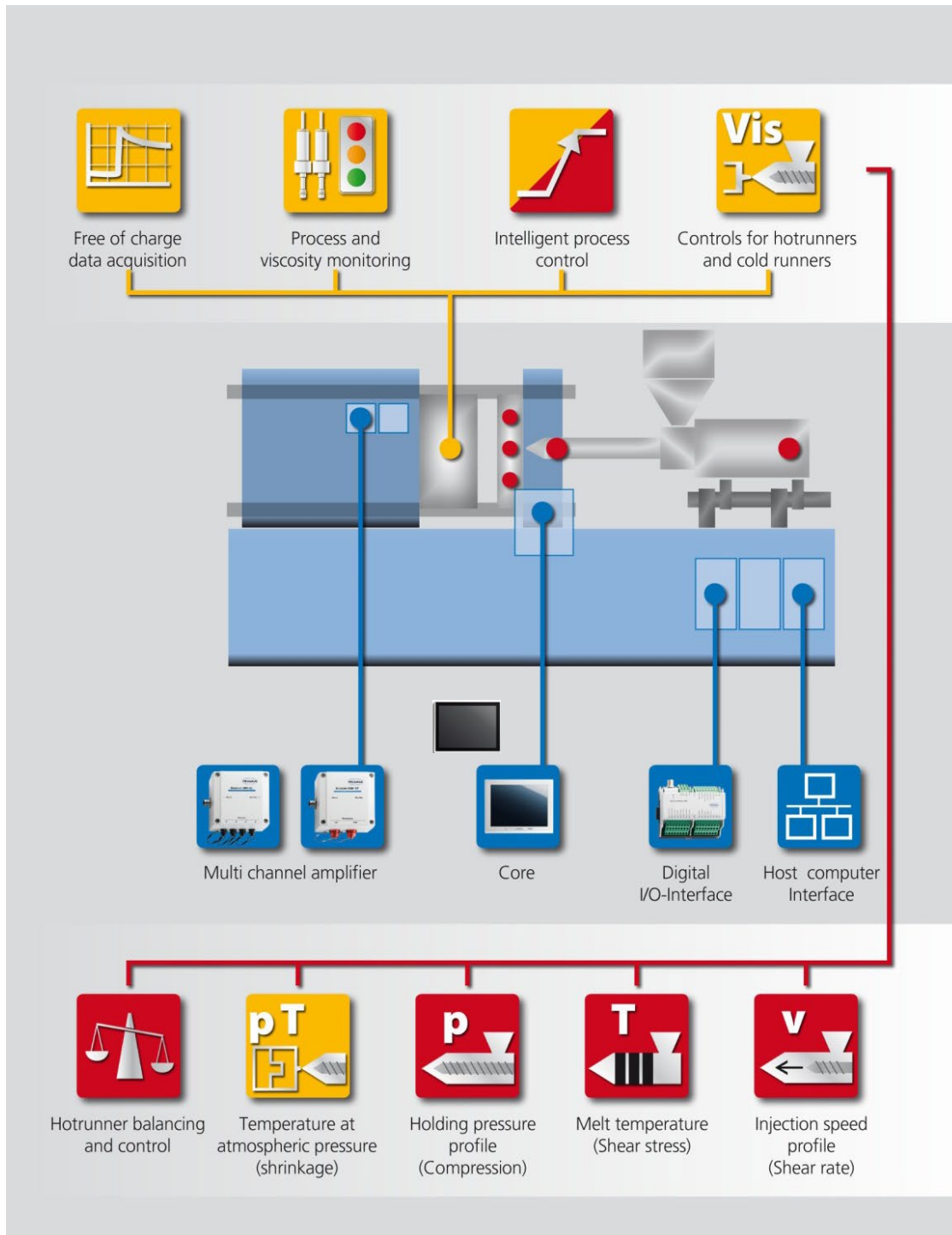


PRIAMUS FILLCONTROL Type 7080A

FILLCONTROL is a modular quality management system for the injection molding process and consists of several independent software modules.

Together with the digital BlueLine devices (amplifiers, Core and machine interfaces) several software modules can be combined depending on the application.



