IMPAX-SK 4

Process Monitoring System

08/2001
Technical details are subject to change without prior notice.

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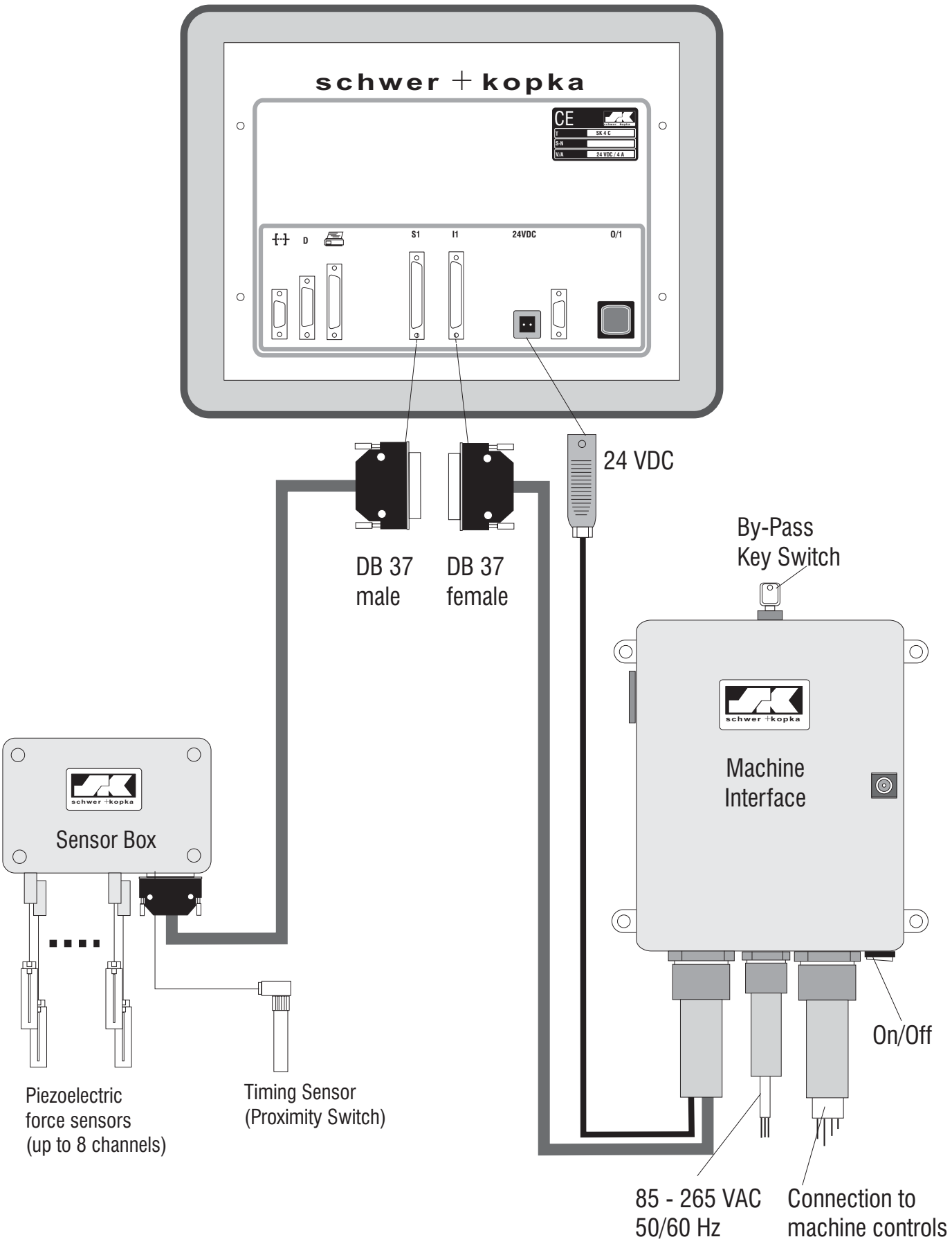
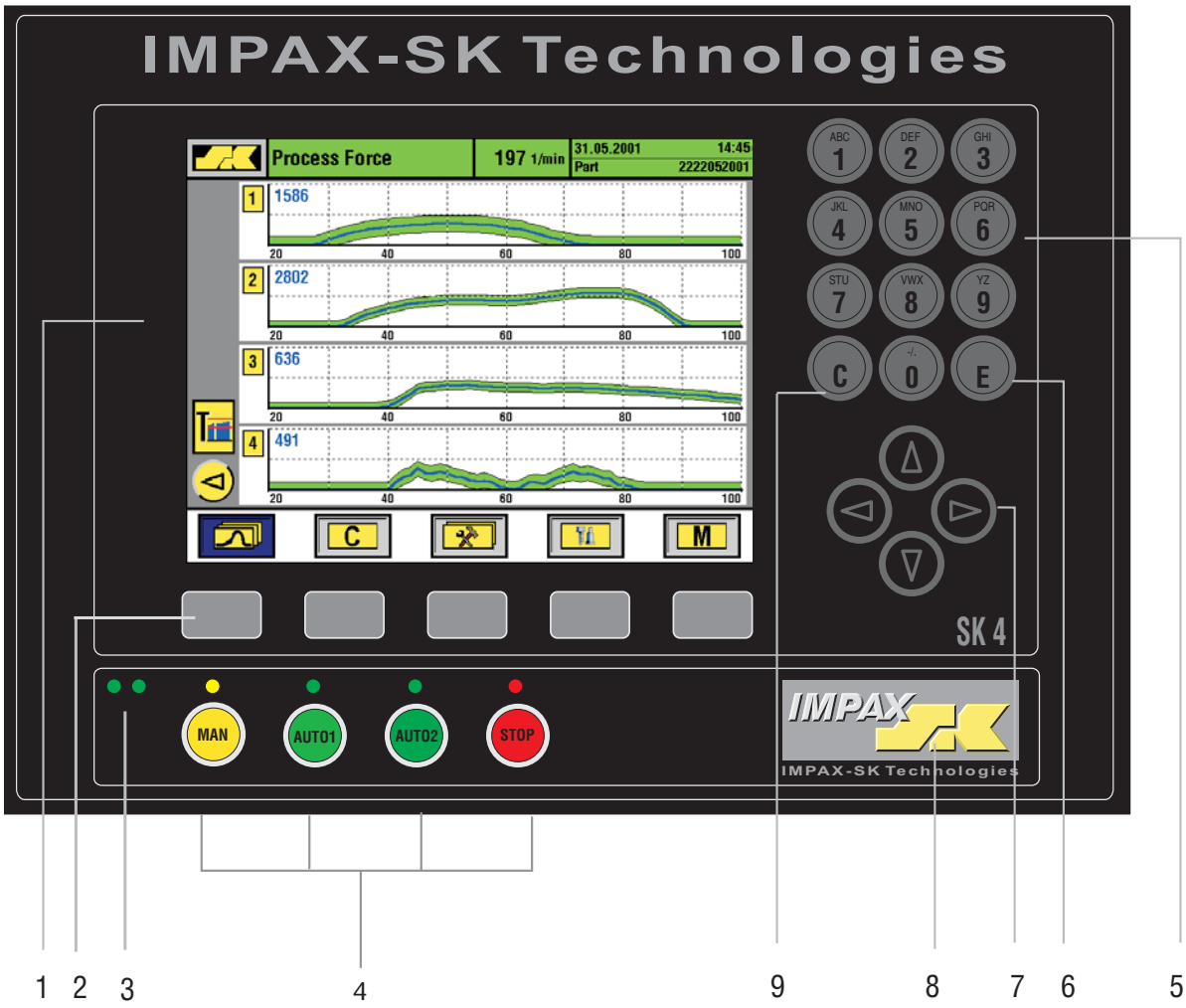
Contents

NOTE: SKROLL*master*® is only applicable to flat die thread rolling machines.

Please note that some of the features described in this manual are optional and/or may not be available for all models or applications.
Technical details are subject to change without prior notice.


schwer + kopka
CE
SK 4 C
24 VDC / 4 A
D
S1
I1
24VDC
O/1
24 VDC
DB 37
male
DB 37
female
By-Pass
Key Switch
Machine
Interface
Sensor Box
On/Off
Piezoelectric
force sensors
(up to 8 channels)
Timing Sensor
(Proximity Switch)
85 - 265 VAC
50/60 Hz
Connection to
machine controls

Front Panel



1. 10.4" Color LCD Display

2. Function selection keys (5)
   (current function is shown at screen bottom)

3. Timing signal indicator lights 1 and 2

4. Operating mode selection with indicator LED:
   - MAN - mode (manual/set-up)
   - AUTO 1 - mode (normal shift)
   - AUTO 2 - mode (after hour shift)
   - STOP (machine is switched off)

5. Numerical keypad 0 - 9
   (and optional alphanumerical entries)

6. Enter key (E-key)

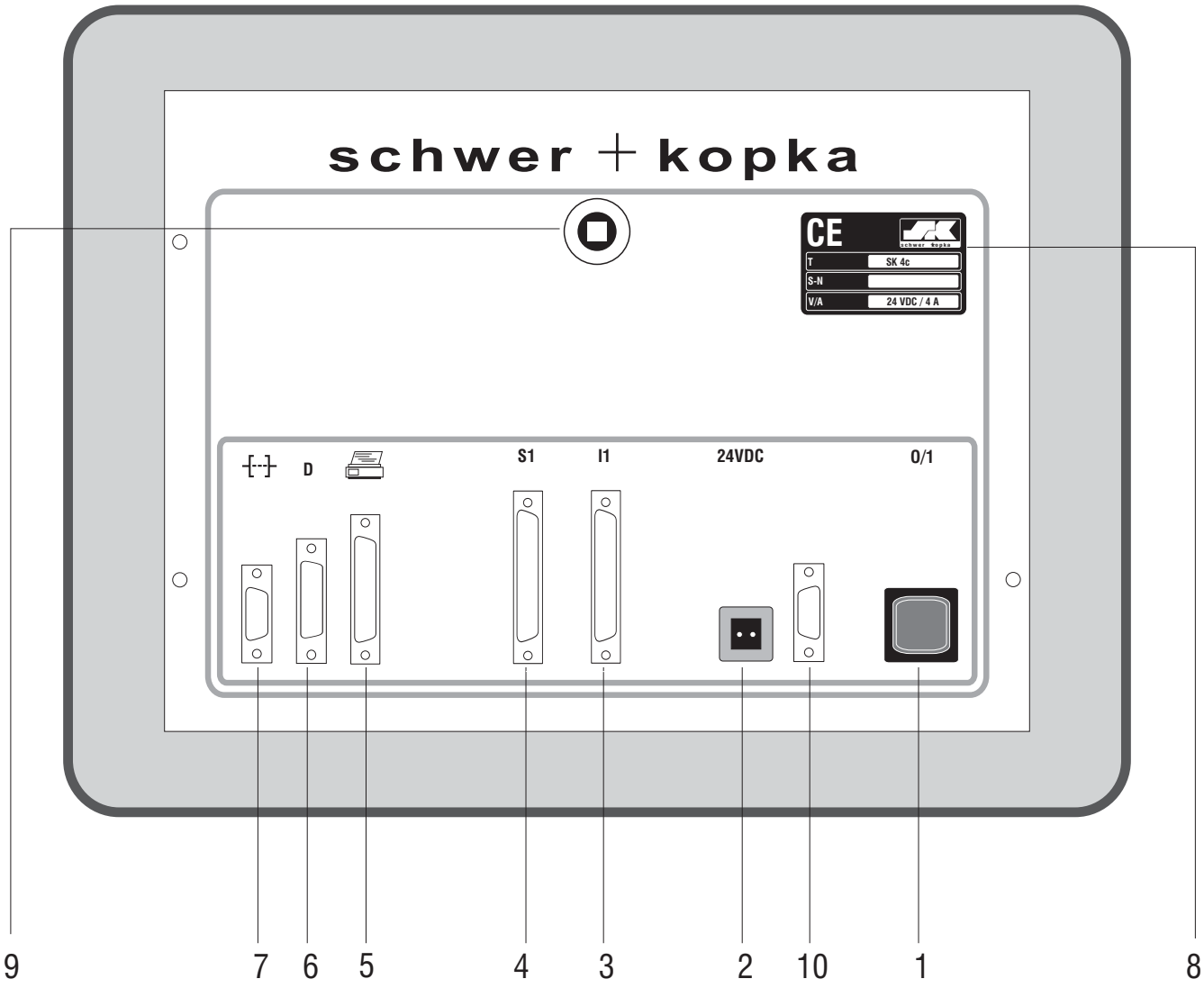
7. Cursor Keys

8. Key depressed together with MAN Key to allow changing the sensor timing window.
   Enter new start value and Press E-Key
   Enter new end value and Press E-Key

9. C-key (Clear/change display mode, etc.)

How to set Screen Contrast/Brightness (for <u>STN screens only</u>):
- press **M**
- press ◑
- press **1** to brighten, press **2** to darken, or press **3** for standard setting of screen contrast

Rear Panel



1. On/Off switch
2. Power Supply connector 24VDC
3. Connecting socket for Sensor Cable (S1)
4. Connecting socket for Interface Cable (I1)
5. Printer port (parallel interface)
6. Diagnosis socket
7. Serial port (RS 232)
8. Name plate
9. Rear panel lock
10. Ethernet-Port (optional)

Start (switching the system on)

The I**MPAX-SK 4 monitoring system** is switched on via the On/Off push button located on the rear panel. Please note that the machine interface must also be switched on via it's On/Off switch in order to obtain power. It is recommended that an isolated voltage supply be used with the system. *In all cases, the IMPAX-SK 4 system should be supplied with continuous power with a battery backup system. The IMPAX-SK 4 power source should not be interrupted if the main machine supply switch is powered off.*

After switching the unit on, the following will appear:
- set-up mode is on (unit is in MAN-mode, yellow LED is illuminated)
- the display turns on. For a few seconds, a test screen with the SK-Logo will appear. After that, the force display screen will come on (without force curves at this point in time because the machine is still off).

Now, you can start the machine. The display will show the measured force curves and you can start monitoring these by switching the unit into AUTO mode.

Selecting the different functions

Just below the LCD-display you will find 5 function keys which provide a very simple way of operating the system. The current function of each key is shown in the symbol box on the bottom line of the display just above the keys. The currently selected function is also highlighted by the blue colored symbol box.

Screen layout

Many features and operational steps are similar on the different screens. These are briefly explained below using the example of the multi-curve screen:

The upper left corner describes the currently selected function screen. When in STOP, this line turns red. The reason why the machine stopped is given.

The background color changes with the selected operation mode:
- yellow: set-up (MAN)
- green: automatic mode (AUTO)
- red: machine is in STOP

This area always shows current machine speed in strokes/minute

Current date and time

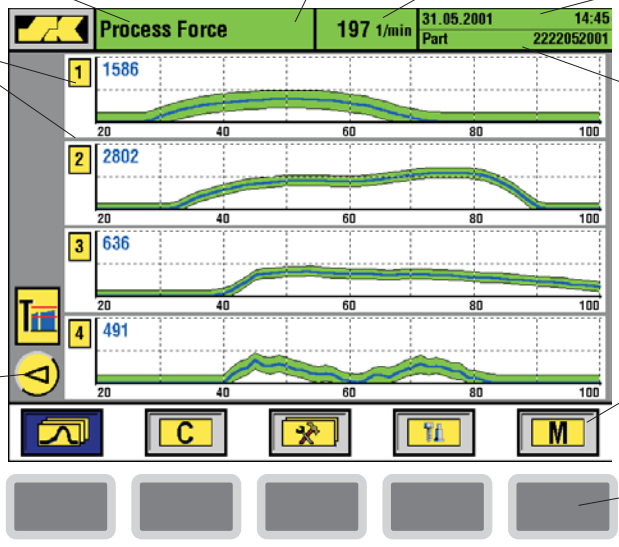
Shows current part number if unit is equipped with part data memory

Pressing the channel number on the keyboard will give an enlarged view of that channel

If machine has more than 5 channels press the up/down cursor key to advance to other channels

Change to trending screens

Pressing the E-key will switch from refresh-mode to overwrite-mode



The symbol box indicates the current function that can be started by pressing the function key underneath

Selecting operation modes

The different operation modes are selected via the mode keys on the front panel, or via the supplementary MAN and AUTO buttons provided on the DUPLO remote control box. The operation modes include functions such as set-up mode or automatic mode for regular or unmanned shifts. The LED's above each mode key indicate which mode is currently running.

MAN mode (set-up)

The MAN mode does not actively monitor the process. However, the unit registers and displays the force signals to help the operator set up the machine. The MAN key can be pressed after a STOP to release the stop relays. In this case, the system will learn new envelope limits after it enters AUTO mode. The time spent in MAN mode can be limited to an adjustable number of strokes after which the unit will switch into AUTO mode by itself (adjustment is done within the set-up menu). If wanted, the system can be set so that it re-uses the previous envelopes without relearning. In this case, after a STOP condition, the system should go directly into AUTO mode.

AUTO1 mode

Pushing the AUTO 1 key will start the monitoring mode. The unit is immediately active after pressing the key. The system either starts learning new limits (if you first pressed the MAN key, then AUTO), or returns to the previous envelopes (if you went straight to AUTO from STOP). In the second case, the unit will wait for a few machine strokes before it resumes with the previous envelopes to allow the machine to reach consistent speed. The envelope monitoring limits are dynamically updated and matched with the process variation. Counting of good parts begins. Every impermissible deviation of the process curve signal will cause the unit to react.

AUTO2 mode

AUTO2 mode offers the same functions as AUTO1, but is used when running unmanned shifts. In addition, the AUTO2 parts counter provides a separate count for parts made during AUTO2 mode. When stopping the machine during AUTO2, the unit fires the separate EMERGENCY-STOP relay that switches off the machine entirely (AUTO1 mode will only fire the MOTOR-STOP relays).

