

Injection Mold Monitor

T118

OVERVIEW

The **sigPOD PSV Injection Mold template** is designed to monitor a plastic injection molding process. Inaccurate control parameters can lead to scrap parts and wasted cycle time. This template captures the process in real-time, allowing for the identification of defective parts, faulty machinery and out-of-control assembly processes, such as:

- Short-shot parts
- Screw failure
- Incorrect mold
- Plastic material temperature
- Injector failure
- Debris or hardened material

Please note that this configuration is intended as a starting point and may require modifications to meet your specific requirements.

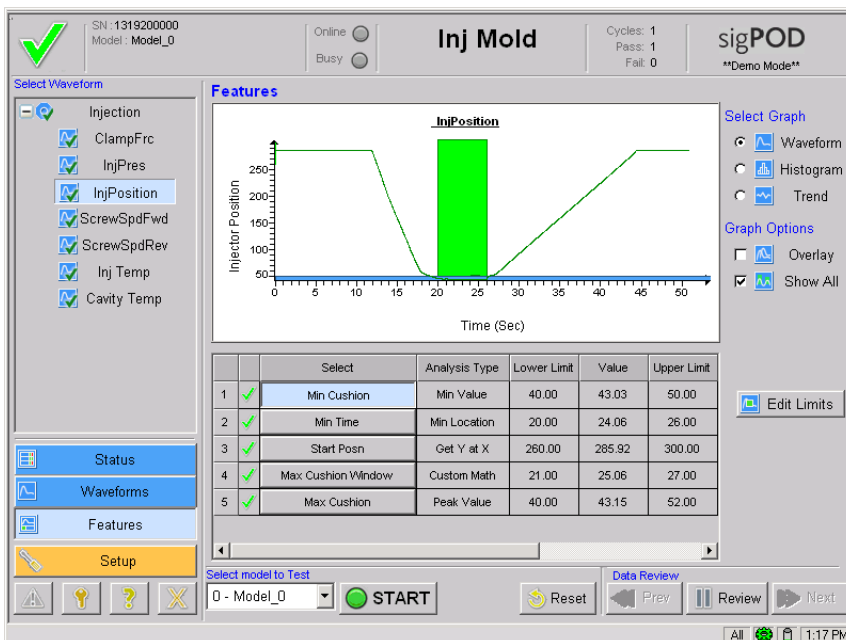


Installing the template

You can install the template using the **System Shell** interface. See the last page of this guide for complete installation instructions.

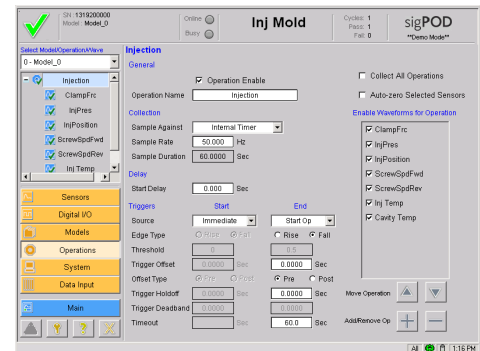
Requirements

The Injection Mold application template is compatible with **version 4.0 of sigPOD PSV**. It can be used on any sigPOD with at least four available analog channels and one available encoder channel.



SETUP

The base configuration is set up a 50 Hz sampling rate and a maximum duration of 60 seconds. These parameters should be tailored to each specific implementation to ensure the process is fully characterized. The settings will depend on the type of part and the particular test (eg.: size of mold or cycle time).



SENSORS

The assigned analog input channels are **00: Clamp Pressure**, **01: Injection Pressure**, **02: Inj Temp** and **03: Mold Temp**. The assigned encoder input channel is **00: Injector Position**.

CLAMP PRESSURE

Clamp Pressure (Analog Input 00) can be measured with a simple 0-10VDC transducer or a strain gage.

TORQUE

Cavity Temp (Analog Input 03) is connected to a temperature sensor in the main mold cavity.

TORQUE

Injection Pressure (Analog Input 01) is connected to a pressure sensor at the injector.