FILLCONTROL



Appliance	Application	Remark	Target Market
7080A- FreeViewer	Process visualization Data analysis of acquired data of all modules Demo mode for the explanation of the control options	Free of charge No license required Download possible	Process analysis Cost analysis Laptop / office Decision guidance for new users
7080A- Measure	Process visualization Data analysis of acquired data of all modules Data acquisition Data saving Data compression	Free of charge To be used together with BlueLine amplifiers type 5080A No license required No monitoring function No switchover function	Assistance for mold setup Mold Maker Universities Schools
7080A- Monitor	Process Monitoring Switchover to holding pressure Data analysis of acquired data of all modules Process visualization Data acquisition and compression Automatic switchover of holding pressure (melt front detection)	License required Including viscosity monitoring Basic module for all modules of higher order General switchover functions Start-up circuitry Good part / warning limits action limits / alarm Each monitoring function individual per channel Each sensor channel can be switched on and off	Automatic part containment of bad parts Monitoring of parts full / not full Guaranteed zero defect shipment Monitoring based on numerous functions
7080A- Switch	Intelligent process control Individual part monitoring Automatic switching functions	License required 7080A-Monitor Module required	Sequential control Valve gate control Rotary table applications Special applications SPS control Automatic venting Core pull control Control of weld lines
7080A- Control H	Balancing and control of hot runner molds	Including Core type 8280C with activated software license 7080A-Monitor module required	Minimizing fill time difference Control of set fill times Transfer of molds Identical parts - identical properties
7080A- Control V	Balancing and controlling of filling phases of multi cavity molds by valve gate nozzles	Including Core type 8280C with activated software license 7080A-Monitor module required	Liquid silicone rubber (LSR) Family molds Thermoplastic - LSR

Appliance	Application	Remark	Target Market
7080A- Control P	Automatic process control: Flow, compression, shrinkage of hot runner and cold runner applications	Including Core type 8280C with activated software license 7080A-Monitor module required	Process control: Injection speed control (via shear rate) Control of holding pressure profile (via compression) Melt temperature (via shear stress) shrinkage (via mold temperature at 1 bar) Transfer of molds Identical parts - identical properties

FILLCONTROL User Interface

Properties	Description
Display	Dynamic (depending on appliance and actual setup)
Order / Configuration Management	Measuring data, configuration data and event log are saved in one common file Export and import functions for order and configuration files
Operation	Via touch screen or mouse / keyboard (in case of PC / Laptop)
User setup	Sophisticated user management
Event log	Report / list of events related to the monitoring functions
Good / Bad part counter	Continuous display of monitoring results
Channel setup	Depending on system (min. 128 channels) Charge (cavity pressure, force, strain) Temperature (cavity temperature) Voltage (machine signals) The channel setup can be changed/configured during data acquisition
Data acquisition	Can be started, stopped, paused and restarted
Display of measuring signals	Display in real time during data acquisition on the screen
Navigation of measuring cycles	Possible during actual measurement
Production concept	Integrated in layout of user interface
Part quality	Limits adjustable for good / bad / warn / action / alarm
Language	Adjustable at any time

7080A FILLCONTROL Monitor: Monitoring Functions

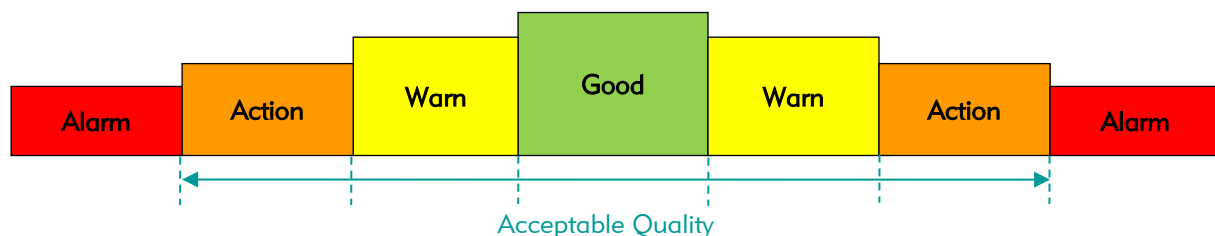
FILLCONTROL Monitor serves as basis appliance for process monitoring and can be combined both individually or however together with other appliances.