STOP

The STOP light comes on every time the unit has switched off the machine. In addition, a machine stop can be initiated by pushing the STOP key manually. The unit always will prompt a stop message on the display to identify the reason for switching the machine off.

If the red LED flashes, this indicates that the monitoring system was put into BYPASS by the key switch located on the machine interface box. The system will continue to operate normally, however **none of the relay functions will be active.**

Envelope monitoring

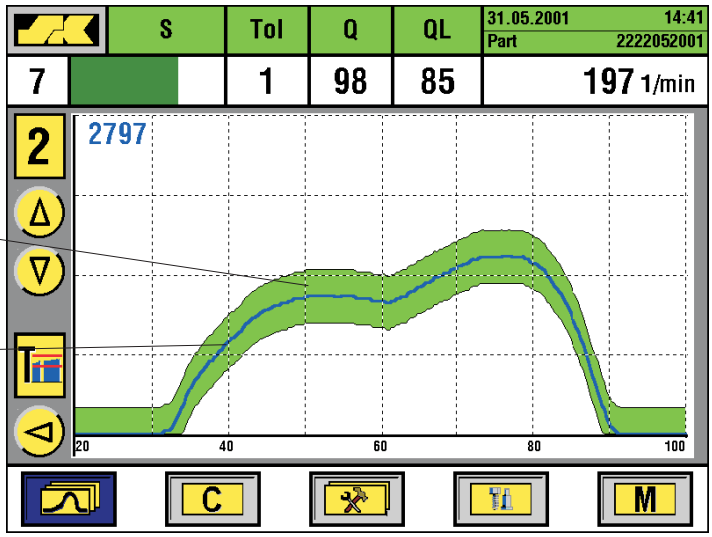
The envelope monitoring technique scans the entire force wave form from start to finish (as determined by the established timing window). Each point scanned is compared to a previously memorized "good parts wave form" by using the upper and lower envelope threshold curves. These are automatically established by the monitoring system each time it is put into AUTO-mode.

Envelope display

Pressing the Curve function key will display the force wave form together with the envelopes. The display shows either multiple-curves (up to 5 sensors at a time) or single curves representing one sensor only. Channel selection from one sensor to another is made by simply pressing the number of the channel you wish to see.

Changing from multiple to single curve presentation and vice versa is initiated by pressing the Curve function key, or by directly pressing the number key for the desired channel. If the monitor has more than 5 channels, use the up and down cursor keys to change the channel displayed.

Single curve



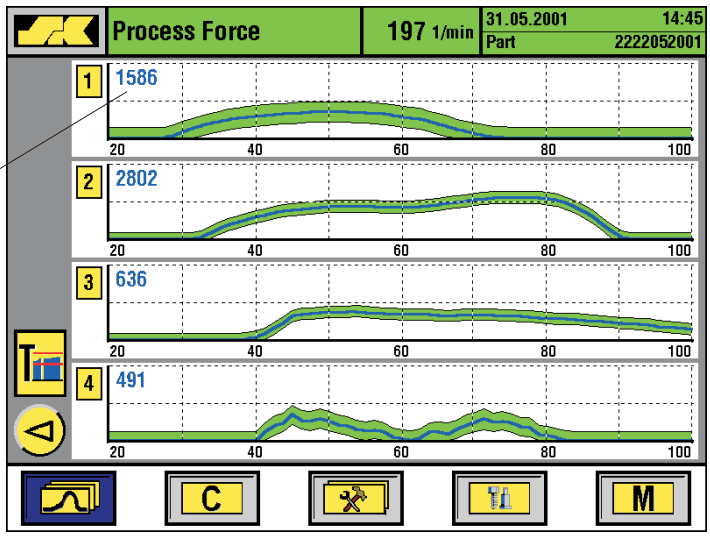
Envelope band (green)

Current force (blue)

Shown while single curve display is active:
S: Sensitivity
Tol.: Tolerance
Q: Q-Factor
QL: Q-Limit

To alter any of the settings press the **C**-key once, then change the numbers, and confirm by pressing the **E**-key

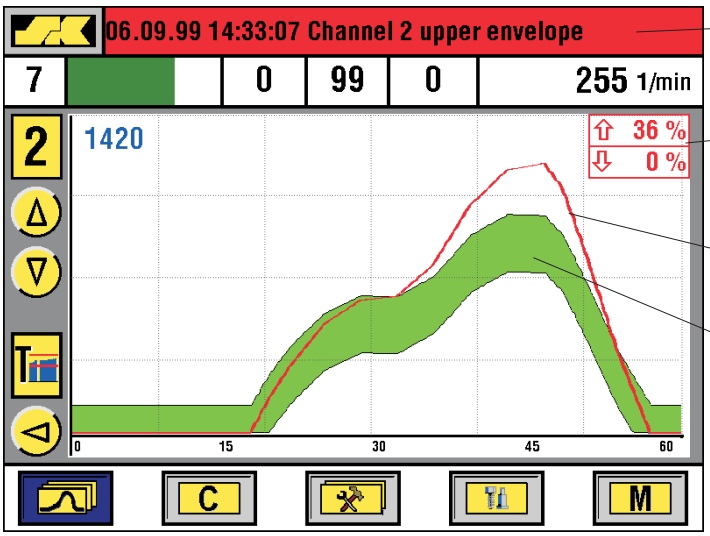
Multiple curves



This number (in millivolts) indicates the peak reading of the signal for the last stroke

Machine stop with envelope error

If a channel's force curve exceeds the upper envelope curve or drops below the lower envelope, the monitoring system will immediately initiate an appropriate stop action. The LCD screen automatically switches to the single curve display of the channel in question making it easy to locate the error. The red LED right next to the STOP-key is lit as well as an external warning lamp that may have been connected. The reason why the machine was stopped along with a date and time stamp for the error are displayed in the red portion at the top of the screen.



Restart after Stop

After stopping the machine due to a force error, it is necessary to determine and to eliminate the cause of that error before you restart production. This prevents the system from learning an improper setup and establishing ineffective control limits. Once this has been done, one of the following procedures should be performed.

Press the MAN-key once to unlatch the Stop-relay(s) which allows you now to jog the machine over. Alternatively, you can press the AUTO-key (if your unit is programmed to re-use the previously established envelopes).

Restart the machine after confirming that the cause of the error is eliminated. Then press the AUTO-key to switch the unit back into monitoring mode. The **IMPAX-SK 4** now calculates new envelope limits, or returns to the previous envelopes if you already pressed the AUTO-key (please refer to page SK4-06, selecting the MAN-mode).

In addition, the monitor will switch from the manual set-up mode (MAN) to automatic mode (AUTO) when it reaches the number of strokes it is allowed to run in MAN-mode (this number can be programmed within the Menu-section, accessible via the **M**-key). This feature prevents the machine from running for long periods of time without going into monitoring mode.

Adjusting monitoring accuracy

Sensitivity and Tolerance

The accuracy or precision of the enveloping technique typically is set automatically by the **IMPAX-SK 4** to match the stability and repeatability of each curve segment. Thus, it is not necessary to fine tune this any further through manual adjustments, however, the **IMPAX-SK 4** does provide the possibility to alter within a certain range the settings for "**Sensitivity**" and "**Tolerance**" individually for each connected channel.

Sensitivity (S) can be adjusted in steps from **1 - 9** (1=coarse, **9**=fine). The sensitivity setting has an effect on the basic width of the envelope which is the distance between upper and lower envelope curve. A coarse setting (= low sensitivity numbers) widens the gap between upper and lower threshold, while a fine setting (= high sensitivity numbers) narrows the gap down which represents a more precise control. Setting the sensitivity to "**0**" switches the monitoring off for this channel (no more envelope curves are being displayed).

The optional **SK**Profile*master* software (see page 31) provides a segmented envelope profile around the force curves (tight where needed; loose where necessary).

The **Tolerance** (Tol) setting determines how many consecutive force signal profiles outside the envelope are ignored or "tolerated" **before** the machine is stopped. Therefore, the tolerance setting prevents undesired machine stoppages caused by random or erratic force errors.

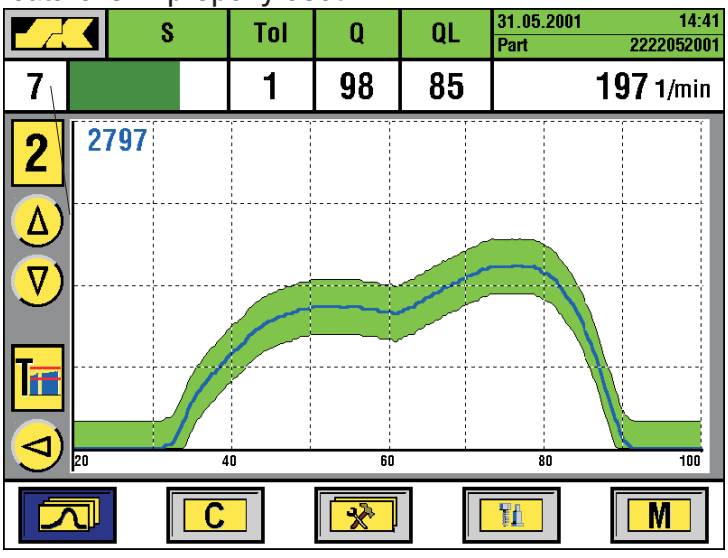
Tolerance can be set to values from **0 - 9** with the following meanings:

0: No force signal errors are tolerated. The first "out-of-limit" force signal will stop the machine.

1: One "out of limit" force signal is tolerated. If it is followed by another "out of limit" force signal, the machine stops

9: 8 consecutive "out-of-limit" force signals will be tolerated. The 9th "out-of limit" force signal stops the machine.

NOTE: Use of tolerances should be scrutinized carefully. Remember, an input essentially bypasses the machine for the number of tolerances entered. Serious damage to tooling could result if this feature is improperly used.



How to alter **S** and **Tol**:

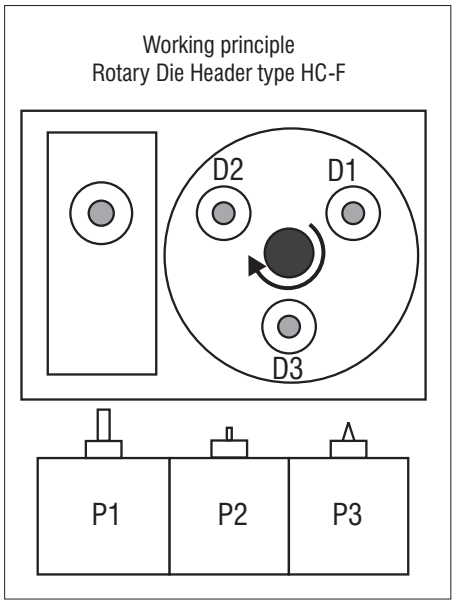
- switch to the desired sensor channel
- press the **C**-key on the keypad (this switches into entry mode)
- the current value for **E** is highlighted in blue color
- enter your new number
- confirm by pressing the **E**-key
- the blue box moves on to **Tol.**
- enter your new setting
- confirm again with the **E**-key
- blue box will move on to QL (see next page)
- confirm again with the **E**-key

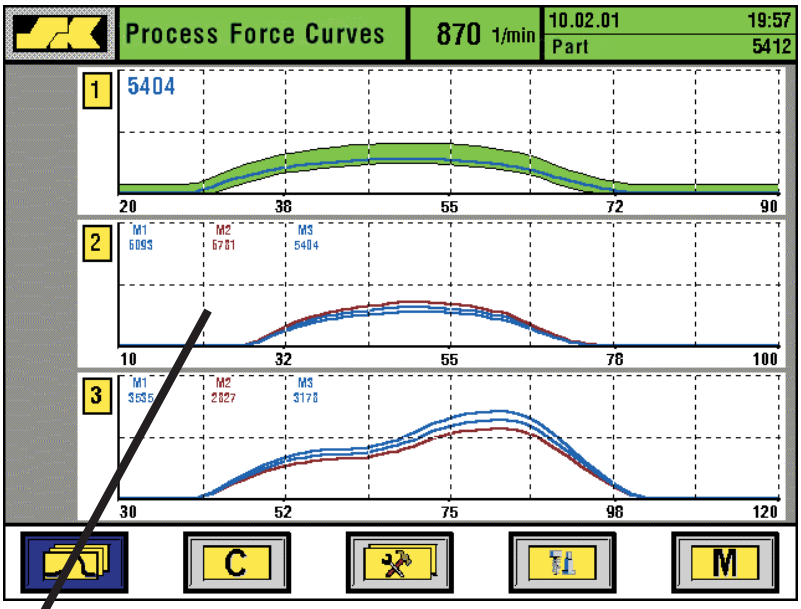
Special software version for machines with rotary die holders

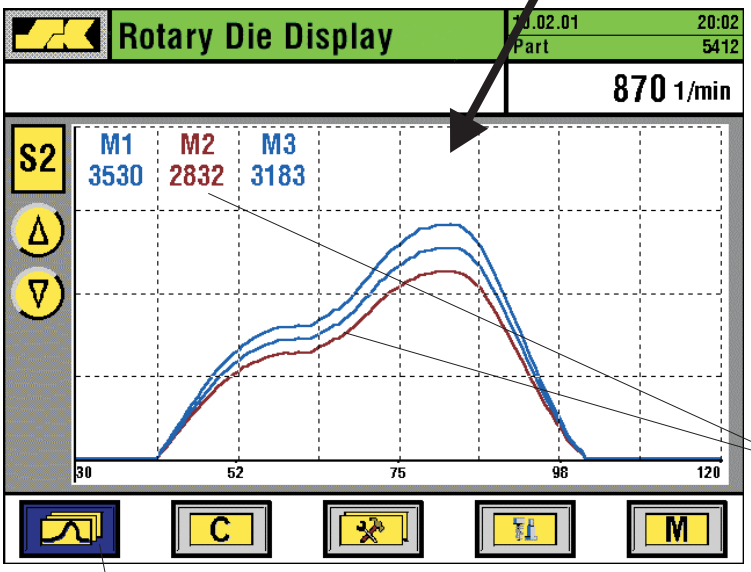
Single die combo monitoring with the ROTDIE II system

The optional ROTDIE II package for rotary die machines provides separate monitoring channels with individual envelopes for every individual punch/die combination. If desired, each combination can even be given separate monitoring sensitivities. In addition, the combination showing the biggest deviation from the average wave form will be identified and marked in red.

The following example is for a machine type HC-F (Hilgeland) with one fixed die in the first station , and a rotary die holder with 3 dies on stations 2 and 3:







To view the curves for another punch, please press again the function button **multiple curves**.

<u>For detailed information for all individual punch/die combinations:</u>

- Press the desired channel number 1 - 3 from the multiple curve screen shown above. The combination showing the biggest deviation is shown in red

<u>Setting of Sensitivity, etc.:</u>

- Press the number of the desired die (1 - 3) from the screen with the details of this punch shown on the left to call up the individual die graph where you can set your parameters

The combination with the biggest deviation from the average is shown in red (here it's die 2)

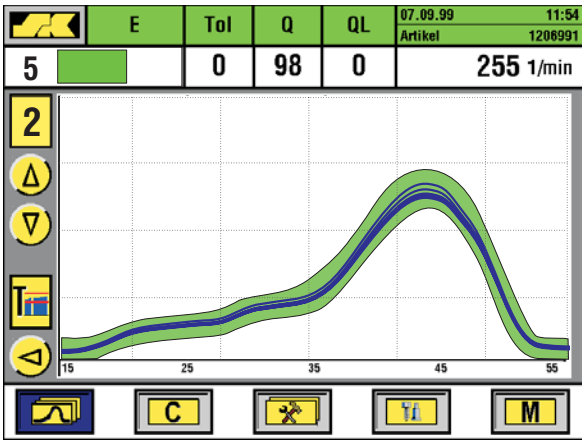
Q-factor (process stability / process quality)

The Q-factor is an indicator which expresses the stability or repeatability of the forming process from stroke to stroke as a percentage number. A low Q-factor (e.g. less than 80%) would result from a very unstable process where the forming force curves are changing significantly from stroke to stroke. As a consequence, this would lead to fairly wide envelopes with little sensitivity. Subsequently, this could also have an adverse effect on the dimensions of the produced parts.

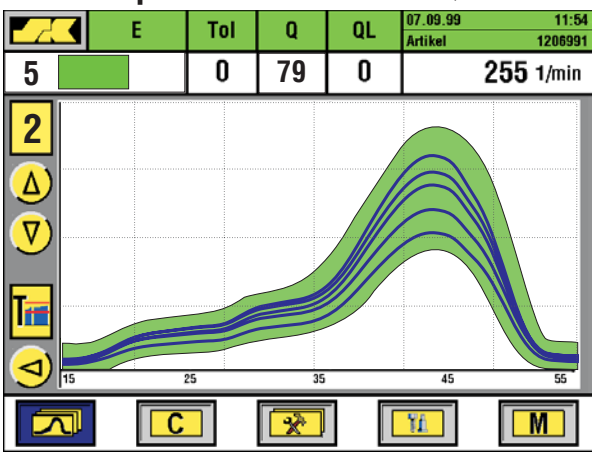
Alternatively, a calm and stable process will produce high Q-readings of e.g. 98% or better indicating the high degree of repeatability. Such a process can be monitored very closely with tight envelope curves.

A separate Q-factor is being calculated for every sensor channel, and is shown as **Q** on the single curve screen for this sensor. In addition, you can program a limit value **QL** which allows to set a required minimum Q-reading. If the current Q-factor drops below your desired minimum (e.g. because of an unstable forming process caused by poor material quality or other inconsistencies), the machine can be stopped.