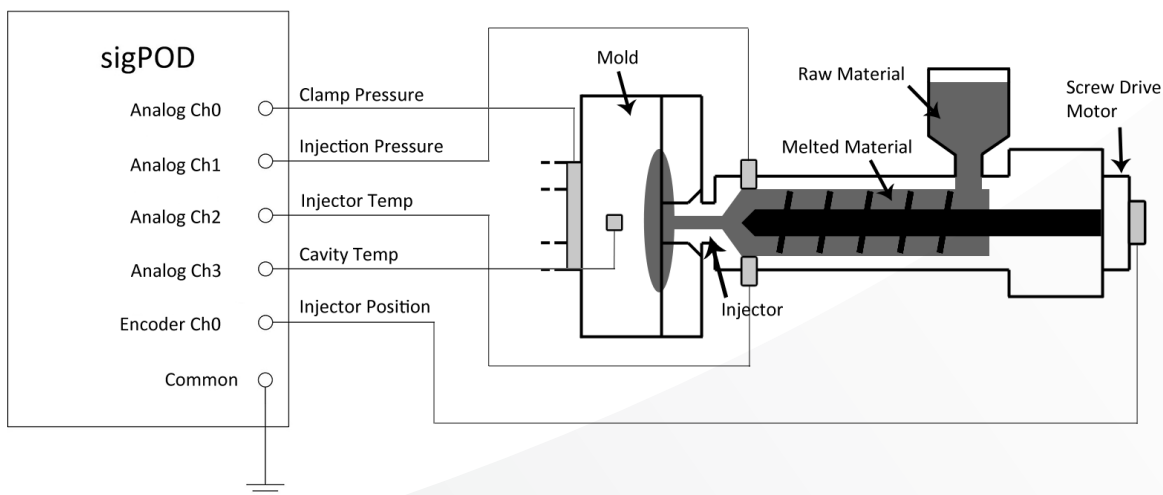
TORQUE

Injector Position (Encoder Input 00) is provided by an encoder attached to the screw/injector drive motor.

TORQUE

Injector Temp (Analog Input 02) is connected to a temperature sensor at the injector.

SCHEMATIC DIAGRAM



APPLICATION CONFIGURATION

The Injection Mold application comes configured with one operation: **Injection**. To add operations, please refer to the *sigPOD PSV User Guide* for more details.

Within Injection, the following waveforms and features are defined:

WAVEFORM DEFINITIONS

WAVEFORM	Y-INPUT	X-INPUT	WAVEFORM PROCESSING	DESCRIPTION
ClampFrc	Clamp Pressure	Time	None	-
InjPres	Injection Pressure	Time	None	-
InjPosition	Injector Position	Time	None	-
ScrewSpdFwd	Speed 0	Time	Low Pass Filter (5 Hz)	Processing the signal exaggerates signal noise, therefore smoothing is applied.
			Smoother (5 points)	Further smoothing of the signal is performed.
			Extract (0 to R04)	The signal is extracted up to the minimum cushion point.
			Absolute of Input Y	Reverse the signal level since it is negative. This is applied to the reverse direction if the signal is not negative.
ScrewSpdRev	Speed 0	Time	Low Pass Filter (5 Hz)	Processing of the signal exaggerates signal noise, therefore smoothing is applied.
			Smoother (5 points)	Further smoothing of the signal is performed.
			Extract (R04 to 99)	The signal is extracted from the minimum cushion point on.
InjTemp	Injector Temp	Time	None	-
CavityTemp	Cavity Temp	Time	None	-

FEATURE DEFINITIONS

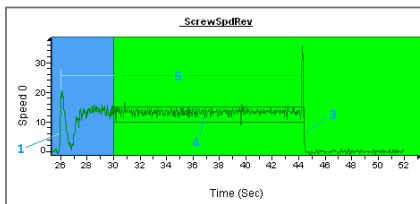
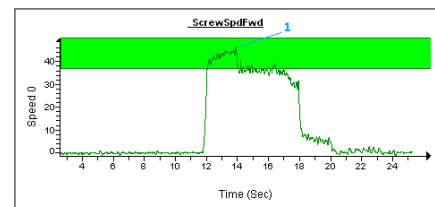
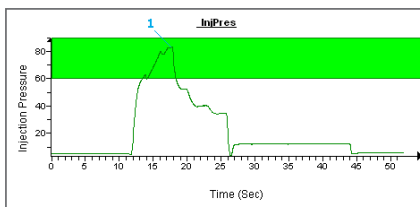
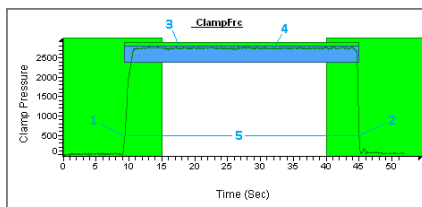
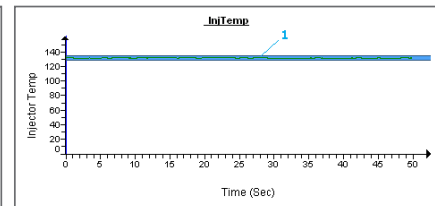
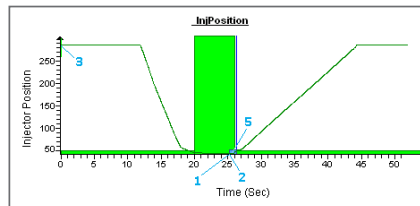
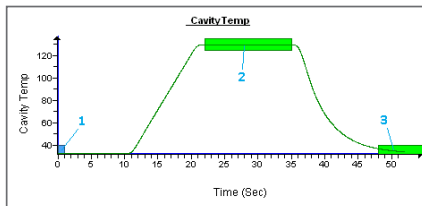
WAVEFORM	FEATURE NUMBER	FEATURE NAME	FEATURE TYPE	DESCRIPTION	EXAMPLES OF DEFECTS DETECTED
ClampFrc	1	Start Thresh	Threshold Crossing	The point at which the clamping engages is found and stored to R01.	NA
	2	Stop Thresh	Threshold Crossing	The point at which the clamp disengages is found and stored to R02	NA
	3	Peak Force	Peak Value	The peak clamp force is found within the engaged range.	Incorrect mold clamp pressure.
	4	Avg Force	Mean	The average clamp force is found within the engaged range.	Incorrect mold clamp pressure.
	5	Hold Time	Custom Math	Calculation of how long the clamp is engaged (R02 – R01).	Incorrect cycle time.
InjPres	1	Max Pres	Peak Value	The maximum injection pressure during the cycle is found.	Improper injection pressure, material not at correct temperature.
InjPosition	1	Min Cushion	Min Value	The minimum screw cushion is found and stored to R03.	Inadequately packed part, voids in material.
	2	Min Time	Min Location	The time at which the min cushion is found is stored to R04.	Used for making max cushion analysis window.
	3	Start Posn	Get Y at X	The injector position at the start of the cycle is found and stored to R05.	Incorrect starting screw position.
	4	Max Cushion Window	Custom Math	1 sec is added to R04 to make an analysis window for the max cushion and stored to R06.	NA
	5	Max Cushion	Peak Value	The max cushion between R04 and R06 is found.	Incorrect screw adjustment.