FILLCONTROL Monitor is precondition for superior control appliances, since a controlled process have always to be monitored.

Monitoring functions: Minimum, maximum, integral, cavity temperature, threshold, melt front (automatic detection), overmolding protection, shear rate, shear stress, viscosity, balancing time

- Unlimited number of monitoring functions for each sensor
- The monitoring functions are setup in groups which can be allocated to a user defined monitoring purpose
- Monitoring limits for warn, action and alarm

The FILLCONTROL Quality Concept



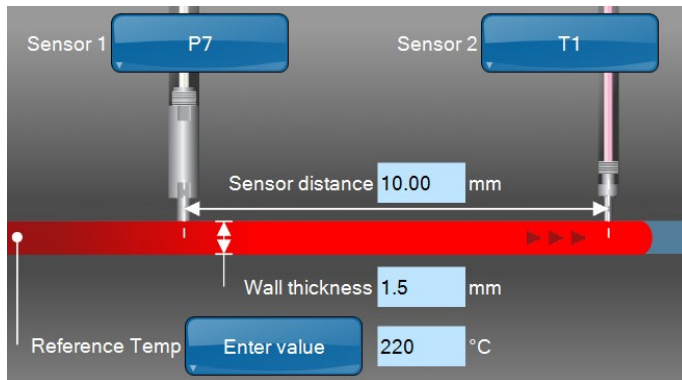
Quality Classification	The quality of a molded part respectively of a criterion is defined by the user for the respective monitoring function. The limits can be defined for following quality levels: Good / Warn / Action / Alarm. These comply with the quality output signals of the I/O Master and I/O Expander modules (interfaces to the machine or to peripherals).
Allocation of quality results	All monitoring functions including viscosity can be allocated to individual or common output signals.
Quality indication	The quality results are displayed after a defined switching time. In case the quality results are missing after the switching time has expired a bad part signal will be created (→entry to the event log). The switching time, the duration and the polarity are valid for all quality output signals.

Concept of Viscosity Monitoring

The viscosity of the melt is an important factor for the evaluation of the material and process consistency during the filling stage. If the material properties or the ambient conditions change the flow conditions in the cavity will also change.

FILLCONTROL monitors the viscosity directly inside of the mold by means of a cavity pressure and a cavity temperature sensor, since a measurement of the viscosity in the machine allows no conclusion to melt flow in the cavity.

Example: Setup for the determination of the viscosity in the mold



7080A FILLCONTROL Switch: Process Control

FILLCONTROL Switch generates real time switching signals when the melt front is detected and allows a targeted process control depending on the flow process. As soon as the melt in the cavity reaches the position of a cavity pressure sensor or a cavity temperature sensor, a switching signal is generated and used for the relevant switching operation according to the application.

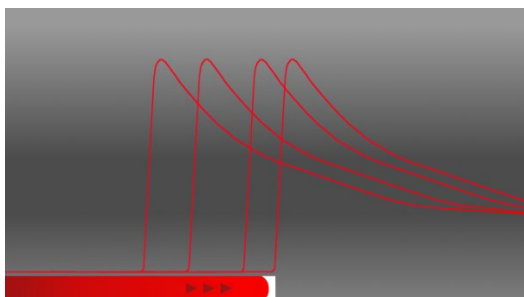
7080A FILLCONTROL Control H: Hotrunner Balancing and Control

FILLCONTROL controls the melt flow in hotrunner molds by determining the fill times automatically and adjusting the hotrunner nozzle temperatures accordingly.