Calm and stable process with a high Q



Unstable process with a lower Q-factor

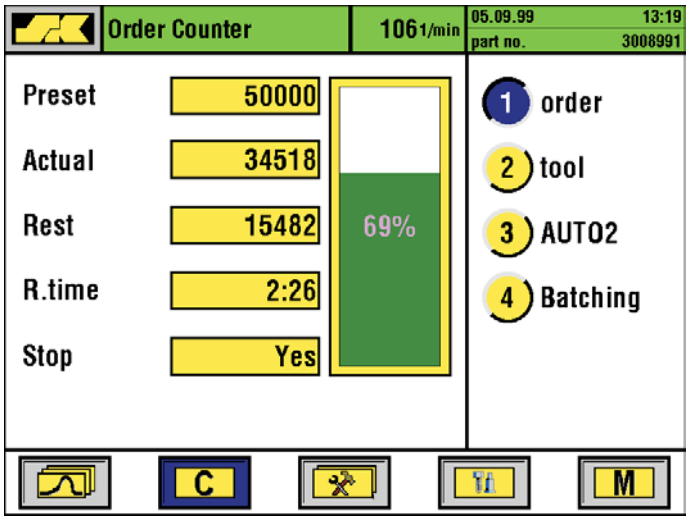


How to set **QL** (Q-Limit)

- select the desired sensor channel
- press **C**-key on the numerical keypad
- press **E**-key twice to skip the entries for Sensitivity and Tolerance until you reach **QL** (old **QL**-value is now in blue)
- enter your new **QL** setting
- press the **E**-key to confirm

Pressing the E-key will switch from refresh-mode to overwrite-mode so you can see the consistency of the process.

The **IMPAX-SK 4** monitoring system provides four (4) different part counters for order size, tool life, unmanned shift (AUTO2-mode) and batching. The counter section is called up on the screen by pressing the **C** function key below the **C** function symbol. Changing from one counter to another is done by pressing the related numerical key **1**, **2**, **3** or **4**. The number and designation of the actively displayed counter is highlighted in blue (e.g. **1** in the graph below). Each counter's display shows the preset quantity, the number of parts already made, the remaining quantity, and the remaining running time needed to reach the target count (provided the machine keeps on running at current speed). The green bar graph on the right side of the display tells you which percentage of the preset quantity has been completed already.



How to set the counter

Press the **C**-key on the numerical keypad (on the right of the display) to switch into entry mode (color of the preset count box changes to blue). Enter the new quantity, check the display to be sure you have typed in the correct number, and confirm with the **E**-key. The made-count automatically resets to zero, and the green percentage bar drops down to zero. You can also enter a different quantity for the made count. This allows you to preset a made count (e.g. if you have already made some parts for this order). You can also choose whether you want the machine to stop when it reaches the preset order size. Press any key on the numerical pad to switch between Stop="Yes" and Stop= "No".

Order size counter

The order size counter counts all good parts produced while running in AUTO1 or AUTO2 operation mode. If desired you can also add all parts made during MAN-mode to the order size count (see set-up section for programming this). When the current count reaches the preset order size, the machine can be stopped in order to prevent over runs.

Tool life counter

The tool life counter counts all parts being made during MAN, AUTO1, and AUTO2 mode (basically all modes which consume tool life). The tool life counter is typically used to stop the machine at regular intervals for tool changes or, if you wish, other kinds of regular checks (e.g. periodic adjustments, inspections, maintenance, etc.).

3 AUTO2-counter

The AUTO2-counter works just like the previously described order size and tool life counters. It counts all parts made while the unit runs in AUTO2 mode. This is in addition to the counts taken by the order and tool counters. The AUTO2 counter is typically used to count production and /or to limit running time for unattended shifts.

4 Batching counter

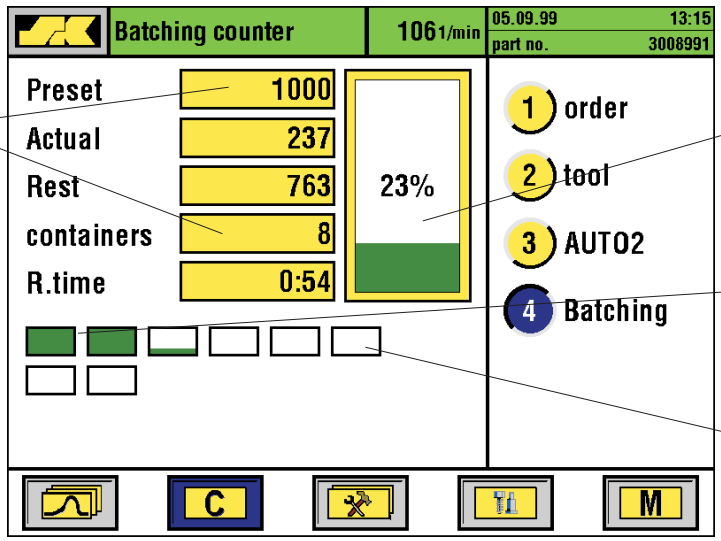
The batching counter is designed to control the function of an external batching unit. Such units prevent mass contamination by routing the produced parts into several consecutive containers. After a preset number of parts, the **IMPAX-SK 4** system will give out a pulse (standard pulse length is 1.5 sec) which is used to switch the batching unit to the next fresh container. When all available containers are filled, the MOTOR-STOP relay is fired to switch the machine off. The display indicates how many containers are filled already, and to what percentage the current container is filled. The remaining run time shows how much time is needed to fill all containers.

Pressing the **C** function key or the **C**-key on the numeric pad switches into entry mode ("preset" box color changes to blue). Enter your desired quantity per container and confirm with the **E**-key. Then enter the number of containers available on your batching unit (up to 18 possible). Confirm again with the **E**-key.

If you set the number of containers to "0" a batching pulse is given continuously after every filled container without stopping the machine at any number of filled containers.

The batching function is switched off when both, the preset quantity and the number of containers, are set to "0".

This example has a batching unit with a capacity of 8 containers at 1000 parts each



The currently loading container (number 3) is 23 % filled.

These 2 green containers are already full.

The 5 white containers are still empty.

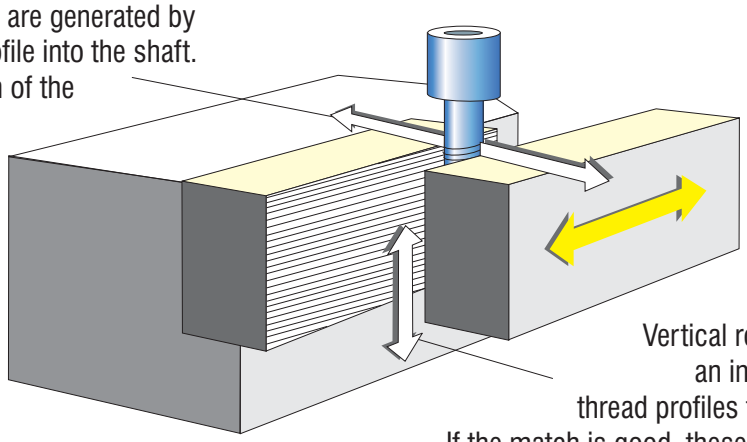
Setting up thread rollers using SKROLL*master*®

Thread rolling machine set-ups can be greatly assisted and facilitated by observing the wave forms of the different rolling force signals that can be measured horizontally and vertically. The **SK**ROLL*master*® feature has been developed to utilize the visual indication of the roll forces to perfect die set-up. (Not applicable to all roller types)

The horizontal (or radial) forces are responsible for “squeezing” the thread profile into the shaft. It is important that this wave form is evenly distributed over the length of the roll. Too much pressure at the start or at the end of the roll should be avoided. In addition, the force wave form should be free of excessive spikes or erratic movements and show as little variation as possible from part to part.

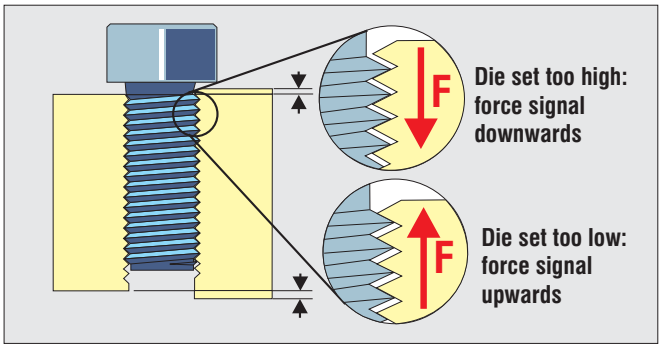
Vertical forces appear when both dies are not in perfect alignment to each other over the length of the stroke. Any “mismatch” between the two thread profiles formed by both dies will tempt the dies to move upwards or downwards against each other to get back into “balance”, depending upon if the adjustable die is set either too high or too low. It is important that these forces are as small as possible. Ideally, the vertical forces will be zero if there is perfect die alignment.

Horizontal (radial) roll forces are generated by the forming of the thread profile into the shaft. They indicate the distribution of the rolling work over the length of the dies.

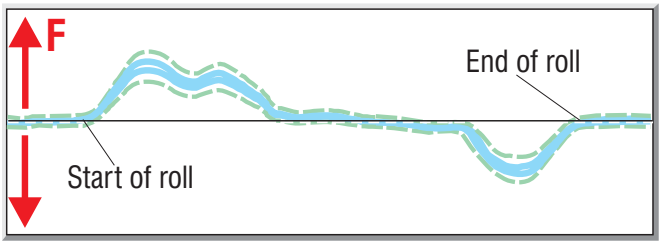


Vertical roll forces are caused by an improper matching of the thread profiles formed by the two dies. If the match is good, these forces are almost zero.

Vertical roll forces indicate poor die match:



The dies should be adjusted such that the vertical forces are minimum (at least this has been proven for symmetrical threads such as machine screw threads):



Setting up thread rollers using SKROLL*master*®

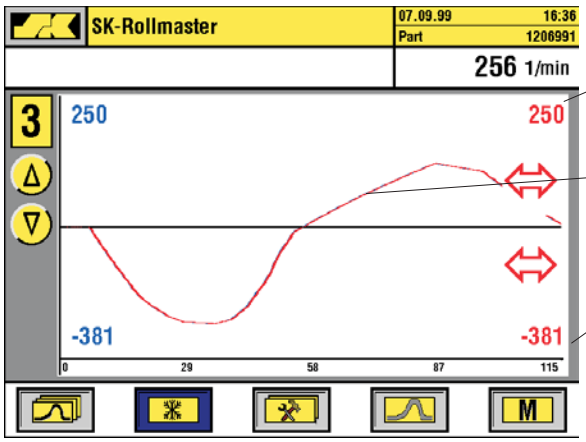
The **IMPAX-SK 4** offers a feature which allows for a very quick and easy comparison of the roll forces before and after correcting die set-up. To do this, please follow the steps below:

- Run the machine (with your initial set-up) and observe the wave forms of the forces. Leave the **IMPAX-SK 4** monitor in MAN-mode. Check if the force curves match the ideal profiles:
  - **Minimum vertical forces**
  - **Stable and consistent horizontal force**
  - **Uniform distribution of horizontal force over length of stroke**

- Press the “Snow Flake” function key. This will “freeze” the current wave forms you are running (frozen curves shown in red).
- Stop the machine and make the necessary tool adjustments.
- Re-start machine and watch how the new force signals (in blue) are different from the frozen red curves. The arrows on the right side now indicate the direction in which the forces changed. When looking at the vertical curves, arrows pointing towards the center line would indicate an improvement in set-up (vertical forces have become smaller). Conversely, arrows pointing away from the center line would usually indicate a worsening in set-up (vertical forces becoming larger).

This procedure allows you to watch step by step if your modifications to a set up improved die match or worked the opposite way. Best of all, all parameters can be checked at full running speed.

After freezing:

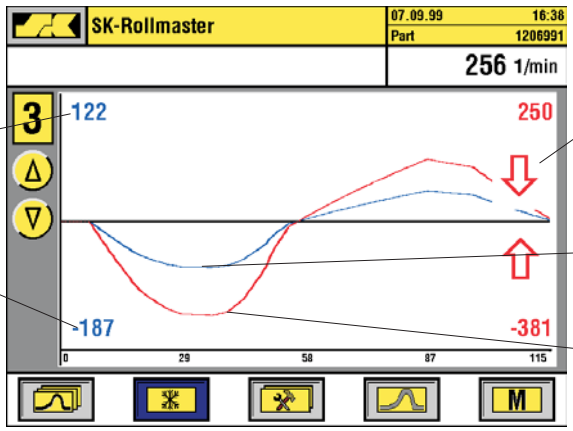


Memorized peak force value upwards (red)

Current setting “frozen” as a red curve

Memorized peak force value downwards (red)

After correction:



Current peak force value upwards (blue)

Current peak force value downwards (blue)

The arrows point the direction of change (blue vs red)

New curve (blue) showing the situation after changing the die set-up

Old "frozen" curve (red)

Header set-up assistance by "freezing" force wave forms

Setting up a cold forming machine properly is often a matter of uncertainty: Are the tools set so that the resulting forming force is sufficient, or are the parts incorrectly formed? Are all forming stations adjusted so that the loading is uniformly distributed, or are some stations critically overloaded? Would it be possible to form a good or even better part with less force which could even increase tool life? But how would one know if and by how much a set-up change improves the setting?

The **SK**Tool*master* system can help you optimize your machine set-up using simple steps. The system indicates if set-up corrections improve the setting, or if they make it worse. At a simple touch of a button, you can "freeze" the current force wave forms on your screen. After trying to improve the setting and restarting the machine, you can immediately see if the new force curves are better than the previous "frozen" ones. Generally speaking, it is advisable to produce a part with the least amount of force possible. Low forming forces are generally considered to be better for the machine and the tooling.

In addition, the shape of the forming force curves will tell you the progression of the metal deformation as it takes place between your tooling. You can also learn to spot unusual wave forms indicating improper settings or bad tooling.

Using **SK**Tool*master* to set up your machine

The **IMPAX-SK 4** can help you improve machine set-up. Try the following procedure:

Put your monitor in MAN-mode (yellow key) and let the machine run and produce parts. Watch the wave forms and compare with your previous experience. If you're not satisfied (e.g. higher force values in some stations, forming loads not properly distributed across the stations, erratic patterns, etc.) press the “snow flake”function key to “freeze” the current wave forms.

These are now shown in red on the screen while the blue lines show the forces of the still running machine. The blue colored “snow flake”function symbol indicates that frozen curves are in memory. They will remain "frozen" until you press the “snow flake” function key again (in MAN-mode; the key will turn back to it’s regular color), or you switch off the monitor.

Now stop your machine and make your desired adjustments.

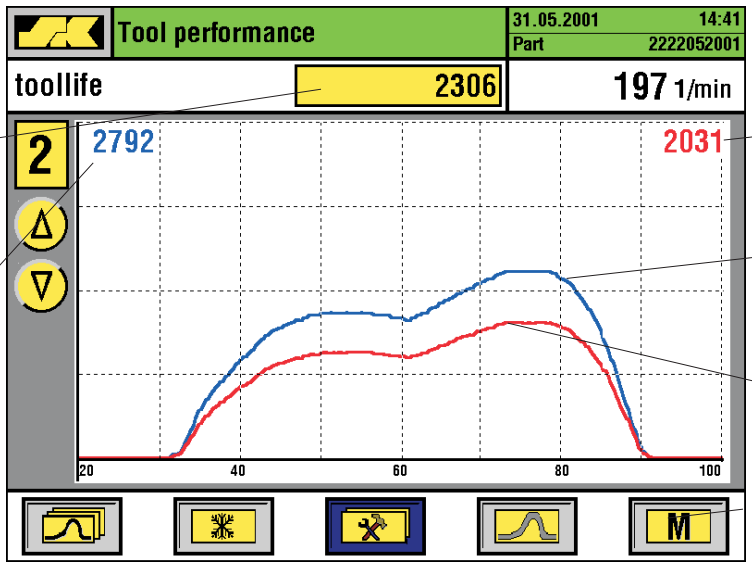
MAN

Re-start the machine and watch how the current force curves (blue) differ from the previous (red) force curves. In addition, you may also want to look at the digital peak force readings and the arrows pointing the direction of change.

The single curve picture shown below (top) has a situation where the new forces are higher than the previous ones. This would indicate that the adjustments increased the forces causing potentially greater problems (when we assume that lower forces are better for machine and tooling).

The procedure described here can help to improve the machine set-up step-by-step.

