HIRSCHMANN AUTOMOTIVE

Technical Delivery Regulation

ES01 – Injection moulding extension

Hirschmann Automotive Gmbh
Oberer Paspelsweg 6-8, 6830 Rankweil

Tel +43(0)5522 307-0 Fax +43(0)5522 307-553
info@hirschmann-automotive.com, www.hirschmann-automotive.com

This standard governs the requirements for the documentation and the general regulations for the delivery of systems.

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This delivery regulation ES01 replaces all previous regulations.

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Responsibility:	Trojer Markus
Department:	P_ET

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1. General

1.1. Area of application

This Hirschmann factory standard specifies the delivery regulations for the injection moulding design of machines, systems and production facilities.

1.2. Deviations

Deviations from this delivery specification which may appear necessary or appropriate to the manufacturer, require written approval from Hirschmann Automotive.

1.3. Standards/Regulations

Even if this technical delivery specification does not specify such in detail, the contractor is fully responsible for, in addition to the requirements specified in this technical delivery specification, all requirements applicable to their service arising from regulations (e.g. EC directives, regulations and other applicable laws) as well as from standards and generally accepted rules of technology.

As far as regulations, standards and technical rules are referenced in this technical delivery specification, the contractor themselves must check whether they are applicable for their work and whether other regulations, standards and rules are also to be adhered to.

If in doubt, the contractor must immediately contact the client.
In addition, the contractor shall immediately notify the client if the contractor recognises or identifies, on the basis of their knowledge, that the service to be rendered by the contractor is not suitable for the intended purpose or suited only to a limited extent.

2. Injection moulding machine

2.1. Closing unit

The closing unit must run on linear guides. If possible, the ejector must be electrically operated. The ejector force must be reducible or adjustable.

2.2. Injection / plasticizing unit

- Conversion to another screw diameter must be possible
- Measurement logss of the following components must be enclosed:
  - Screw
  - Cylinder
  - Non-return valve
- The cylinder, screw and non-return valve must be supplied in a highly wear-resistant design (it must be assumed that production of PA with 40% glass fiber content is required).
- A minimum service life of the cylinder, screw and non-return valve of 10,000 hrs must be guaranteed
- Position-regulated screw

2.2.a Module

The heating strips and sensors must be supplied in plug-in version on the injection unit, the type of plug connection must be clarified with Hirschmann Automotive.
Heating strips in reinforced design for use up to 450 °C.

2.2.b Screw

Unless otherwise specified, the screw must be designed as a standard 3-zone screw.

2.2.c Nozzle

The radius of the nozzle tip must be 7.5 mm. If a magnetic clamping system is required, the nozzle must be designed extended. In addition, the nozzle contact force must be adjustable.
Nozzle bore, see specification sheet.

2.2.d Cooling and heating

The heat strip must be controlled via semiconductor relays. Only ceramic high-performance heating strips are to be used. An adjustable cooling circuit for the intake area is required.
The cover of the plasticizing unit must be dimensioned so that potential insulating sleeves can be retrofitted without conversion measures.

2.3. Electrical connections

The power supply of the machine must be as follows: 3x400 V/N/PE 50 Hz, or for machines in Mexico: 3x400 V/N/PE 60 Hz

All attached sockets or socket sets are to be completed as specified in the specification sheet.

The following sockets types are to be used:

- CEE 400 V / 16 A
- 230 V / 16 A Schuko
- Or a combination of both

2.4. Interfaces

If the following interfaces are required in the specification sheet, these must be designed with the following plug connections. Documentation and place of production, according to specification sheet

- Ejector plate protection: Hirschmann STAKAP2 incl. Stasi bar and shorting plug
- Colouring: Hirschmann STASAP2 incl. bar
- Good / reject part interface: Harting 5-pin connector
- Good part impulse counter:: Harting 5-pin connector
- Hot channel plug connector: Harting HAN 24-pin with double locking latch

2.5. Temperature control

2.5.a Temperature control general

- The temperature control must be designed according to the specification sheet.
- High-temperature hoses or piping must be designed for a continuous load of 160 °C and 8 bar pressure.
- Supply lines that are used up to 100 °C should also be equipped with ferrules or press rings. (Hose clamps only allowed in the wide variant)
- Shut-off valves must always be accessible.
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2.5.b Hoses

- Hoses must not lie or be laid on the floor; cleaning of the floor should be possible at any time. If necessary, a channel or support can be attached to the machine.
- Hose outlets must be designed with a custom thread and have a sealing cone compatible with the couplings or screw connection.
- For service, the device tower or individual devices should be able to be pushed away despite the hoses being installed; a small hose reserve must be provided.
- Crossing of hoses should be avoided if possible.
- Dismantling of hoses which are located on partition plate or distributor block should be possible without disassembly of other hoses

2.5.c Temperature control couplings

- The couplings specified within the specification sheet must be used.