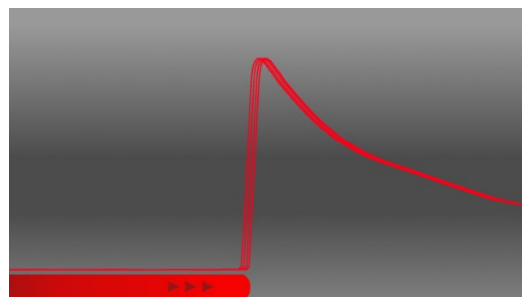
The system can be operated in three different operating modes:

1. Balancing of multi cavity molds
 - different fill times in the multi cavities are compensated
 - all molded parts are filled at the same time
2. Fill time control
 - the melt flow is controlled based on a reference
 - weld lines are specifically controlled to a certain position
3. Sequential control
 - the melt flow in sequential molds with more than one cavity is controlled in order to balance the flow between all sequential nozzles

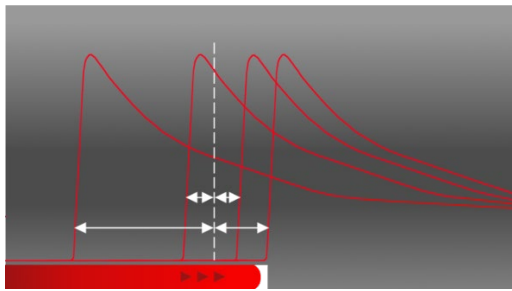
Example: Balancing of a 4 cavity mold



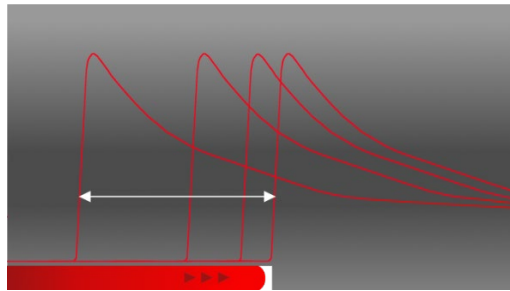
The temperature signals are displaced in time
The cavities are filled differently



After balancing all cavities are filled
at the same time



Fill time deviation is the highest time deviation of a signal from the mean fill time



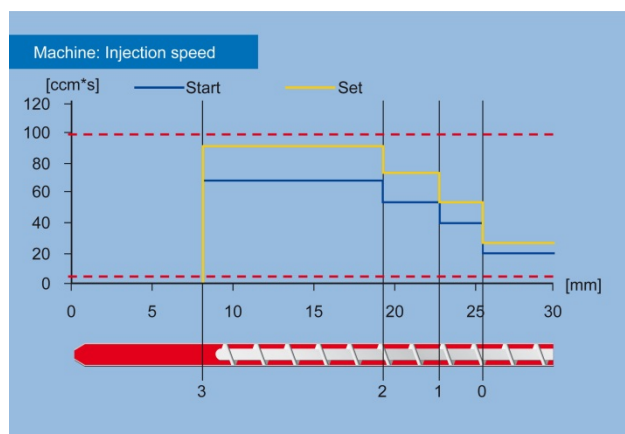
Fill time difference is the time difference of the cavity filled first to the cavity filled last

7080A FILLCONTROL Control P: Process Controller

The quality of a molded part results from the melt flow, the compression and the shrinkage. All these parameters however must be determined and controlled directly inside the cavity, because only this way the process can be kept consistent independent from the machine. Process validation independent from the machine is only possible if the properties are determined and influenced decoupled from the machine.

7080A FILLCONTROL Control P: Shear Rate Control

The shear rate of a plastic melt depends on the geometry of the cavity on the one hand and on the adjusted injection speed of the molding machine on the other hand. Basically two sensors are required to determine shear rate by which the arrival of the melt front is automatically detected at the sensor position. On principle two pressure sensors, two temperature sensors or one of each (pressure or temperature) could be used. The shear rate determined this way can be reproduced on the same or on another machine at any time by varying and adapting the injection speed profile accordingly. The flow conditions are therefore always the same.

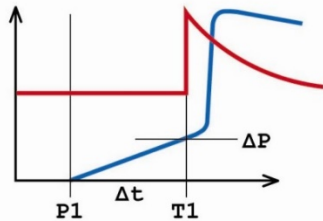


Example:

Injection molding process with 4 injection stages
The injection speed profile is automatically adapted via host computer interface of the molding machine