Single curve presentation



Counter keeps track of how many parts this tool has run since "freeze" of the reference force curve

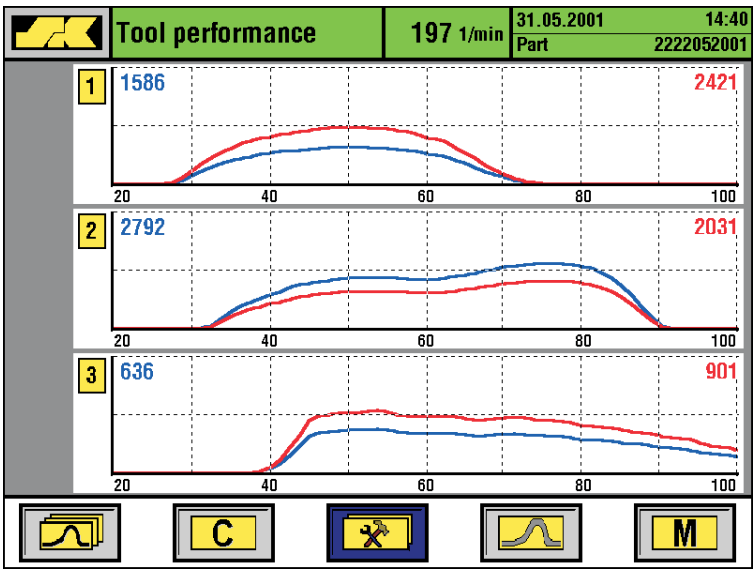
Peak force value after set-up change

Peak force value of old curve (red)

New curve (blue) showing the situation after set-up change

Old curve (red) before set-up change

Multiple curve presentation (example for 3 curves)



Channel 1: new force is lower than old one

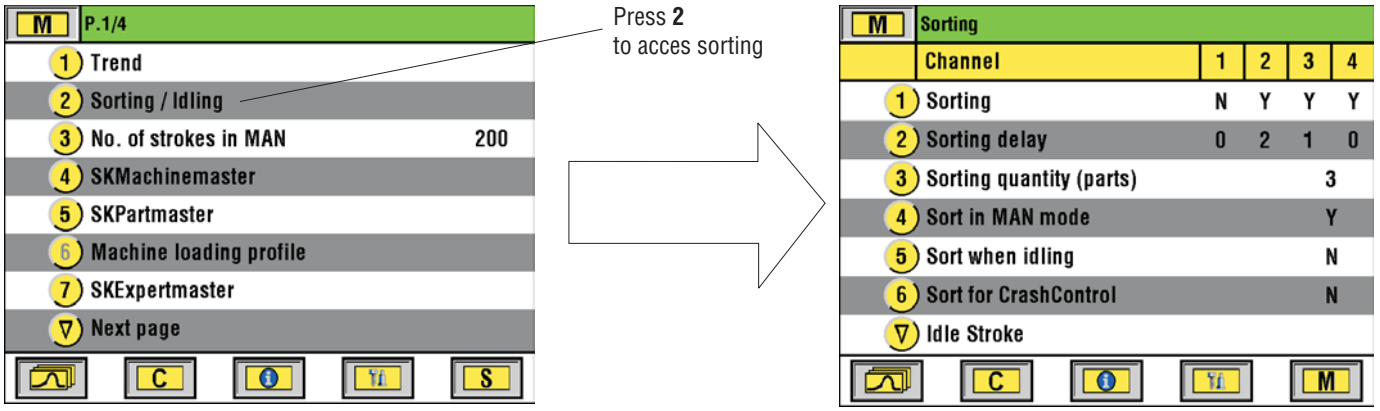
Channel 2: new force is higher

Channel 3: new force is lower

The sorting function

All **IMPAX-SK** process monitoring systems are designed to operate in conjunction with suitable parts separation devices such as gates or traps in order to separate any detected faulty parts from the previous good parts production. The **IMPAX-SK 4** unit will give a sort signal via its sort relay to open and close such devices. It is recommended that the machine be stopped at the same time so that the operating personnel can evaluate the type of defect and initiate possible corrective action. Alternatively, the machine may be allowed to carry on producing while randomly occurring defects are automatically segregated. The machine will only be stopped by the process monitor if too many consecutive process errors are detected(adjustable via the"**Tolerance**" setting, see page 09).

The settings for sorting can be found inside the menu section (accessible via the **M** function key)



Setting the sorting parameters

Press the numbered key to select the desired function. The related data field on the right side turns dark. Enter the desired number, or press any number key to switch between **Yes** and **No**.

1. Sorting (Yes/No):
Sorting function is active for this channel when set to "**Y**".
When set to "**N**" this channel is not used for sorting.

2. Sorting delay:
Allows you to delay the sort signal. This feature is useful in cases where the suspicious part needs some time to get to the actual sort position. The delayed signal prevents too many good parts from being sorted along with the bad one. The delay is entered in number of parts (or stokes).

3. Sorting quantity (parts):
Determines the number of machine cycles or strokes for which the sort signal will be given. This ensures that the faulty part has really passed the gate position. Any setting higher than 1 will sort one or more good parts along with the bad one which is generally recommended for quality control assurance.

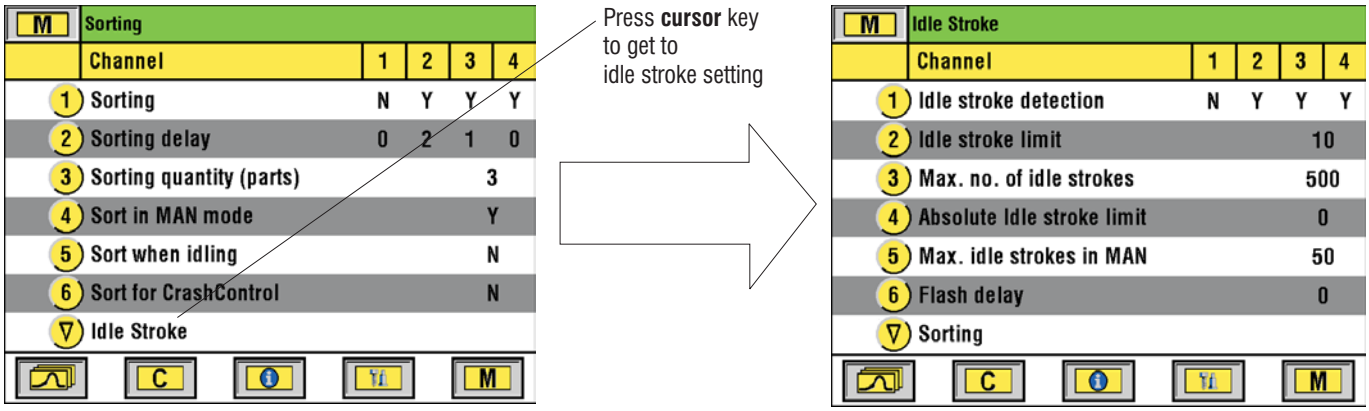
4 **Sort in MAN mode:** When set to "**Y**" the sort signal will be activated when the **IMPAX-SK 4** runs in MAN mode. All set-up pieces and non-monitored parts are sorted which prevents possible contamination.

5 **Sort when idling:** When set to "**Y**", the sort signal will be activated every time the process monitor detects an idle stroke. On some machines certain faults have very low force readings and may look like an idle stroke. Idle strokes, however, are typically allowed on these machines and would not prompt a sort signal. In such a case, the sort gate can be activated for safety reasons every time an idle stroke or a "would-be idle" stroke is detected. This prevents any parts (caught up in the machine frame) from vibrating free and contaminating a lot.

6 **Sort for Crash Control:** when set to "**Y**" the sort signal will be activated for every so-called crash-control stroke. These are machine strokes where due to feeding problems, or in case of detected short feeds, the forces are not monitored with their regular envelopes but are only checked for heavy overloads (crash). These potentially suspicious parts can all be sorted.

Idle stroke adjustment

Some machines tend to occasionally run idle stokes due to problems in feeding blanks down the feed rails. Normally, an idle stroke is considered to be a "fault", and the monitor would stop the machine. To prevent that, the monitor is capable of seeing the difference between an idle stroke and other faults, and can tolerate idling for a certain period of time. The machine will be stopped only if idling continues (e.g. when feeder bowls are empty). The following parameters can be set to tell the monitor what idle strokes look like:



1 Idle stroke detection

Allows you to select which channels will tolerate idle strokes. Set those channels to "**Y**".
In those channels where you don't want to allow idle strokes put a "**N**". Confirm your settings with the "**E**" key.

2 Idle stroke limit

Determines the limit for idles strokes as a percentage of the normal peak force reading. If a force reading is below the threshold, this stroke will be considered an idle stroke. The example above will see idle strokes if the peak forces are less than 10 % of the normal load.

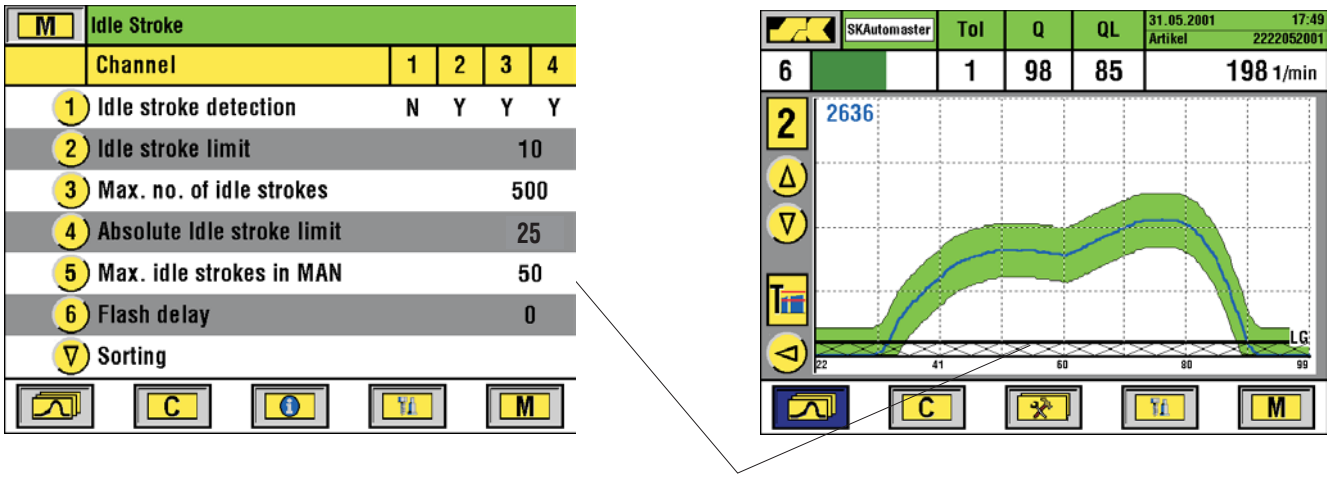
3 Max. number of idle strokes

Determines the maximum number of tolerated consecutive idle strokes before the machine is switched off (example above: 500 strokes). During this time, the optional warning lamp will flash to alert the machine operator of an unproductive machine condition.

4 Absolute Idle Stroke Limit (**SK**Single*master* option)

This setting will prevent very small force signals (peak lower than the set limit value) to be considered as valid force curves but to be treated like idle strokes. This feature ensures that idle stroke signals (important on thread rollers) are ignored during the “learning” process.

If your monitor is equipped with this option, the force curve display will visualize the set absolute idle limit as a shaded area.



Absolute Idle Stroke Limit

5 Max. idle strokes in MAN (0 .. 9999), Option **SK**Single*master*

Determines how many consecutive idle strokes will be accepted in MAN mode (only in conjunction with the function described at 4 above).

6 Flash delay

Determines when the optional warning lamp starts flashing in case of idle strokes (number of consecutive strokes after which the lamp starts). This feature prevents that the lamp flashes all the time in case of irregular no-feeds.

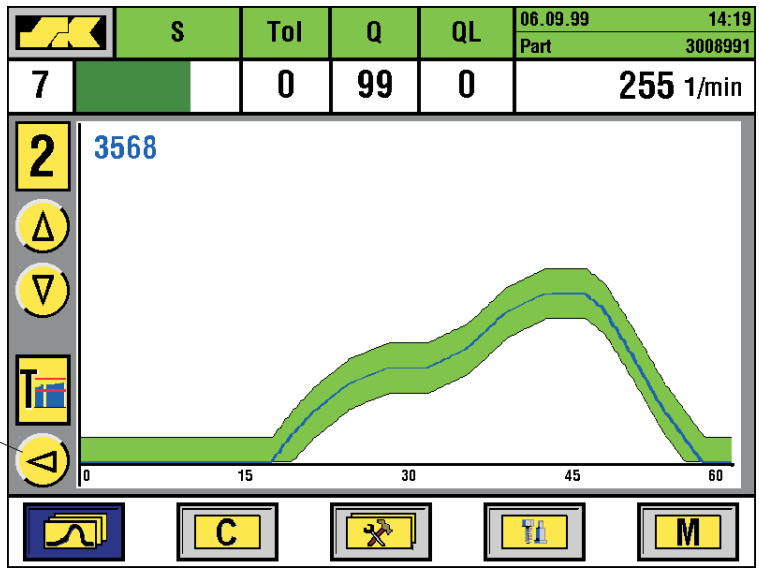
The trending feature allows to visualize and to monitor gradual changes in your forming process such as a steady but slow rise or fall of the forming load. Trending can be activated individually for each channel.

Graphic trend display with Stop/Go

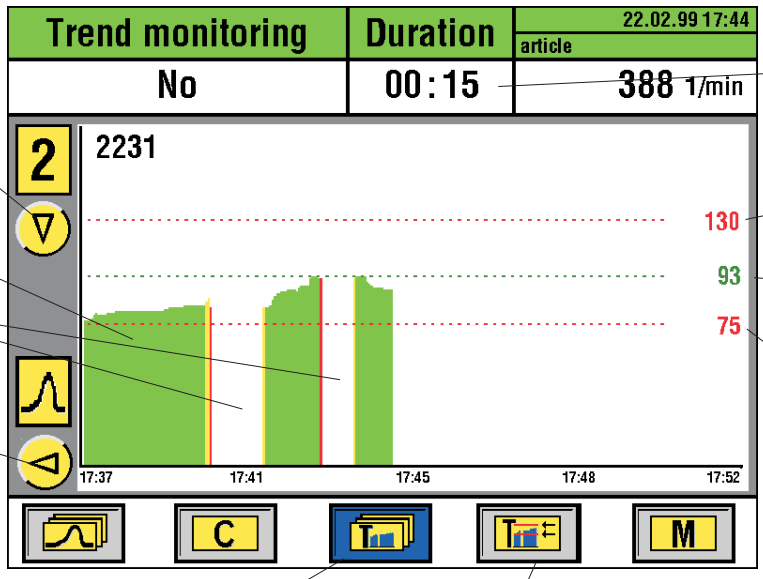
The **IMPAX-SK 4** offers graphic trending on its color display. The presentation includes the display of the average forces over time, the selected trend limits, and any machine stops in between. The trending screens can be accessed as follows:

1) Press the **M** function key, then select **Trend** (press key **1**), or

2) From the single force curve screen, press the **Cursor**-key to go to the trending screen for the same sensor channel.



Switch over to Trend



Move to the next channel

Graphical trend

Machine was not running

Go back to the force curve

Duration of the trending graph

Upper trend limit

Current trend value

Lower trend limit

Press the corresponding function key to switch to multi-trend display

Press the corresponding function key to adjust trend limits.

How to set the trending parameters

The following parameters can be set in connection with trend monitoring (press the **C**-key first to get access to entry mode):

- "**Trend monitoring**" active "**Yes**" / "**No**"
  When set to "**Yes**", the trend limits will be shown as thick solid lines.
  When set to "**No**", the trend limits will be shown as thin dotted lines.
- "**Duration**" determines the length of the trend graph on the screen from left to right. Time frame can be set between 15 minutes and 24 hours. Each channel can be set to it's individual time.

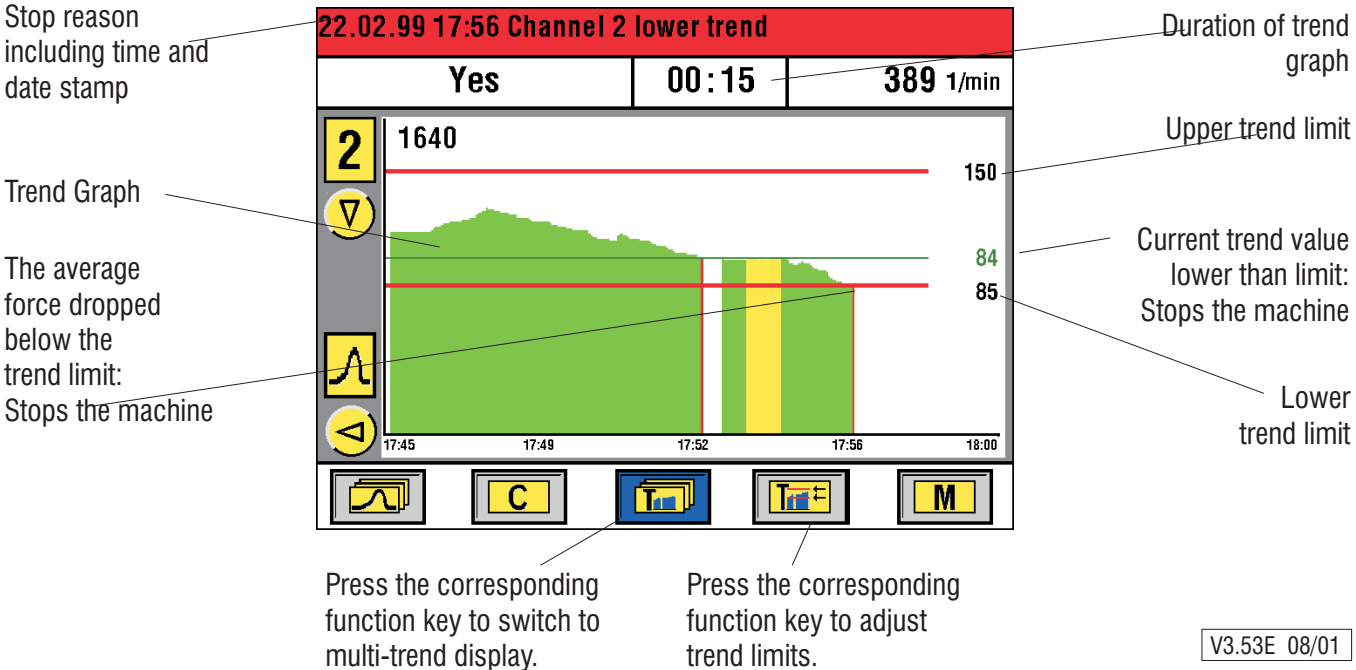
Adjusting the trend limits

The trend limits can be adjusted independently for each monitored channel. Press the **Trend Limits** function key. A windows will come up on the left side of the screen giving you access to altering the limits.

How to set the limits:

- Use the cursor **up** or **down** keys to move the limit to the desired set point, and confirm by pressing the **E**-key, or
- Enter the new numbers with the numeric keypad, and confirm with the **E**-key.

The trend graph will be plotted on the screen from left to right according to the selected time duration of the graph. Machine running time in AUTO mode is plotted in green with the height of the graph showing the trend of the average peak force reading. When the graph has reached the right end of the screen it will jump back to about the middle of the screen and continue from there. The gaps in between indicate that the machine is down in STOP mode, while time in MAN mode is shown in yellow. If the average peak force goes above or below the trend limits, the machine will be stopped (provided you have "Trend Monitoring" active for that channel).