2.6. Operating unit

2.6.a Hardware

A flat screen monitor with colour display and at least partial touchscreen operation must be available for operation of the machine.
Rapidly changing keystrokes must be possible without delay. The monitor unit must be robust.

Registration at the control unit must be via RFID (according to Euromap 65). At least 5 RFID cards must be provided with delivery, of which 1 unit is to have the highest client level.

A separate ON/OFF button must be present on the control unit for operation of both the heat channels (if required) and the temperature control unit. Ideally, this is located next to the ON/OFF button for the cylinder heater.
In addition, USB ports must be integrated into the control unit.

2.6.b Software

The following software features must be integrated:

- Programmable start-up program (eg: starting without repressing for X cycles and automatic switching of production parameters)
- Programmable automatic startup and shutdown
- Min. 2 freely programmable parameter pages for creating customer-specific pages
- Alarm log / log file
- Input log (changes must be logged with the operator)
- Min. 3 authorization levels, which must be freely configurable
- Automatic empty spray function
- Automatic form height adjustment
- Tool and process data can be stored:
    - Internally
    - on a USB memory stick
    - on a network drive
- User interface language switchable / The following languages must be available for the user interface: German, English, Czech, Romanian, Chinese, Spanish, French
- The mass cushion must be taken along the smallest screw path
- Software designed for min. 24 tool heating zones, incl. all displays and settings such as boost function, heating current display, starting, reduction mode as setpoint control and automatic PID control
- Software monitoring of temperature control units via RS 485 / Canbus / 20 mA interface, including all displays such as flow rate and function selections for cooling, emptying, switching off.
- All values related to the plasticizing unit must be displayed with two decimal places on the screen
- Dynamic pressure adjustable in multiple steps
- Plastification adjustable in multiple steps
- Min. 3 opening and 3 closing speeds for the clamping unit, assignable path-dependent
- Injection speed / afterpressure adjustable in multiple steps
- Path and time-dependent switching of the injection stages
- Ejector setting via terminal:
    - Forward speeds, 2 steps
    - Reverse speed
    - Multi-stroke
- Export of process parameters in .xls (or similar) format
- Screenshots can be easily stored at the press of a key (softkey)
    - on a USB memory stick
    - on a network drive
- Own data can be entered (e.g. comments about the program, etc.)

- Manual integrated in control system
- Ejector plate protection programme, including signal change query (0/1) can be switched ON or OFF
- Tool data set must be transferable to the background
- Machine maintenance plan displayed and monitored via the machine control, incl. logbook entry upon confirmation of execution.
- Operating hours counter and automatic hour counter (cannot be reset)
- Remote access to allow external access for assistance via network interface
- Min. 3 programmable inputs / outputs
- Automatic reference value determination
- Adjustable process graphics
- Adjustable log graphics (trend graphics)
- Production log (piece counter, good / reject parts etc.)
- Shift-related piece counter
- Target/actual value log
- Monitoring graph
- Monitoring parameters freely adjustable
- Monitoring of cylinder temperatures with tolerance ranges
- Tolerance inputs

2.7. Machine construction and equipment

- Drilling pattern for robot according to VDMA
- Machine supports on rubberized feet
- Automatic central lubrication
- Lubrication points of the closing unit must be routed centrally to an externally accessible position
- Lubrication points of the injection unit must be routed centrally to an externally accessible position
- A central maintenance unit should be provided for the pneumatic components
- Protective doors in robust design
- For horizontal machines, a 3-colour LED signal light is to be provided. Constructed from top to bottom with functions as follows:
  Red: machine malfunction, orange: manual / setup mode, green: machine in automatic mode
  Positioned on the operator side on the front side of the closing unit

2.8. Magnetic clamping system

If required in the specification, a magnetic clamping system from Roemheld-Rivi, type "M-TECS" according to Hirschmann Automotive option model, is to be used. In addition, there must be a dowel pin in the clamping plates of the machine and a corresponding hole in the magnetic clamping plates in order to be able to centre the clamping system upon the machine in the correct position. If it is a machine type that is not yet in use at Hirschmann Automotive, a design approval of the magnetic clamping system must first be obtained from the customer.