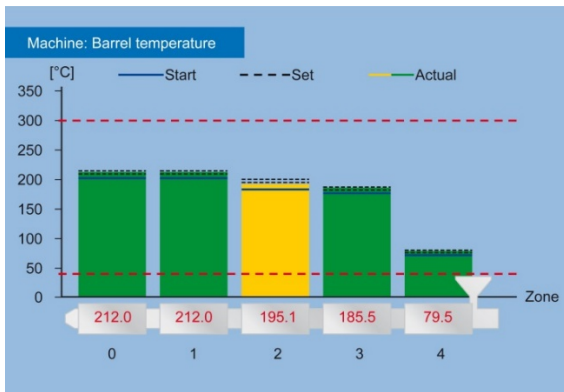
7080A FILLCONTROL Control P: Shear Stress Control

Shear stress is also determined during injection and depends first of all on the fill pressure during the filling stage. For this reason the beginning of the pressure rise as well as the time for the pressure detection are automatically determined and analyzed.



Example: Cavity pressure (blue) and cavity temperature (red)
The times P1 and T1 are automatically determined, as well as the time difference Δt and the pressure difference Δp

In order to control shear stress the melt temperatures must be changed. This is achieved by changing the barrel and hotrunner temperatures. The control can be applied for cold runner and hotrunner molds.



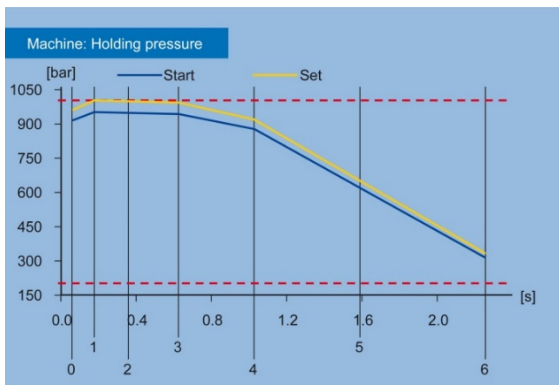
Example: Shear stress control via barrel temperatures of the molding machine

7080A FILLCONTROL Control P: Compression Control

The mechanical strength of a molded part depends among other things on the compression of the melt during manufacturing. Too high compression as well as too low compression may lead to undesired results depending on the application and the geometry of the molded part.

In order to reproduce the compression of a molded part the holding pressure profile of the respective machine must be adapted. For this reason a reference value of the cavity pressure is being saved during the holding pressure phase.

This cavity pressure value serves as reference value, to reproduce the optimized compression respectively agglomeration of the injection part. The holding pressure profile of a molding machine is finally modified respectively adjusted as long as the optimized reference value in the cavity is conformed.



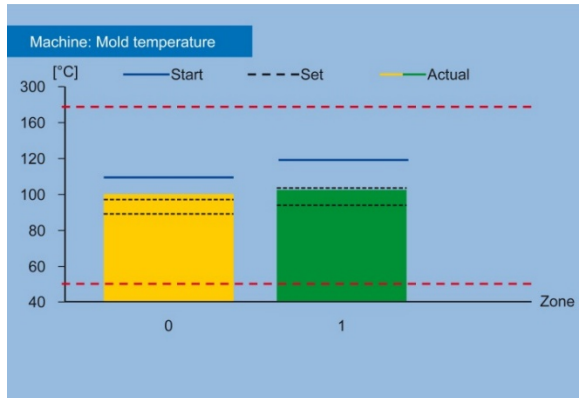
Example: Compression control of a molded part by adapting the holding pressure profile of the molding machine

7080A FILLCONTROL Control P: Shrinkage Control

A molded part starts to shrink in the injection process when atmospheric pressure will be reached due to the cooling of the melt. If these parameters change during the process the shrinkage of the parts will change as well and therefore their dimensions.

The shrinkage control of the FILLCONTROL system determines the cavity temperature when reaching atmospheric pressure and controls existing deviations automatically.

The system controls the temperature controllers preferably via host computer interface of the machine.