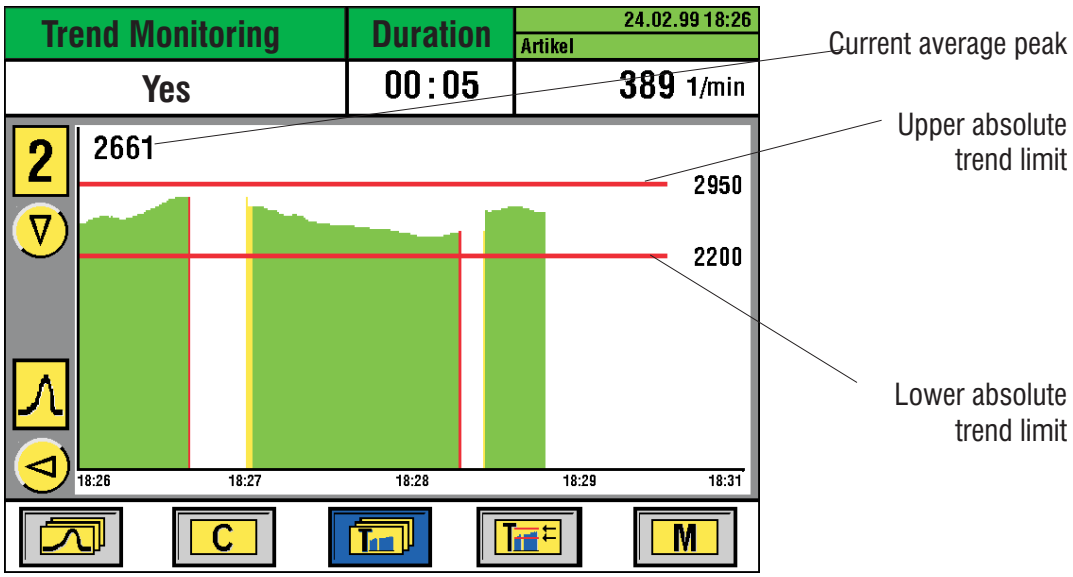
Relative or absolute trend limits

The trend limits can be set either in relative or in absolute numbers (set this within the Menu-section under "**Monitoring Parameters**").

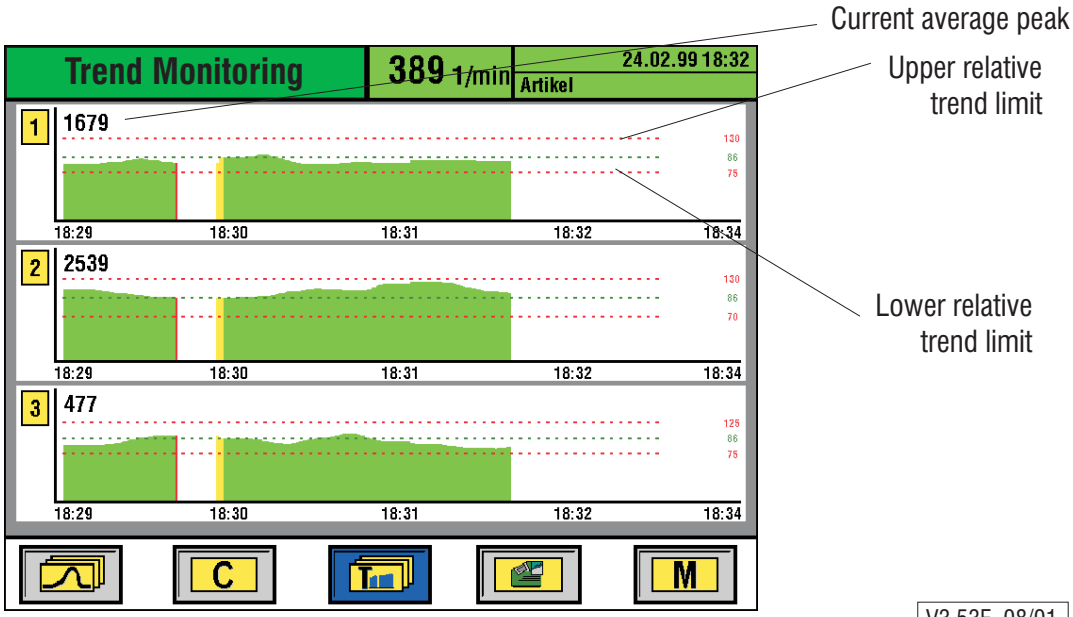
When choosing **relative limits** (as shown in the graphs on the previous pages), the current trend value representing the average peak force at that time, will be set to 100% each time you start a new learn. The trend limits also read in relative numbers. If the lower trend limits is set at 85% (as shown in the graph on the previous page), the average force is allowed to gradually drop by maximum 15 percent. If it continues to drop, the machine will be switched off. Working with relative trend limits has the advantage that the limits can remain active even when you change the machine over to another product which typically would mean totally different actual forces.

Absolute trend limits are based on the actual force scale the monitor works with (incoming voltage or calibrated references). Thus, absolute limits typically need to be adjusted every time you change the product. Absolute trending is mainly designed to be used in conjunction with long term analysis of tooling.

Trend monitoring with absolute limits



Trend monitoring with relative limits (shown on the multi trend display)



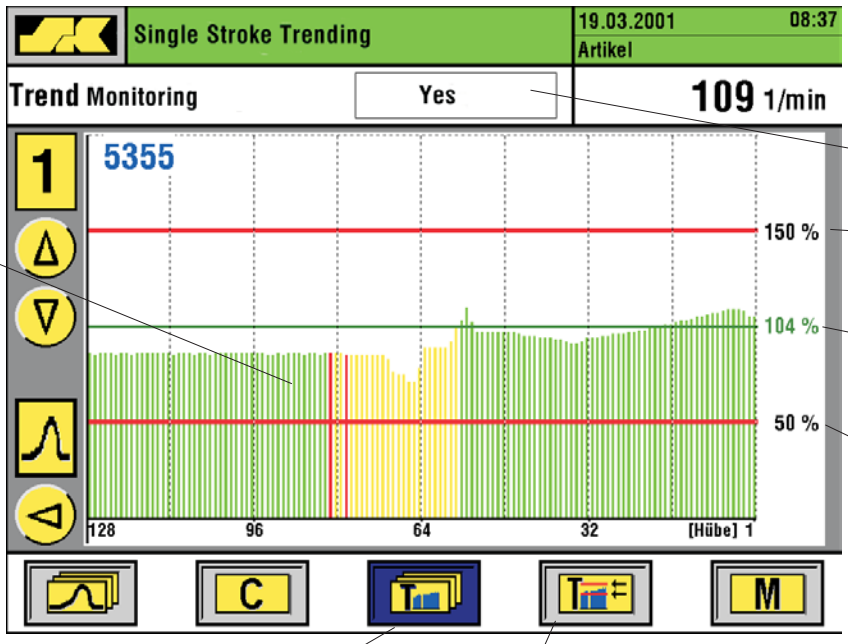
Single Stroke Trending

The trend graph can be programmed as an optional feature to show single stroke values rather than the trending over the average force value (re-programming is done within the menu section).

The single stroke trend graph “plots” the maximum force values as thin vertical lines from left to right. The full screen will the show the peak values of the last 128 parts. A new part is added to the right, while the first part on the left side will drop out.

Setting the trend limits is identical to the procedure explained previously on page 22.

NOTE: Single stroke trending is based on individual cycles, and not on the average over many parts. This means that a single part which is above or below the set limits will stop the machine. Before, the average calculated from the last 100 parts had to exceed the limits.



Trend graph shows single strokes as vertical lines. The color of each line indicates the operation mode in which this line was plotted
- green: AUTO
- yellow: MAN
- red: STOP

Trend Limits are activated (Monitoring = Yes)

Upper Trend Limit

Current Trend Value

Lower Trend Limit

Press to change screen to multiple channel trend

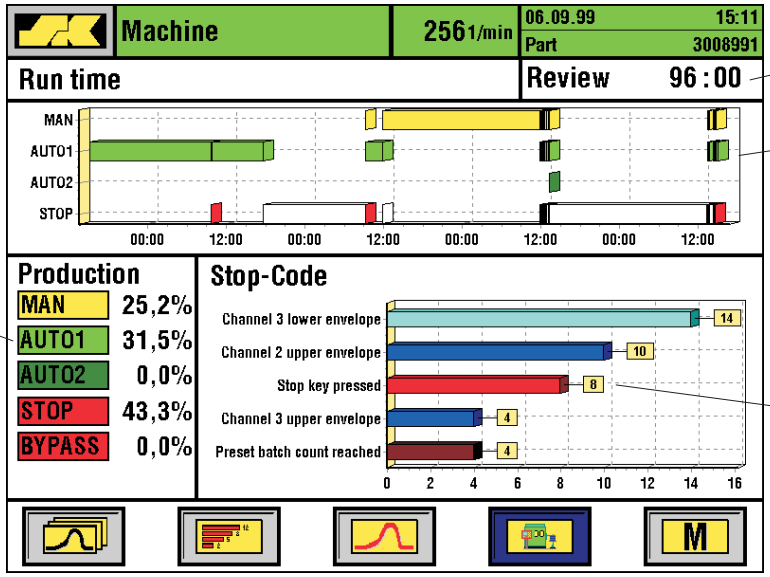
Press to adjust Trend Limits

Statistical machine and process data analysis (optional)

The **IMPAX-SK 4** offers as an option the possibility to memorize machine running data over a period of time, and to provide some statistics from that data. This function is accessible via the first page of the Menu section, item no. 4, "**SKMachinemaster**".

Machine run time diagram

This screen summarizes the machine performance over a certain time frame (history). This includes up and down times, utilization percentages and stop code statistics. The review (history) can be set between the last 30 minutes up to the last 96 hours (press the **C**-key to gain access).



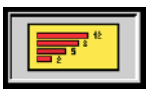
Review time

Machine "run time recorder" including up and down times

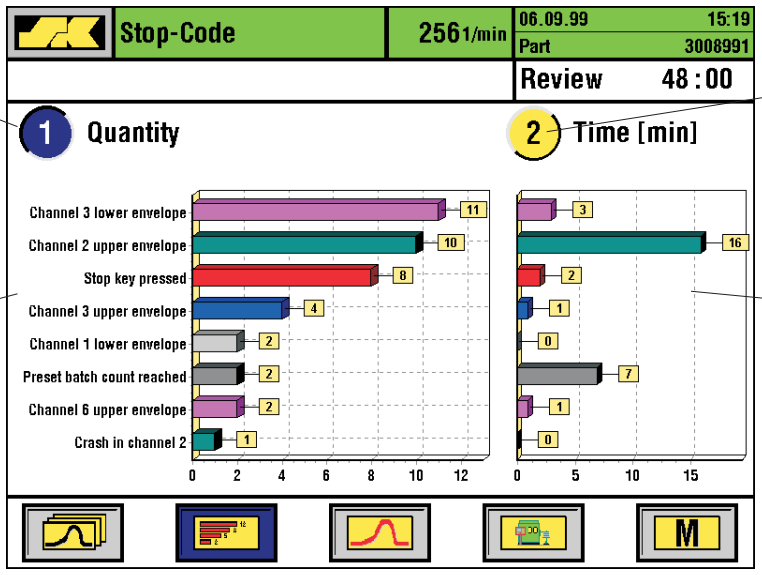
Distribution (%) of the up and down time intervals (efficiency)

Histogram of the 5 most frequent events causing downtime

Stop frequency



Press the function key to see a detailed error and stop code analysis .The error listing can be either put in sequence of their frequency (press **1**) or in order of the down time caused by each type of error (press **2**).

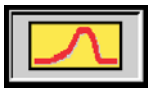


Press **1** to sort by frequency/ quantity (as in example on the right)

Press **2** to sort by the down time caused by each type of error

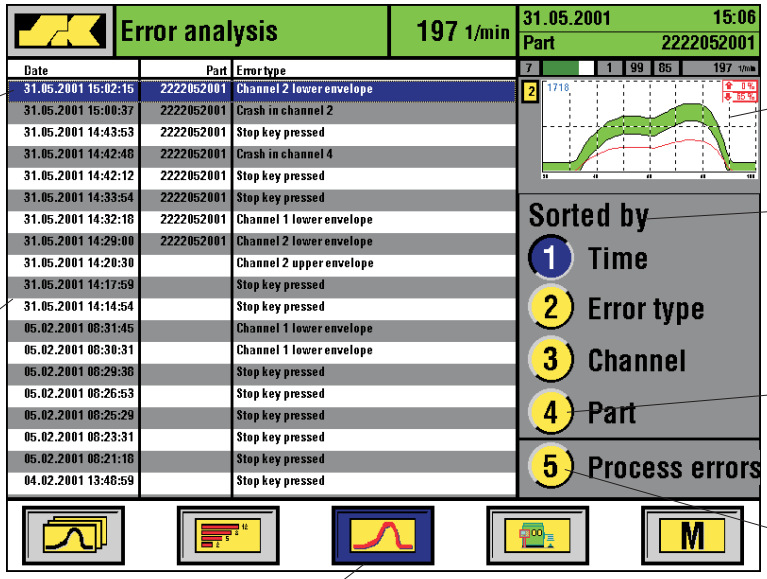
The left column shows how often each error occurred in the selected review time frame (history)

The right column shows the amount of down time (min) caused by the listed errors



Error analysis (failure curve memory)

All errors and machine stoppages are kept inside the monitor's memory, and are available for later analysis over a period of time. Press the **Error Curve** function key below the function symbol shown on the left.



Use the cursor keys to scroll the blue bar to the desired position (the related error curve will automatically insert in the upper right corner)

Listing of all recorded errors

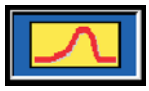
Appearance of a process error (failure curve)

Sort list: by time of error (press **1**), by type of error (press **2**), or by channel (press **3**).

Press **4** to just list process errors (without counter stops, etc.).

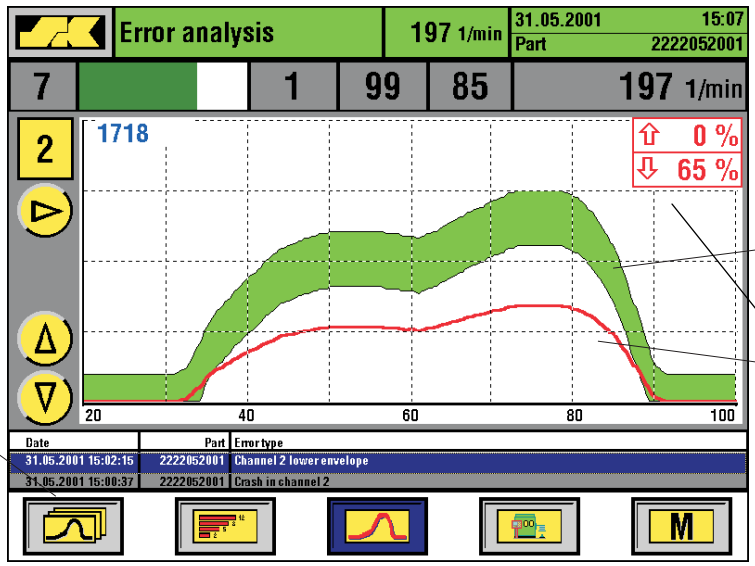
Press **5** to list all errors made while the current part was running.

Error code function symbol



Enlarged error curve display

Press the **Error Curve** function key again to obtain an enlarged image of the error curve you are just looking at to see more details:



Example of a force error:

This was the envelope valid at the time the error occurred

The actual error curve is shown in red.

Shows error size. (65% of the force curve is below the lower envelope boundary.)

The blue bar marks the currently displayed error

Error code function symbol

Load distribution profile

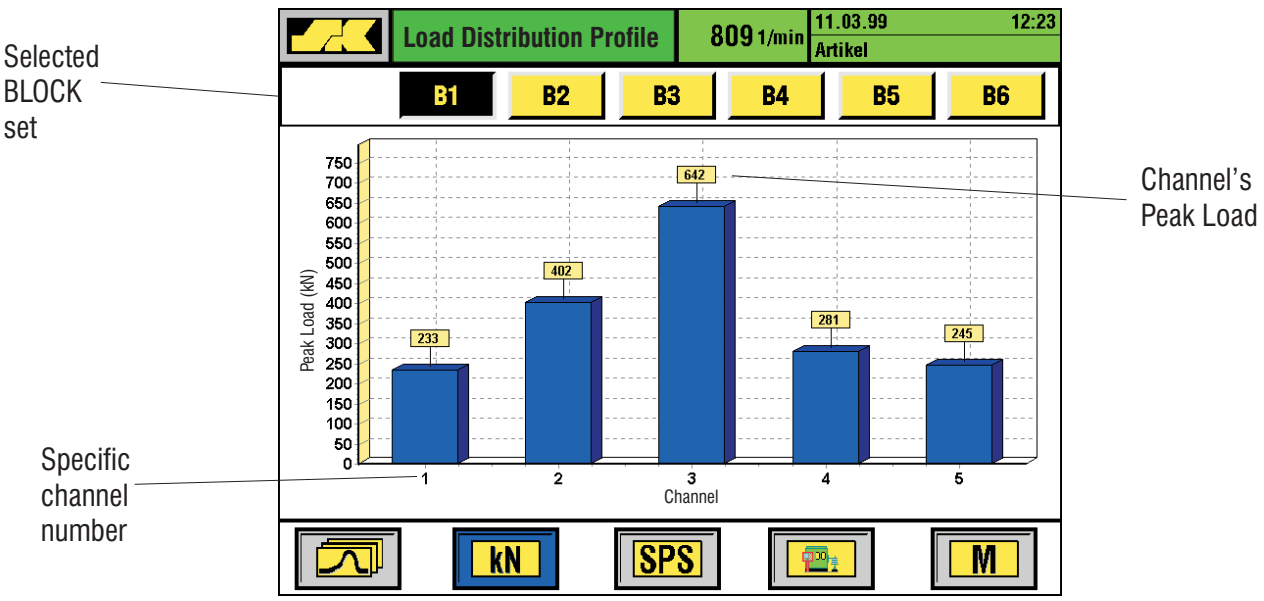
The load distribution profile can be accessed from the first page of the MENU SECTION (press **M** and **6**). This screen shows the distribution of the current peak force readings (blue bars) for each channel. This information allows you to view the actual distribution of the forming work among the channels and to decide whether or not you'll find the distribution acceptable.