The installation of a control cabinet should be considered. The position must be agreed with the customer. The power supply must include a circuit breaker and fuse for the clamping plate control.

If no release of the clamping system is available, the alarm fault of the external clamping plate must be displayed. If a gap of 0.2 mm occurs between the mould plate and clamping plate during the cycle, all machine movements must be STOPPED. The clamping system release may only work in setup mode. The unit must also be able to be moved in setup mode.

3. Granulate drying & conveyor technology

3.1. Piping system

When connecting a fully automatic injection moulding machine, stainless steel is used as piping material for the longitudinal pipes, and glass for the bends. For the connection of semi-automatic injection moulding machines, aluminium is used for the longitudinal pipes, and stainless steel for the bends. Storz couplings are used for the coupling system.

3.2. Vacuum system

The vacuum blowers are to be frequency-controlled for better efficiency. A central filter should be provided in front of the vacuum fan, and the fans should be equipped with silencers.

3.3. Drying air generation

The dry air generators are equipped with a dewpoint control. A dewpoint of below -20 °C must be maintained at all times. The dry air blowers must be frequency-controlled depending on the load. In the event of a malfunction, a corresponding fault message must be issued. An RJ-45 Ethernet connection and connection to an internal MES must be provided. The drying air generator must be designed according to the dimensioning in order to be able to handle the defined drying volumes + a reserve of 10%.

3.4. Drying hopper

The drying hopper must be designed so that the defined material can be dried down to its permissible residual moisture according to the specifications of the material manufacturer at the specified throughput (measurement with Brabender system) and over-drying is avoided. Removal of material during operation must be possible. The drying temperature is to be controlled centrally. Automatic lowering of the drying temperature and the air quantity depending on the throughput is to be provided.

3.5. Material conveying equipment

The conveyor must be matched to the specified throughput and the preferred material.

4. Encapsulation

4.1. Machine requirements

4.2. Material preparation

- Bubble-free material processing must be guaranteed
- Container temperature-controllable, temperature control and monitoring linked to the control system
- Hoses temperature-controllable, temperature control and monitoring linked to the control system
- The lines must be kept as short as possible; undercuts and angles must be avoided
- Container size adjusted to material consumption
- Level sensor, linked to control -> Info when material needs to be refilled
- Batch entry when refilling the material, with stored expiry date, system malfunctions if defined time is exceeded

4.3. Work trolley

If trolleys are ordered, the following information must be observed:

- Heatable trolleys made of aluminium for receiving the provided component holders
- Insulating plate for thermal insulation with cutouts for pallet centring
- Silicone heating mat 0 - 200 °C control range, temperature adjustable via control system and monitorable with freely selectable tolerances - cable outlet in the middle
- Strain relief for heating mat cable
- Exchangeable cylinder pins for indexing component fixtures
- Design of centring bushes permits exchange
- The cycle must not be able to start if the cart is not fully inserted
- Axis accuracy for the carriages: absolute deviation of max. 0.3 mm, incl. measurement protocol
- Threaded pins for adjusting the carriage parallelity

4.4. Goods carrier coding

If goods carrier coding is ordered, the following information must be observed:

- 5 sensors on dosing system which query the coding of the component acceptance before start via 01010
- Automatic program selection via the coding

4.5. Dosing components

- Dosing capacity adjusted to material consumption
- Dosing pumps can be temperature-regulated, adjusted and monitored by the control system
- Dosing accuracy: ± 4%
- CPK value of casting weight of > 2.0 must be achieved, for individual components as well as mixture

4.6. Software

- Pot life monitoring
- Output of error messages (easy to interpret, with explanation of the error)
- different operating levels
- Password protection with automatic log-off
- Different dosing and driving programmes must be able to be stored
- Switchable visualization of the dosing system
- Actual values and process parameters must be recorded and read out from the machine for further processing -> actual values: runtime of the dosing pump / component;
- Changes must be recorded
- Weight:
    - 1 precision scale for weight testing and process control, protected against slipping, freely accessible
    - Reading on scale: 0.001 g / repeatability: 0.001 g
    - automatic weight control linked to the control system
    - freely selectable tolerances
    - 130 shots must be able to be carried out
    - Values must be logged and read out
    - incl. cup detection
- Pressure and temperature monitoring with freely adjustable nominal values and tolerances