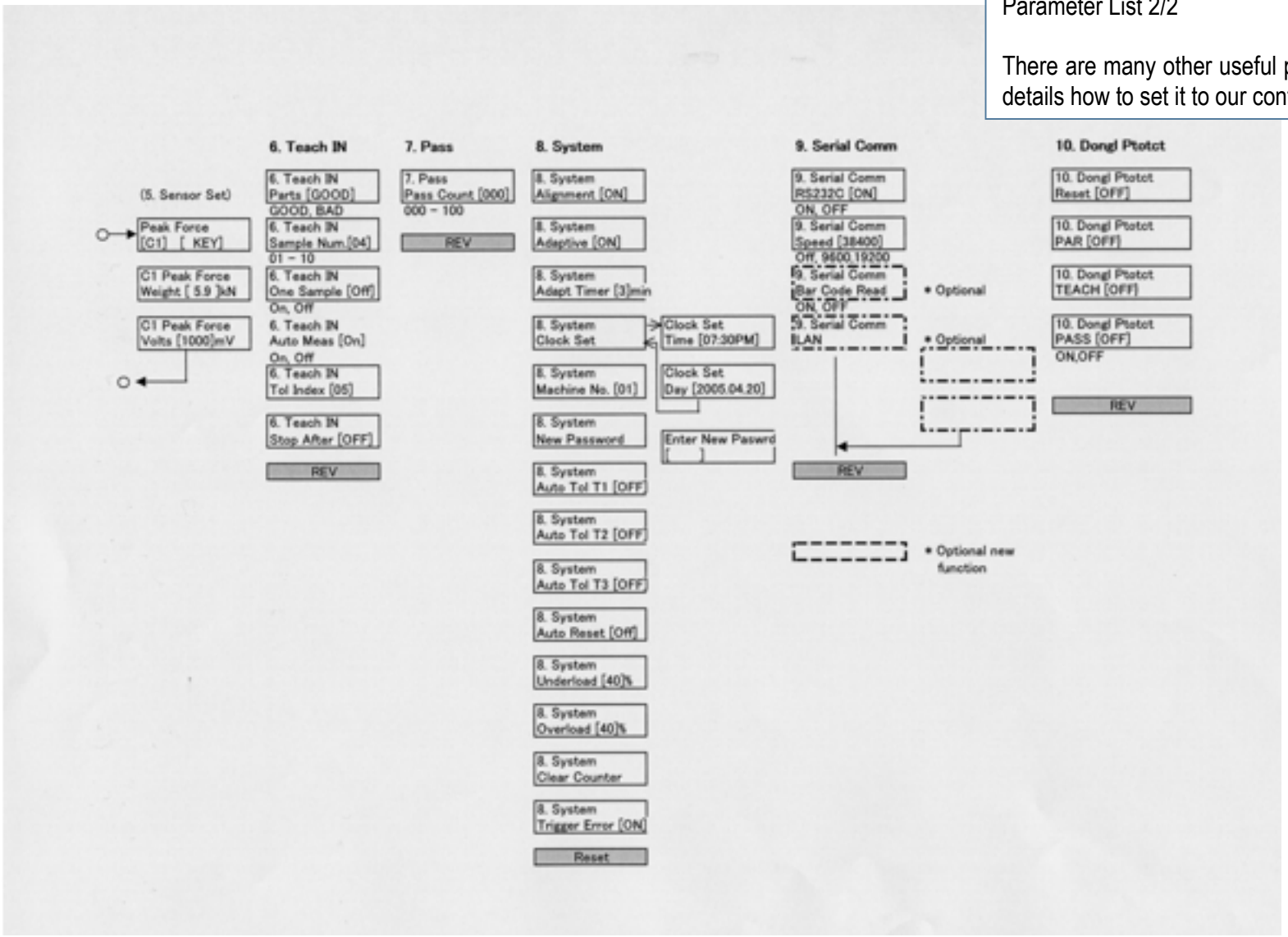
Parameter List 1/2

There are many other useful parameters. Ask details how to set it to our contact



Parameter List 2/2

There are many other useful parameters. Ask details how to set it to our contact



# 10 CE – Declaration of Conformity

CE

EG – Konformitätserklärung
*EC-Declaration of Conformity*

| | |
|---|---|
| Die Firma:<br>The Company: | Mecal S.r.l.<br>Strada per Felizzano 18<br>15043 Fubine (Al)<br>ITALY |
| Produktbezeichnung:<br>Product | Crimpkraftüberwachung<br>*Crimp Force Monitor* |
| Typenbezeichnung:<br>Type: | CFM-MX10N; CFM-MX20N<br>*CFM-MX10N, CFM-MX20N* |

Das bezeichnete Produkt erfüllt die Bestimmungen der Richtlinie:
*The above mentioned product complies with the regulations of the directive and a mendments:*

89/336/EWG und 73/23/EWG

„Richtlinie des Rates zur Angleichung der Rechtsvorschriften der Mitgliedsstaaten über elektromagnetische Verträglichkeit."
*„Directive of the European Council for approximation of the law of the EEC members about electromagnetic compatibility and low voltage."*

durch Einhaltung folgender Normen:
*by adhering to the following standards:*

EMC:

EN 55022 (Class A):
Funktionseigenschaften, Grenzwerte und Prüfverfahren
*Emissiontest (Class A)*

EN 50081-2/CISPR 16 (1977):
1. IEC 801-2: Electrostatic Discharge
2. IEC 801-3: Radio Frequency, Electromagnetic Field
3. IEC 801-4: Fast Transients, AC Power Ports and Signal cables

EN 60204-1 (VDE 0113-1): 1998-11
Sicherheit von Maschinen; Elektrische Ausrüstung von Maschinen,
Teil 1: Allg. Anforderungen
*Machine Guideline*

Diese Erklärung wird verantwortlich abgegeben durch:
*This declaration is submitted by:*

(Ort, Datum)
*Place, Date*

Geschäftsführer
*General Manager*