On multi-station machines, it is normally desirable to have a fairly uniform distribution of the forming work in order to obtain good tool life. A distribution heavily out of center, on the other hand, is typically not acceptable because this would wear out the ram slide bearings.

The numbers shown in the diagram are either based upon the **IMPAX-SK 4**'s internal scale (directly associated with the strength of the incoming sensor signal), or they can be actual tonnage (kN) readings in case you use calibrated sensors.

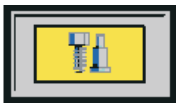
If your machine is equipped with exchangeable tool packs with calibrated sensors installed in each pack, you can have several sets of calibration parameters stored under **BLOCK 1** to **BLOCK 6.** Whenever you change a tool pack, you can call up the associated calibration BLOCK and have the correct absolute load readings off the sensors installed in this tool pack.

If your monitor is also equipped with the optional “Part Data Memory”, the load distribution profile diagram will show in addition any reference load distribution that may have been stored under the respective part number (see next chapter Part Data Memory).



Part Data Memory (optional SKPart*master*)

The memory function of the **IMPAX-SK 4** system allows one to store by part number important information relative to the setting parameters such as sensitivities, tolerances, timing windows, profile zones etc., and to re-use them for repeat jobs. If your monitor is also equipped with the respective optional features, the unit will also memorize the target force wave forms and the machine loading profile.



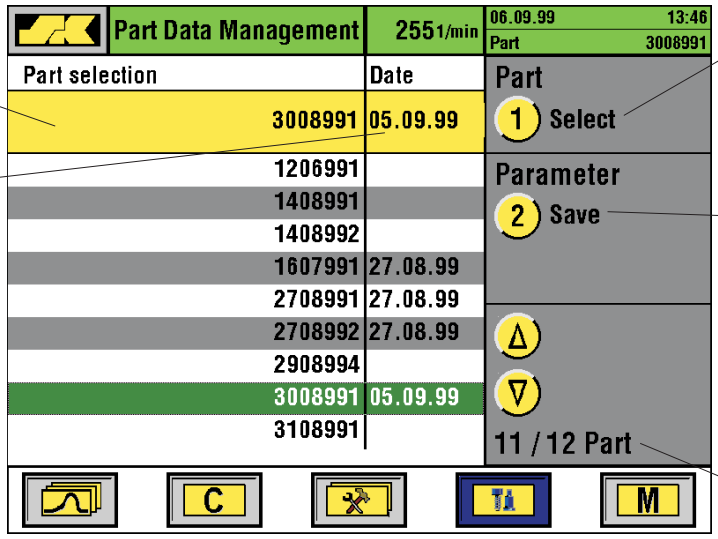
Access to Part Data Memory

Access to enter a new part, to recall part data from memory, or to refresh data for an existing part number is via the **PARTS** function key.

The following "**Part Data Management**"screen appears:

The upper yellow line shows which part is currently selected

The date marked shows that and when data has been memorized for this part.



Press **1** (Select Part) to:
- Enter a new part number
- Select an already existing part number from the list

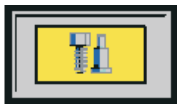
Press **2** (Save Parameter) to store part data into the memory:
- First set of data for a new part
- Overwrite data for an existing part

Shows the position of the cursor bar (example: cursor is at part 11 out 12)

Every attempt to enter data (pressing **1** for picking a part number, or **2** for saving part data, followed by **E**) is followed by a security question asking whether or not you really wish to make that entry:

- SELECT PART ? YES / NO
  When you picked an existing part number (without data in memory), or when you enter a new part number.

- LOAD PARAMETERS? YES / NO
  When you picked a part with data in memory. Answering yes (press **E**-key) will re-load and automatically activate that data (only possible while the monitor is in MAN or STOP). This function is used when re-calling data from a previous run for a repeat job.



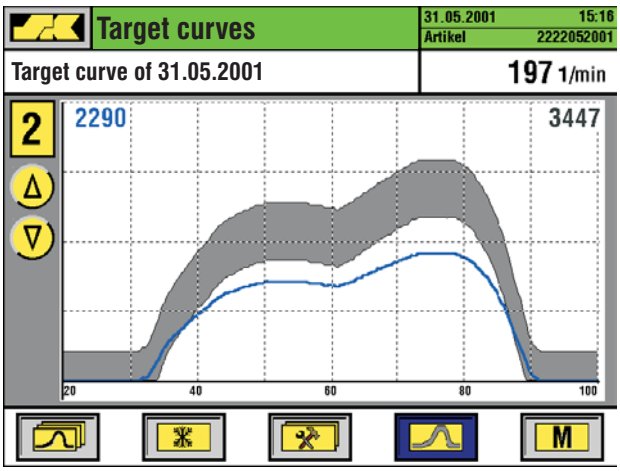
- STORE PARAMETERS? YES / NO
  When you wish to enter data for the selected part number the first time. Please note that this is only permitted while the unit runs in AUTO mode. Normally, you want to memorize data only after the part has run and performed well for a certain time (tooling run-in, machine warm-up, consistent material, etc.)

- OVERWRITE PARAMETERS? YES / NO
  When you wish to refresh an existing set of data for the selected part number. This may be the case when you have found better settings during a run or repeat run of that part.

Re-activating a previously produced part will do the following:
- Reset all relevant parameters back to the settings of the previous run
- Show you the memorized target force curves and your current forces (optional function)
- Give you the load distribution diagram (old and new peak loads in comparison; optional function)

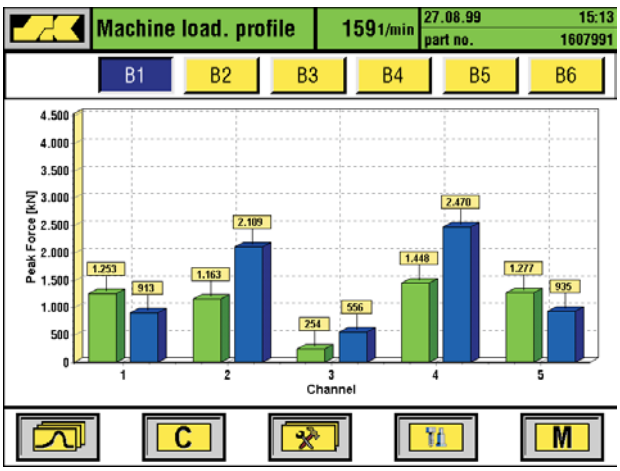
To see the target force curves vs your current forces press the **TOOL** function key. The graph shows channel by channel (or in multi-channel presentation) how your current forces (blue lines) compare against the memorized target area (gray envelope zone).

To see the load distribution diagram press **M** for Menu and then **6** for “Machine Loading Profile”.



Tool Performance / Target Force Curves
Shows the current force curve (in blue) vs the memorized target forces from a previous run (stored on 31.05.2001). The example here shows that channel number 2 is currently working at much less load than before (peak force reading now is 2290 vs. 3447 earlier).

Press the Curve function key to see the target curves for all channels on one screen.

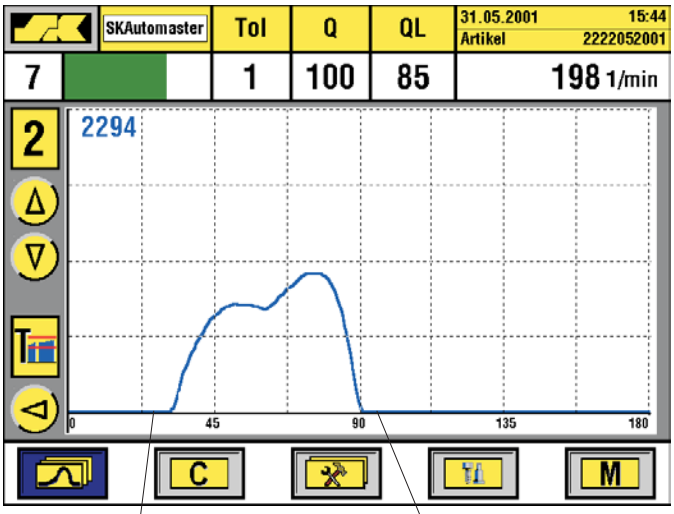


Machine loading profile
Shows for each channel the current peak force readings (blue bars on the right side) vs the memorized previous readings (green bars on the left side).

SKAutomaster automatic envelope setting

The **SK**Auto*master* function offers a unique procedure to always obtain perfect envelope settings and timing windows without any operator assistance. **SK**Auto*master* automatically locates and zooms in on the appropriate forming signal without the need for any manual interference. As a result, the monitoring accuracy is always set to the optimum.

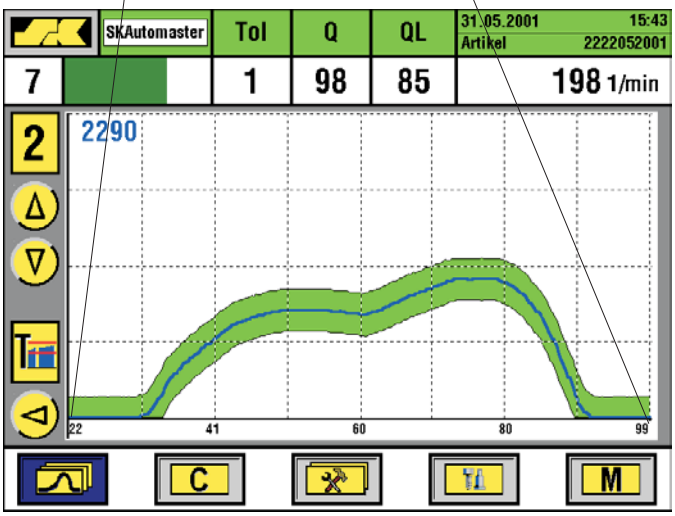
In most applications, the basic sensitivity setting can be kept on higher numbers keeping the envelope width as narrow as possible. The special **SK**Auto*master* software routines will in addition assure that the envelope band is properly adjusted.



While running in MAN-mode, the system will use a timing which is set overly wide to make sure that the force signals for all different parts will fall within this base frame.

This technique guarantees that even unusually wide force curves which may occur when changing from one part to another, still will be within the set timing window.

ZOOM



When advancing into AUTO-mode,the **SK**Auto*master* automatically locates the force curve and zooms in on it.

The force curve is basically stretched so that is uses the full width of the screen without wasting any monitoring capability for idle signal before or after the actual force curve.

NEW: Envelope Profile Monitoring

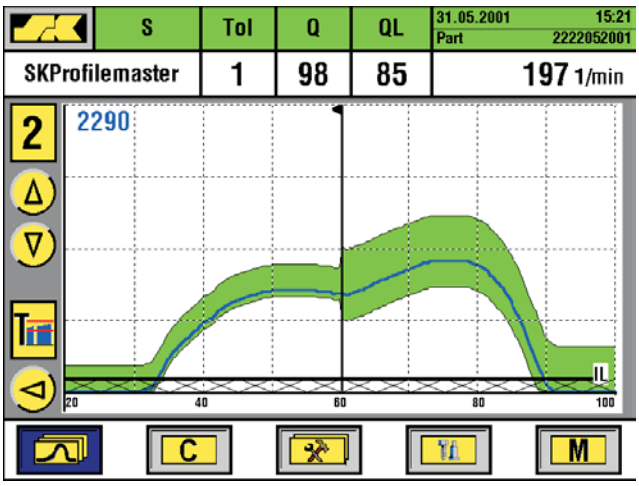
The **SK**Profile*master* monitoring technique represents the next generation of force monitoring procedures. The conventional enveloping technology had to accommodate varying force curve areas with one sensitivity setting only. So you were either not sensitive enough where it mattered (in those areas where tools actually formed the metal), or you had to live with too many nuisance machine shut-downs.

The **SK**Profile*master* technique now allows you to set different sensitivity profile zones that will perfectly match with the varying stability of your forming processes. Sensitive enough where needed, and loose enough where necessary.

Each force channel can have the following individual settings:
- Different sensitivity settings for upper and lower profile limits
- One, two, or three adjustable profile zones

(see supervisor's manual for settings, modification and erasing of profile zones).

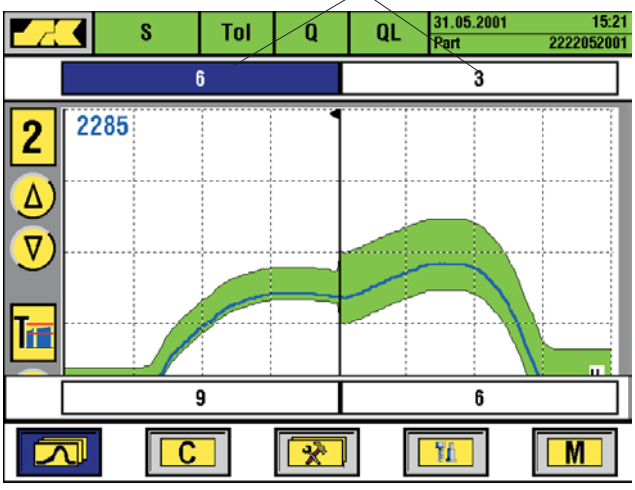
The example below shows a profiled envelope band (2 zones) with different upper and lower Sensitivity settings per zone:



The SK Profile*master* **envelope profile band.**
Each segment has it's own profile limit setting allowing you to find a perfect balance between tight limits where needed (to detect smaller tool failures), and loose limits in other areas to prevent unnecessary machine stoppages due to random variation.

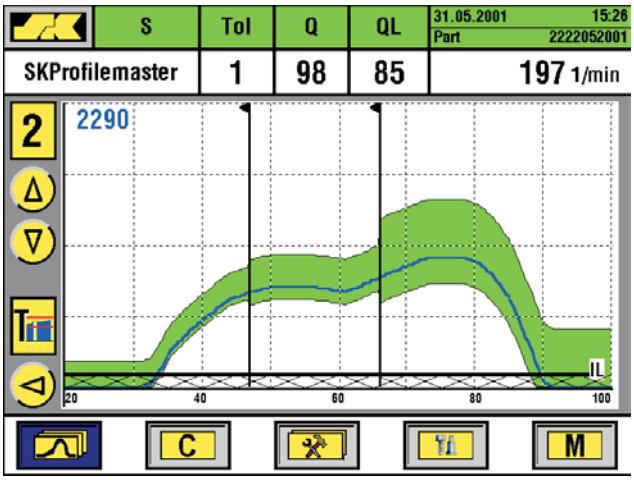
The channel shown on the left side works with 2 profile zones, each having individual high and low profile limits.

Sensitivity windows

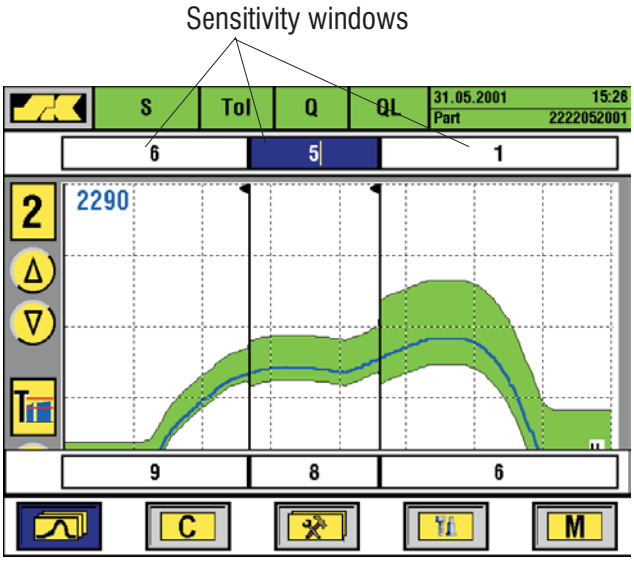


How to set the SKPROFILE*master* **band:**
- Press **C** to access sensitivity entry mode
- Separate sensitivity windows pop up for each individual profile zone
- Use the cursor keys to move the border line between 2 zones around
- Set each zone's desired sensitivity from **1** to **9** (1=coarse; 9=fine)
- Confirm each zone's selection by pressing the **E** key (you are able to view immediately how your setting is affecting the envelope width in each zone)
- Confirm also your settings for **Tol** (tolerance) and **QL** (Q-Factor limit)

The next example below shows a 3-zone profile envelope band with different upper and lower Sensitivity settings per zone:



The SK Profile*master* **envelope profile band.**
The 3-zone setting allows for an even closer match between curve segment variation and adopted profiles.



How to set the SK Profile*master* **band:**
- Press **C** to access sensitivity entry mode
- Separate sensitivity windows pop up for each individual profile zone
- Use the cursor keys to move the border line around between 3 neighboring zones

◄ ►

- Set each zone's desired sensitivity from **1** to **9** (1=coarse; 9=fine)
- Confirm each zone's selection by pressing the **E** key (you are able to view immediately how your setting is affecting the envelope width in each zone)
- Confirm also your settings for **Tol** (tolerance) and **QL** (Q-Factor limit)

Please note:

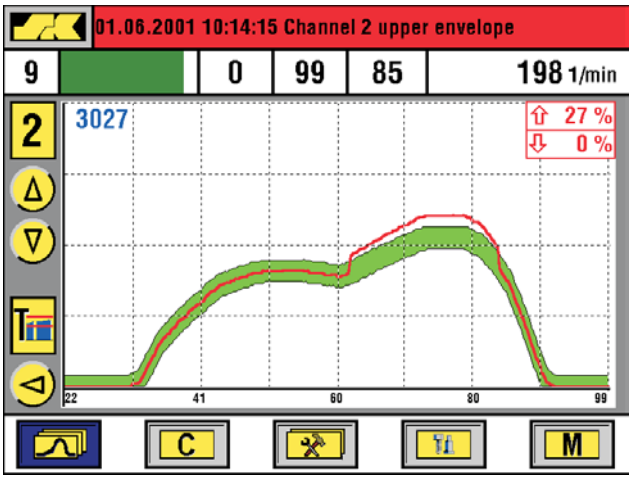
Changing the timing window will automatically erase the profile zones on the channel in question, and you will have to go to the MENU section (page 4/4, **SK**Profile*master*) and re-activate the number of profile zones you wish to have for the new timing window.