Table Continues...

FEATURE DEFINITIONS

WAVEFORM	FEATURE NUMBER	FEATURE NAME	FEATURE TYPE	DESCRIPTION	EXAMPLES OF DEFECTS DETECTED
ScrewSpdFwd	1	Max Inj Spd	Peak Value	The maximum forward speed is determined.	Improper screw speed, wrong material temperature.
ScrewSpdRev	1	Start Thresh	Threshold Crossing	The start point of the reverse direction is found (> 6rpm) and stored to R07.	NA
	2	Num Thresh	Threshold Count	The number of falling thresholds is found to determine where to look for the stop point, then stored to R08.	NA
	3	Stop Thresh	Threshold Crossing	The stop point is found (< 6rpm) and stored to R09.	NA
	4	Avg Speed	Mean	The average speed is found between R07 and R09, then stored to R10.	Improper screw retraction speed.
	5	Fill Time	Custom Math	The fill time is calculated by the following formula: (R05-R03)/R10.	Improper cycle time, short shot or over-packed part.
InjTemp	1	Average	Mean	The average injector temperature is found.	Improper material melting temperature.
CavityTemp	1	Before	Mean	The cavity temperature before heating is determined.	Incorrect starting mold temperature.
	2	In Process	Mean	The cavity temperature during the mold process is determined.	Inadequate mold temperature for proper material flow.
	3	After	Mean	The cavity temperature after cooling is determined.	Improper part cooling before mold open.


WAVEFORMS



Before you install the template

- Ensure PSV version 4.0 or higher is already installed on the sigPOD.
- If the template is on a USB flash drive, ensure the flash drive is inserted in the USB port of the sigPOD.

To install the template

1. On the *System Shell* toolbar, click *Install* to open the *Install* dialog box.
2. In the *Type* area, ensure *Back Up* is selected.
3. From the *Location* drop-down list, select one of the following:
 - X:\[Removable] – if the template file is on a USB flash drive
 - <Network Places> – if the template file is on a network drive
4. Click the  button next to the Location drop-down list.
5. In the *Open* dialog box, navigate to the template file (.SBK) to be installed.
6. Select the template filename, and click *Open*.
The template filename and properties are displayed in the *Install* dialog box.
7. In the *Install* column, *Component* area, ensure the *Calibration*, *Configuration*, and *Application Data* check boxes are selected.
8. Click *OK*.
9. To start the installed template, click *Run* on the *System Shell* toolbar.

For more information about installing application backup files, including template files, see the *InspeXion System Shell User Guide*. (To access, click *Install* on the *System Shell* toolbar, and then click *Help* in the *Install* dialog box).

About sigPOD Application Templates

sigPOD is a uniquely versatile platform that can be used for different applications across the production line. A sigPOD template serves as a starting point for configuration of the unit for a particular manufacturing test or monitoring requirement. Additional manual configuration will usually be required to fit to a test environment's specific circumstance. Please consult the sigPOD PSV user guide to learn more about how to configure the software. If you have suggestions on other templates or would like to share your own, contact us. If you require a customized application to meet your specific needs, our Manufacturing Intelligence Team can develop one for you. Request more information at inquiries@sciometric.com.

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