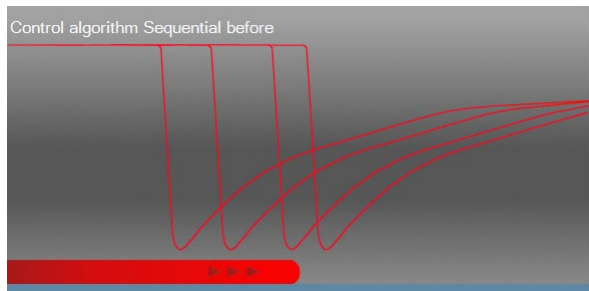
Example:

Shrinkage control of a molded part by automatic adaption of the mold temperature control on the fix and the moving half of the mold
Basically it is possible to control a number of cooling circuits at the same time

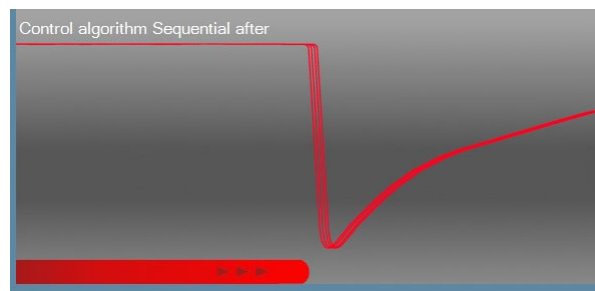
7080A FILLCONTROL Control V: Valve Gate nozzle Control

FILLCONTROL Control V balances and controls the melt flow in coldrunner and hotrunner molds by automatically delaying the opening of the valve gate nozzles. Similar to hot runner multi cavity molds this results in simultaneous filling of all cavities which is especially relevant for silicone and multi components applications. In general it is possible to control each single valve gate nozzle individually, which effectively is applied for family molds. The opening of the nozzles occurs with trigger. The closing of the nozzles occurs, for example, by detecting the melt front in the cavity.

The following example (production material: LSR) illustrates the state of the signals and cavities before and afterwards effected valve gate nozzle controlling:



Before: The temperature signals are time delayed, the cavities are filled differently.



Afterward: All cavities are filled simultaneously.

Accessories

Description	Type
BlueLine Core	8280C
BlueLine I/O Master	8980C
BlueLine I/O Expander	8981A
BlueLine Bus Interface	8982A
BlueLine Amplifier	5080A / 5070A
Proximity Switch	9015A
BlueLine Power Supply	9016A
Top Hat Rail	9080A

Order Examples

Example 1: 7080A FILLCONTROL Monitor for Process Monitoring

Item	Quantity	Module Type	Description	
1	1	7080A Monitor	Software module for monitoring and control of the injection molding process	7080A Monitor Pack
2	1	8280C	BlueLine Core incl. Touch Screen Display and Harddisk	
3	1	9021A	Fixing device for BlueLine Core type 8280C	
4	1	5080A-16T	BlueLine multi-channel amplifier for 16 temperature channels	
5	1	5080A-4p	BlueLine multi-channel amplifier for 4 pressure channels	
6	1	8980C	BlueLine I/O Master, interface for easy connecting of digital alarm and switching signals to the machine respectively to the peripherals	
7	1	1282A2	Installation kit incl. control cabinet feed through type 1282A for BlueLine Hybrid Bus cable type 1280A	
8	2	1280A5	BlueLine Hybridbus connecting cable, l = 5 m	
9	16	4103F0.2	Miniature cavity temperature sensor incl. flexible quick disconnect	
10	16	4100D1.0A2-101	Waterproof quick disconnect cable for miniature cavity temperature sensors	
11	2	1194A-8T	BlueLine multi channel connecting box for maximum 8 temperature signals	
12	2	1144A2	Multi pin connecting cable (temperature), 8 channels, l = 2 m	
13	1	4561B	Mounting / extraction tool for cavity temperature sensors	
14	1	4562A	Assembly tool for mounting nuts of the sensors (temperature)	
15	1	4563B	Assembly tool for the mounting nuts of quick disconnects (temperature)	
16	4	6001B	PRIASED® cavity pressure sensor with sensitivity detection	
17	4	6101D0.2	Waterproof quick disconnect for cavity pressure sensors for the installation into mold inserts	
18	4	6100D1.0-102	Waterproof quick disconnect for cavity pressure sensors for the installation into the mold platen	
19	4	1041A2	Connecting cable for cavity pressure sensors with and without sensitivity detection, l = 2 m	
20	1	6561A	Mounting / extraction tool for cavity pressure sensors	
21	1	6562B	Assembly tool for mounting nuts of the sensors (pressure)	
22	1	6563B	Assembly tool for mounting nuts of quick disconnects (pressure)	
23	1	9080A	Top Hat Rail for BlueLine devices	

Example 2: 7080A FILLCONTROL Switch for Automatic Process Control and Process Optimizing.