SKPhantom*master* (Error acceptance)

The optional **SK**Phantom*master* feature offers a simple and quick way to accept certain erratic force readings as “acceptable or phantom errors” without having to widen the general monitoring limits or increase tolerance settings.

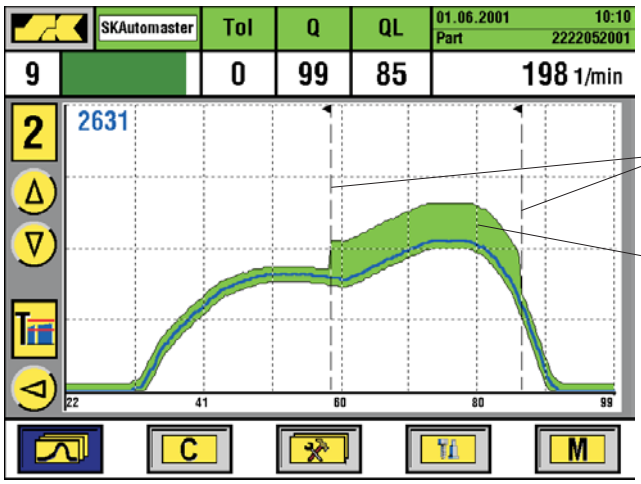
If you wish to memorize a specific type of force error as an “acceptable event", press the **STOP** key (while the **IMPAX-SK 4** is still in STOP mode). You will be asked to confirm if you really want to accept this error. If you say yes (press **E),** the monitor will automatically widen the envelope profile such that this force error will be inside the envelope profile the next time it occurs.

The screen will show dotted lines to indicate that the profile widening in this segment originates from accepting an allowable error. Please note that you can only accept one error per channel.



How to set the **SK**Phantom*master* function:

You wish to accept the small error shown on the left side as an acceptable event.
- Press the **STOP** key (while the unit is still in Stop mode)
- You will be asked whether or not you wish to insert a so-called phantom area. Press **E** to answer yes (**C** for no)
- After re-starting the machine, the envelope will be widened in the area where the now accepted error has left the previous limits



This is how **SK**Phantom*master* sets the new envelope profile to accept the error.

Phantom area (where the above error has left the previous profile)

Widened envelope profile inside the phantom area; note that it widened only upwards, not downwards)

Please note:

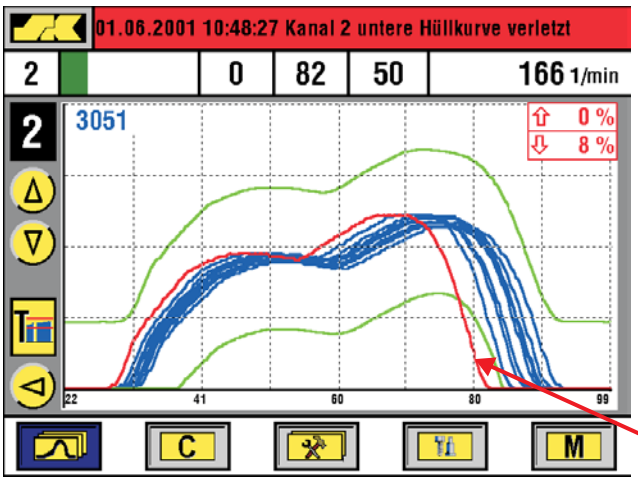
Only one accepted error is allowed per channel. If you wish to accept another type of error, you will have to delete the previous phantom area (question to do so is automatically asked after you pressed STOP). Then press **STOP** key again to set a new phantom zone.

SKQ*master* (machine inconsistency compensator)

Some machines tend to vary slightly in speed during the run, or may have a trigger pulse taken from an unstable running side shaft (instability often observed on machines with chain-driven side shafts).

The RPM fluctuation will cause the force waves forms to bounce sidewards left and right. In order to overcome this, you would typically open the envelope band to accommodate for that. At the same time, however, you will loose sensitivity but still experience occasional nuisance shut downs.

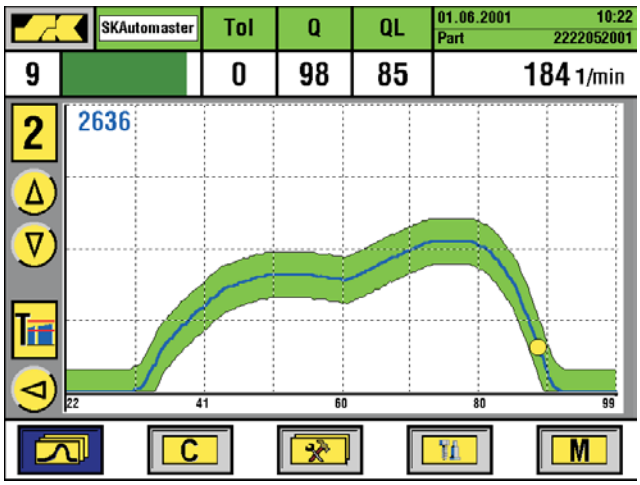
The **SK**Q*master* function now stabilizes the force signal by automatically compensating left-right bouncing of the wave form. This allows you to run the usual tight envelopes or envelope profiles, and it significantly minimizes nuisance shut-downs.



Without **SK**Q*master*:

- Machine speed inconsistencies cause the force curves to bounce left and right
- Envelope limits need to be set wide open to allow the machine to run. You loose sensitivity.
- Still erratic force curves occur causing the machine to stop without apparent reason

This force curve is outside envelope!



With **SK**Q*master:*

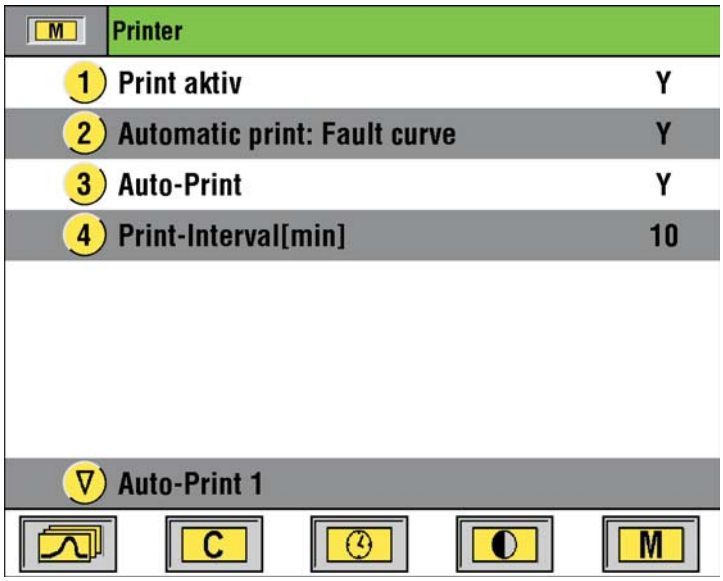
- The signal is automatically stabilized. RPM fluctuation is compensated.
- Envelope now can be set close around the actual process. You regain the necessary sensitivity.
- Nuisance shut-downs are avoided.

Printing function

The **IMPAX-SK 4** offers the optional function to print out all screens as hard copies. In addition, there is the option to have an AUTO-PRINT performed that will give you automatic print outs of selected screens at predetermined time intervals.

Setting of print parameters

The main MENU SECTION on page 4 /4 contains the following sub-menu (press **M**, go to page 4 and press **2** for **Printer**)allowing you to set all relevant print parameters to suit your requirements.



1. Print active (Y/N)
Select if you wish to use the printing feature (set to "**Y**"). You now will be able to print out a hard copy of most of the screens by pressing **0.**

2. Automatic print: fault curve (Y/N)
Select if you wish to receive an automatic print-out each time a process (force) error occurs. Printed will be the force curve of the channel producing the error.

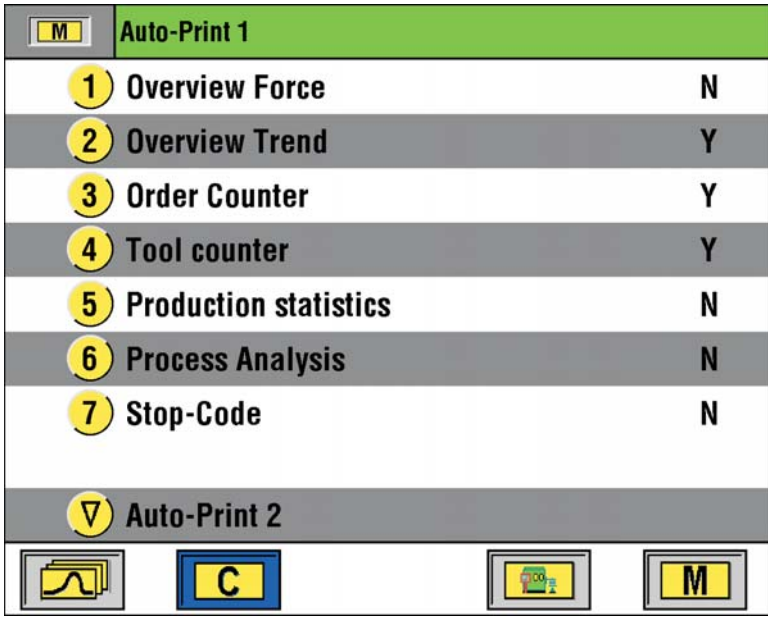
3. Auto-Print (Y/N)
Select if you wish to use Auto-Print. If set to "**Y**", you must go to the next page (use cursor key or press 9) and determine which screens to print.

4. Print Interval (min)
Set in which time intervals you wish to Auto-Print. Only automatic running time is counted (unit running in AUTO-mode).

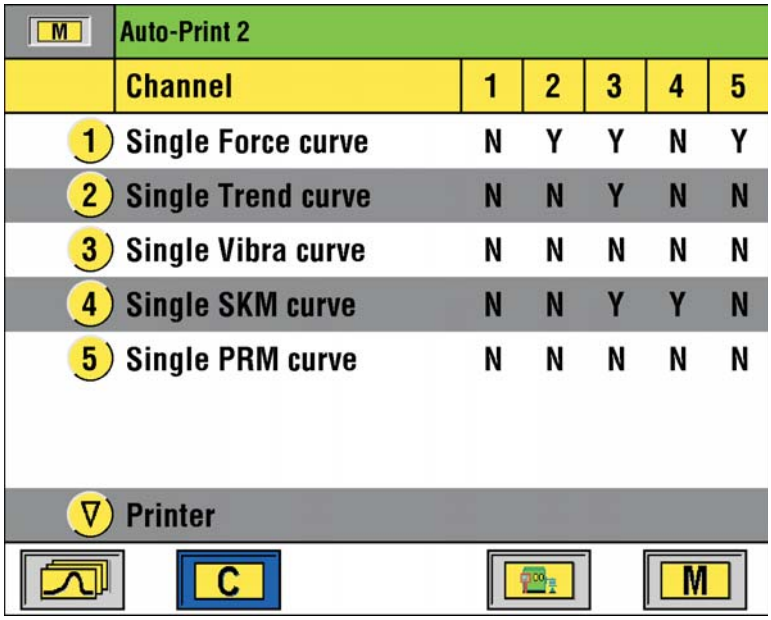
Auto-Print Selection

Select on the following 2 menu pages which of the available screens you wish to Auto-Print (set that item to "Y"). Please confirm each selection by pressing the **E**-key.

Please note: Your monitor will automatically show the screen to print for a brief moment just before it prints. Please restrict the number of pages to auto-print and the time intervals to the capabilities of your printer. Please check with us for the type of printer the monitor can work with (different drivers are preloaded, other may be added).



The second Auto-Print selection screen contains the channel-by-channel selectable screens. Again, please confirm each selection at the end of the line by pressing the **E**-key.

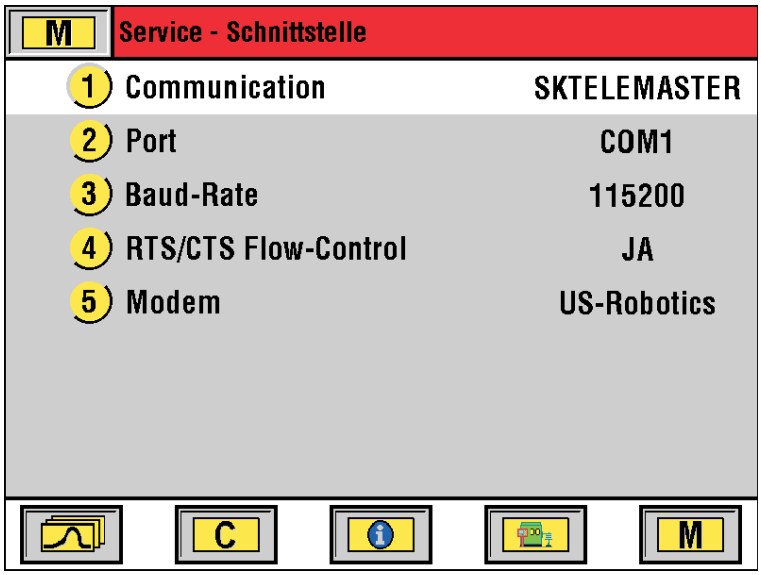


SKTelemaster

The Teleservice function offers the possibility to have your IMPAX-SK 4 monitor remotely checked. Through a standard telephone modem, your monitor can connect to the IMPAX-SK service Computer. From a remote location, the IMPAX-SK service technician can have a live view into your monitor and actually see the machine running. All set-up parameters can be verified, and, if needed, remotely corrected. In addition, the service technician can have a look a the force curves and possibly give some advice in respect to optimized settings and better performance. To utilize Teleservice, it is necessary to provide a telephone outlet in the vicinity of the machine where the modem plugs in. The telephone number must be an extension accessible from the outside.

How to prepare your monitor for Teleservice

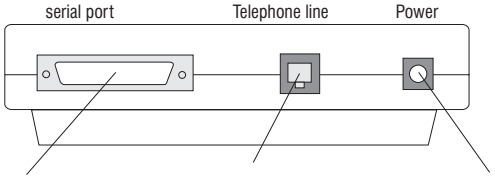
Press the function button **M** to access the Menu Section. Use the cursor key to proceed to page **3**. Sub-item # 4 contains the settings for the "**Service-Interface**". Call up # 4 and ensure that all parameters are adjusted like shown below. Alter any settings if necessary. Then switch your IMPAX-SK 4 off.



Connect the Modem

Connect the teleservice (available as an option) to the serial port on the rear panel of the IMPAX-SK (small 9-pin plug), to the telephone outlet and connect the power supply adapter. Then switch the modem and the IMPAX-SK 4 back on. Our service technician will now be able to call up your Monitor.

ON/OFF switch
(on the left side of the housing)



to IMPAX-SK 4 to telephone jack from power supply adapter

General description

The machine interface serves as connection between the SK process monitoring systems and the machine controls. First, the interface contains a set of relays which are used to transfer switching signals towards the machine (e.g. stop machine, flip sorting gate, etc.). Second, the interface has terminal connectors which are used to input various digital signals from the machine, such as the timing signal, finger-open signal on multi-die machines, ESA-input on hot formers, etc.). In addition, the interface also provides through it's built-in supply unit the 24 VDC power to the IMPAX-SK unit.

Switching functions

The standard interface contains 6 relays rated at 12A/250VAC. Each relay offers normally-open and normally-closed contacts. The LED next to the relay shows it's current status. If the LED is lit, relay coil is powered. If the LED is off, the relay coil is powerless (low).

Relay #1 (Sorting) / Relay #2 (Batching):

Both relays are normally powered. They will drop to give the sorting or batching signal.

Relay #3 and #6 (Motor-Stop) / Relay #4 (Emergency Stop):

All 3 relays are normally powered. They will drop to switch the motor off or to switch emergency stop. The "Motor Stop" relays #3 and #6 will switch every time the process monitor goes into stop. Relay #4 "Emergency Stop" will be switched in addition with a delay of about 1 minute when a stop signal is given during AUTO2-mode (unmanned shifts). This relay is typically used to switch off every electrical component on the machine when it stops during unmanned shifts.

By-Pass key switch

The by-pass key switch located on the outside of the interface box will force all relays to stay in their normal position. The process monitoring system can now be removed from the machine, and the machine is able to run without the monitor. In case of total power failure inside the interface, all relays must be bridged in order to run the machine without the monitoring system.

Good-part-made pulse output

The good-parts-made output pulses a short signal for every good part made when the machine is running. Some data networking systems require such a signal to tell if the machine is running or not. No output signal is given in case of machine downtime, or when the machine runs idle.

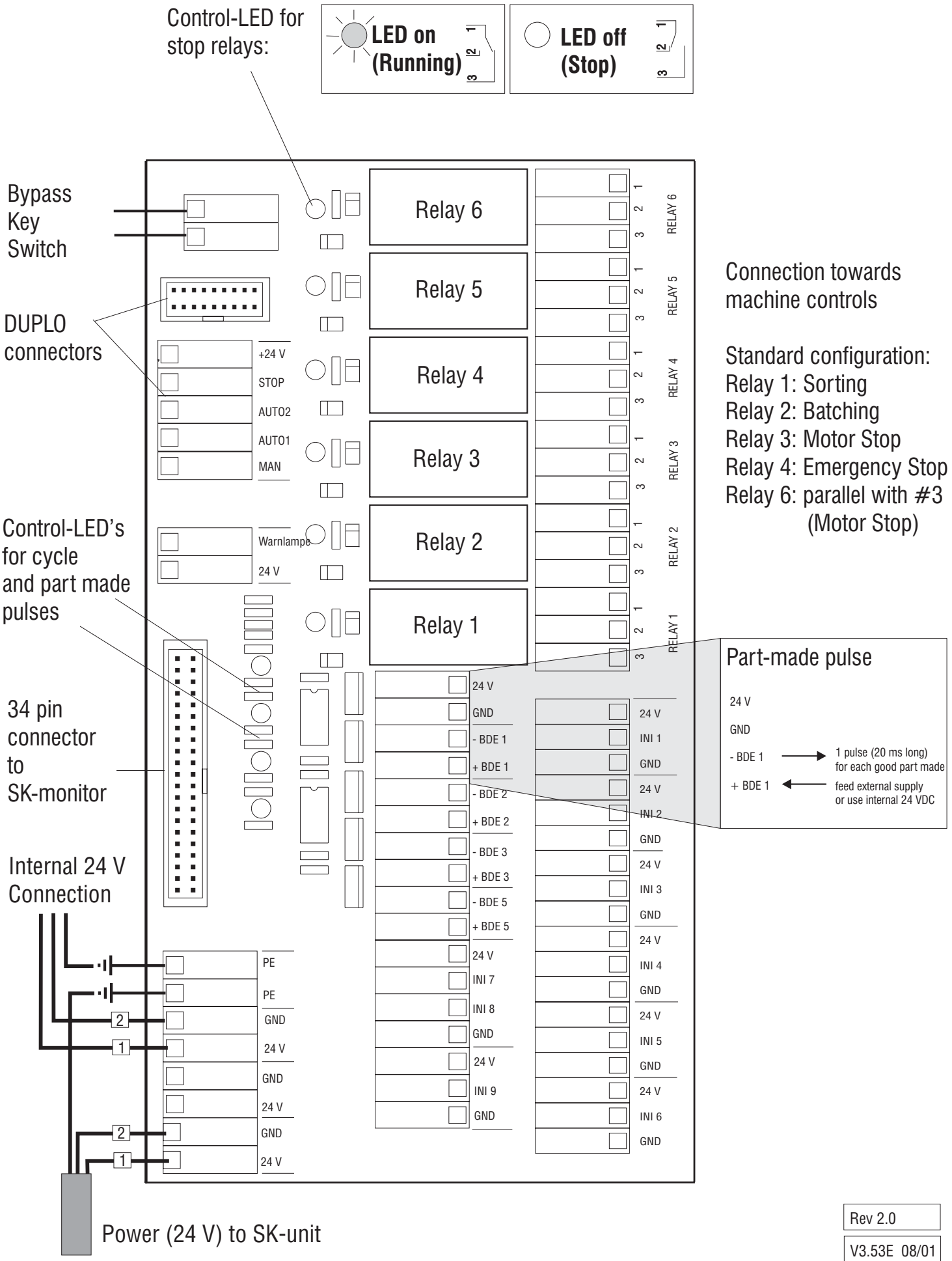
Digital inputs

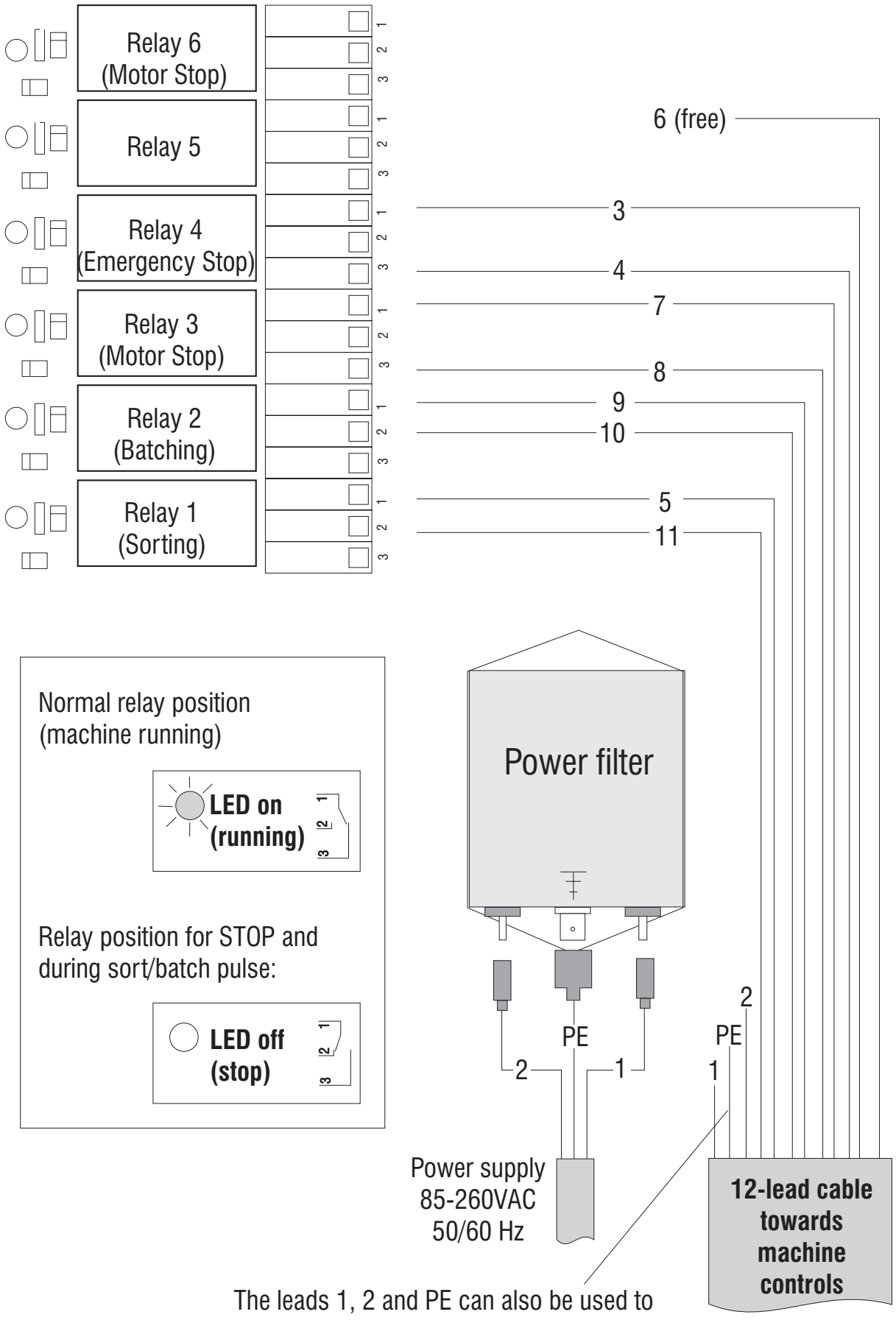
The following digital inputs are reserved for fixed functions:

INI 1: timing signal input (proximity switch)

INI 2: second timing signal input, only needed for synchronization on rotary die headers!
(normally, prox switches are not connected here but inside the sensor box)

The other inputs are reserved for future functions.

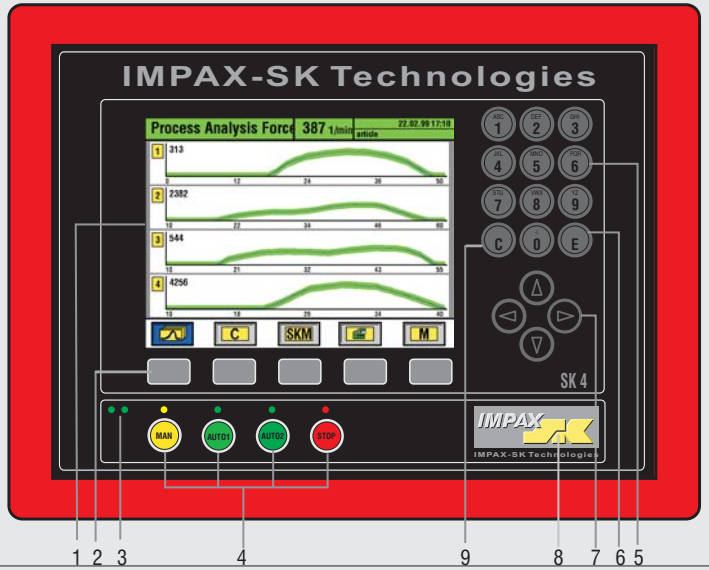

Control-LED for stop relays:
LED on (Running)
LED off (Stop)
Bypass Key Switch
DUPLO connectors
Control-LED's for cycle and part made pulses
34 pin connector to SK-monitor
Internal 24 V Connection
Power (24 V) to SK-unit
Relay 6
Relay 5
Relay 4
Relay 3
Relay 2
Relay 1
RELAY 6
RELAY 5
RELAY 4
RELAY 3
RELAY 2
RELAY 1
+24 V
STOP
AUTO2
AUTO1
MAN
Warnlampe
24 V
PE
PE
GND
24 V
GND
24 V
GND
24 V
GND
- BDE 1
+ BDE 1
- BDE 2
+ BDE 2
- BDE 3
+ BDE 3
- BDE 5
+ BDE 5
INI 7
INI 8
INI 9
INI 1
INI 2
INI 3
INI 4
INI 5
INI 6
Connection towards machine controls
Standard configuration:
Relay 1: Sorting
Relay 2: Batching
Relay 3: Motor Stop
Relay 4: Emergency Stop
Relay 6: parallel with #3 (Motor Stop)
Part-made pulse
1 pulse (20 ms long) for each good part made
feed external supply or use internal 24 VDC


Relay 6
(Motor Stop)
Relay 5
Relay 4
(Emergency Stop)
Relay 3
(Motor Stop)
Relay 2
(Batching)
Relay 1
(Sorting)
6 (free)
3
4
7
8
9
10
5
11
Normal relay position
(machine running)
LED on
(running)
Relay position for STOP and
during sort/batch pulse:
LED off
(stop)
Power filter
PE
PE
2
1
2
1
Power supply
85-260VAC
50/60 Hz
12-lead cable
towards
machine
controls
The leads 1, 2 and PE can also be used to
supply general AC power from machine controls
(if permitted by electrical safety codes)

IMPAX-SK 4

Operation Manual

IMPAX-SK Technologies



1. LCD color graphic display (10.4“)
2. Function selection keys
   (current function is shown at screen bottom)
3. Timing signal indicator lights 1 and 2
4. Operating mode selection with indicator LED:
   · MAN - mode (manual/set-up)
   · AUTO 1 - mode (normal shift)
   · AUTO 2 - mode (after hour shift)
   · STOP (machine switched off)
5. Numerical keypad 0-9
   (And optional alphanumerical entries
6. Enter key (E-key)
7. Cursor Keys
8. Key depressed together with MAN Key to allow changing the sensor timing window.
   Enter new start value and Press E-Key
   Enter new end value and Press E-Key
9. C-key (Clear/change display mode

Moves back to multi-curve display; switches between single and multi-curve displays.

C Moves to the part counters

Calls-up multi-trending screen

Press to adjust trend limits

“Snow flake” button freezes current force wave forms

Moves to target curves (tool performance)

Moves to part data memory (store and reload part data)

Error log (frequency and related down time)

Error log (errors and error curve log)

M Moves to the menu and set-up section (service-access code required)

1 Turn On (push button located on rear panel)

The display and the **MAN**-key light up. **IMPAX-SK 4** is ready. Start the machine and check your parts. When okay, start the monitoring mode (Step 2):

2 Press AUTO-key

Unit will move into automatic monitoring mode. During the first few machine cycles the monitoring limits (envelopes) will adjust and fine tune.

3 Process Failures (machine stops)

In case of process errors (e. g. force errors or counter stops) the machine will be stopped by the **IMPAX-SK 4** (the green AUTO light turns off, the red AUTO light turns on). The display's top line turns red. The error reason and stop time are displayed.

4 Re-start after machine stop

A) <u>If you wish to re-learn new envelope limits after start-up:</u>
- press the **MAN**-key (stop relays are released so machine can be jogged)
- eliminate the cause of the stoppage, re-start the machine and check the parts
- when parts are ok, press **AUTO** again to start a new learn and activate monitoring.

B) <u>If you wish to continue using the previous envelope limits:</u>
- go straight to **AUTO** from STOP. Eliminate error and restart the machine
- the monitoring mode will restart as soon as the machine runs consistently

C Set the part counters

- press function key **C** (counter C1 for order size will appear)
- to set count press (C) (the old value turns blue), enter your desired new count
- confirm your entry with (E). Actual count zeroes, confirm again with (E)
- to switch counter from stop active (√) to not active (-): press any key
- use the buttons (2), (3) or (4) to call up the other counters

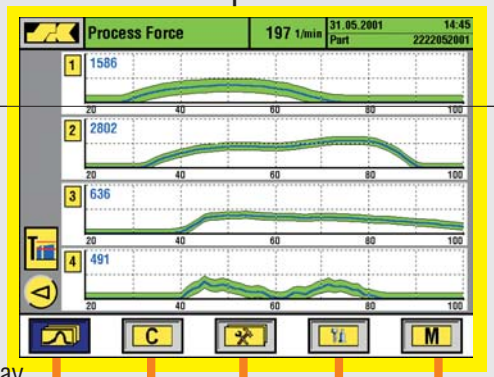
S Set Sensitivity (**S**) and Tolerance (**Tol**)

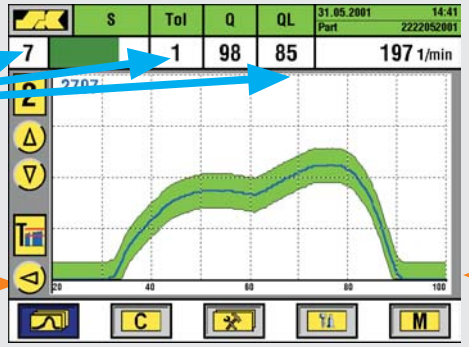
- Press and then a numbered key to move to the desired channel
- to adjust settings press the (C) key (the sensitivity number will turn blue)
- first adjust **sensitivity (S)** setting (1=coarse, 9=fine, 0=channel is off)
- confirm with (E). The blue box moves over to **tolerance (Tol.)**
- adjust **Tol.** (1-9 allows faults, 0= immediate stop) and confirm with (E)

IMPAX-SK 4

Displays & Operating Screens

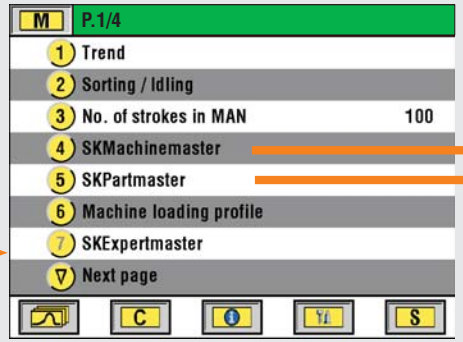
Start-Up Screen





Waveform/s Display

1,2..

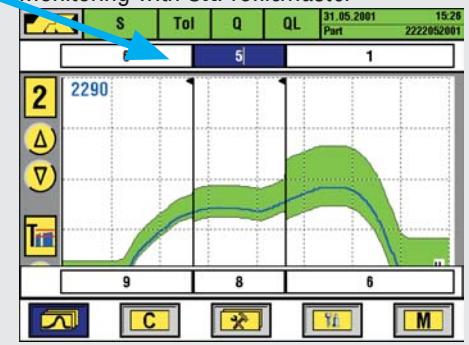


Part Data Memory

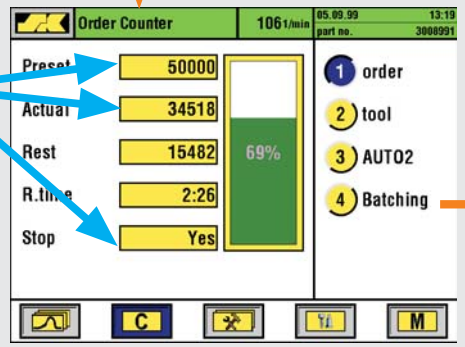
Target Curve Memory

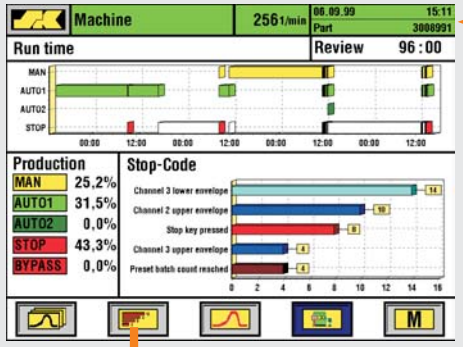
C

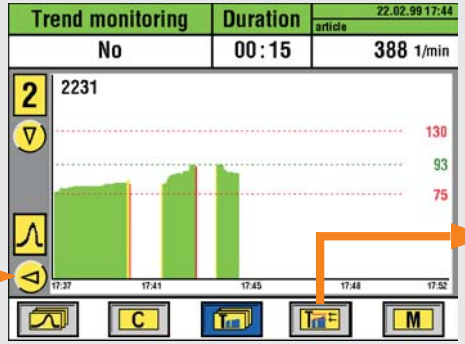
Monitoring with **SK**Profile*master*



C

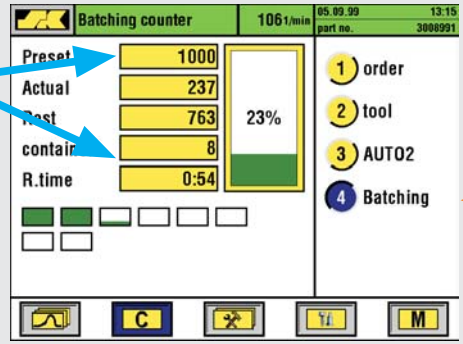






Trend Limits

C



4

C → activates the data entry mode

→ advances to the next screen

◁ 4 1,2.. Press to activate the function