Item	Quantity	Module Type	Description	
1	1	7080A Monitor	Software module for monitoring and control of the injection molding process	7080A Monitor Pack
2	1	8280C	BlueLine Core incl. Touch Screen Display and Harddisk	
3	1	7080A Switch	Software module for the control of the injection molding process, for the individual monitoring of every single cavity as well as for special switching and monitoring methods such as rotary table and multi component applications	
4	1	9021A	Fixing device for BlueLine Core type 8280C	
5	1	5080A-16T	BlueLine multi-channel amplifier for 16 temperature channels	
6	1	5080A-4p	BlueLine multi-channel amplifier for 4 pressure channels	
7	2	1041A2	Connecting cable for cavity pressure sensors with and without sensitivity detection, l = 2 m	
8	1	8980C	BlueLine I/O Master, interface for easy connecting of digital alarm and switching signals to the machine respectively to the peripherals	
9	1	1282A2	Installation kit incl. control cabinet feed through type 1282A and BlueLine Hybrid Bus cable type 1280A2	
10	2	1280A10	BlueLine Hybridbus connecting cable, l = 10 m	
11	8	4004D0.2-101	Miniature cavity temperature sensor	
12	1	1194A-8T	BlueLine multi channel connecting box for maximum 8 temperature signals	
13	1	1144A2	Multi pin connecting cable (temperature), 8 channels, l = 2 m	
14	1	4561B	Mounting / extraction tool for temperature sensors	
15	2	6001B0.4-102	PRIASED® cavity pressure sensor with sensitivity detection	
16	1	1280A1	BlueLine Hybrid Bus connecting cable, l = 1 m	
17	1	6561A	Mounting / extraction tool for cavity pressure sensors	
18	1	6562B	Assembly tool for mounting nuts	
19	1	9080A	Top Hat Rail for the mounting of BlueLine devices	
20	1	8981A	BlueLine I/O Expander, Add-on interface for the simple interfacing of digital alarm and switching signals of the machine and other peripheral	
21	2	8982A	BlueLine Bus Interface (IF), Interface for the connection of several BlueLine I/O groups of modules	

Example 3: 7080A FILLCONTROL Control H Hotrunner Balancing and Control (without individual bad part selection)

Item	Quantity	Module Type	Description
1	1	7080A Control H	Software module for the balancing and control of hot runner molds, incl. BlueLine Core type 8280C and connecting cable type 1250A-Synventive RS485
2	1	7080A Monitor	Software module for monitoring and control of the injection molding process
3	1	9021A	Fixing device for BlueLine Core type 8280C
4	1	5080A-16T	BlueLine multi-channel amplifier for 16 temperature channels
5	1	5080A-16p	BlueLine multi-channel amplifier for 16 pressure channels
6	1	1280A5	BlueLine Hybridbus connecting cable, l = 5 m
7	1	1194A-8T	BlueLine multi channel connecting box for maximum 8 temperature signals
8	1	1144A2	Multi pin connecting cable (temperature), 8 channels, l = 2 m
9	8	4004D0.2-101	Miniature cavity temperature sensor
10	1	4561B	Mounting / extraction tool for temperature sensors
11	1	1195A-8p	BlueLine multi channel connecting box for maximum 8 pressure signals
12	1	1054B2	Multi pin connecting cable (pressure), 8 channels, l = 2 m
13	8	6008AA0.4-102	Miniature cavity pressure sensor
14	1	6567C	Assembly tool
15	1	6568A	Mounting / extraction tool for cavity pressure sensors
16	1	6585A	Assembling aid
17	1	9080A	Top Hat Rail for the mounting of BlueLine devices
18	2	1282A2	Installation kit incl. control cabinet feed through type 1282A and BlueLine Hybrid Bus cable type 1280A2
19	1	8980C	BlueLine I/O Master, interface for easy connecting of digital alarm and switching signals to the machine respectively to the peripherals
20	1	1251A	Converter RS232-RS485