# AIM Information Booklet

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AXXICON ISO MANUFACTURED

# PREFACE

This booklet is made to inform you about the AIM Mould System and the relationship between ISO, CAMPUS® and Axxicon Moulds Eindhoven BV.

You will find information on the latest developments in testing polymer properties and the reasons why every laboratory should have an ISO mould, like our AIM Mould System.

At the end the importance of a good and experienced mould maker is explained. A mould maker who is trusted by all main plastic testing laboratories in the world.

**Note: This and other information is also available on** www.axxicon.com



The information is partly taken out of information from ISO and CAMPUS®, but may contain not updated information or mistakes. Therefore we advise you to check everything with relation to ISO and CAMPUS® yourself.

# CONTENTS

# 1. HOW IMPORTANT IS ONE WORLD STANDARD?

**Developments in determining plastic properties**

The plastics industry is a global market, and the competition is becoming more challenging. We tend to export and/or we compete with imported products. Outstanding and recognisable quality is more important than ever before. Now the important questions are "Do we have the right test results?" and "What do these results mean?"

Plastic properties do not only depend on the size and geometry of the sample, but also on the specimen history. We can change test results by simply changing injection-moulding parameters. Plastic properties also change, influenced by the design of the injection mould (runner length, end- or side-gated, gate size, temperature, surface etc.). However, test standards normally do not mention anything about the production of test specimens.

The International Organisation for Standardisation (ISO) solved this problem. Besides the existing test standards, standards where developed for 'Injection moulding parameters', 'Mould design' and 'Acquisition and presentation of data'. Further they also reduced the amount of different samples. With only 6 ISO samples, including the so-called "Multi-Purpose" specimen you can do most ISO tests.

In addition to the ISO standards, a special material database has been developed. Its name is CAMPUS® (Computer Aided Material Pre-selection by Uniform Standards). This database only contains data from material suppliers, who are affiliated to CAMPUS®. They use the above-mentioned ISO standards for production, testing and presenting plastics. CAMPUS® data are presented on a floppy disk supplied by the material supplier. Special software from MBase enables the integration of data from different suppliers.

These developments are very important for all players in the plastics industry. Raw material suppliers, compounders etc., but also research and development centres, educational institutes, OEM's and moulders can profit from it. Using these ISO standards will lead to 'Rationalisation of procedures and Cost reduction' and 'Better and more consistent product quality'. But moreover you will get worldwide 'Comparable test results' and therefore 'Better access to expanding markets'.

These developments started in Western Europe, and are now spreading all over the world. Not only European companies changed their national standard for ISO, but also the US and Asian industry moves over. Although most American companies use ASTM, the big industries, like the automotive, see the benefits of these ISO standards, and they are now pushing their plastic suppliers to test according ISO. Besides that, standards like ASTM and JIS are being harmonised with ISO.

"The US plastics industry is starting to transition to the use of global testing standards", says Stephen J. Watson, Senior Technical Consultant of DuPont Co. "It is essential to maintain and facilitate growth" (Plastic Engineering; April 1995).

According to Louis T. Dixon, Ford Motor Co., "Manufacturers now marketing only in the US should not be thinking on a short term basis. It is inevitable that at some point in future, they will have to interact with a global manufacturer. That means that the language of commerce must be international and based on uniform and global standards". (Plastic Engineering; April 1995).

The Japanese industry seems to agree with this. The main material suppliers embraced the thought of ISO and CAMPUS®.

Not having international standardised standards may even be a barrier for international trade (S.J. Watson; DuPont Co.). Whether you choose for ISO or not, it seems clear that standardisation of plastics testing is seen as a better route to expanding markets and therefore necessary.

ISO and CAMPUS® establish the uniform standards that grease the wheels of commerce, across a large part of the world.

# 2. WHY LABORATORIES USE THE AIM MOULD SYSTEM?

## *2.1 Reasons*

In the (recent) past, most companies used their own, or national standards for acquiring plastic material properties. These standards are procedures of 'how to test' and with which sample.

In some laboratories material properties are acquired from samples which are cut from sheet. This however is only interesting if the product, for which the plastic will be used, is also a sheet product. If this is not the case, tests on injection moulded parts are recommended.

Very often so-called 'Family-tools' are used. Injection moulds with a lot of different test samples in it, sometimes provided with the possibility to shut-off runners, so only one sample (or a few) could be selected for the injection moulding. In other cases for every sample type another mould is used.

However, current developments in testing thermoplastics have lead to strict rules concerning the production of test specimens. ISO standards prescribe exactly how an injection mould should be made. Their regulations contain more than only the cavity geometry and 'Family-tools' are no longer allowed.

Therefore Axxicon Moulds Eindhoven BV developed the AIM Mould System.

## *2.2 Advantages of the AIM Mould System*

Standardisation
- ❑ Designed according ISO
- ❑ Testing according ISO and other standards
- ❑ Allows low-cost change to ISO
- ❑ Obtaining data for CAMPUS®

Time & money
- ❑ Faster development
- ❑ Greater productivity
- ❑ Cost effectiveness
- ❑ Lower tooling costs
- ❑ Faster set-up
- ❑ Convenient storage
- ❑ Minimum purging
- ❑ Easier maintenance & repair
- ❑ Lower material costs
- ❑ Increased productivity

Quality
- ❑ More rigorous, exact testing
- ❑ Quick comparison of plastics
- ❑ Consistent product performance
- ❑ Higher product quality

Flexibility
- ❑ Flexible and safe operation
- ❑ Exchange with other plants/customers
- ❑ Special specimens according your wish
- ❑ Easy, flexible expansion of tools
- ❑ Enables intermediate testing
- ❑ Instant production change-over
- ❑ Maximum versatility
- ❑ Short production cycles possible

Construction
- ❑ Quick change system
- ❑ Changing convenience (side loaded)
- ❑ Cooling/heating automatically connected
- ❑ Corrosion resistant steel types used
- ❑ Pins and bushes for excellent alignment
- ❑ Fitting almost every moulding machine

# 3. WHAT DO ISO & CAMPUS® REQUIRE?

## 3.1 General

The CAMPUS® database only contains basic data from licensed material suppliers, which testing procedures are fully according to the ISO standards. In order to realise worldwide comparable test-results, ISO has, in addition to the different test procedures, also developed standards for:

- Mould design for sample preparation
- Injection moulding parameters
- Acquisition and presentation of data

Furthermore they designed only 6 test specimens with which all ISO tests can be executed.

## 3.2 ISO injection moulding machine requirements

For preparation of reproducible and comparable test specimens, only reciprocating screw injection moulding machines, with necessary devices for control and maintenance of conditions shall be used. The ratio of moulding volume (Vm) to screw-stroke volume (Vs) should normally be between 20-80%
The type of screw shall be suitable for the moulding material (length, depth of thread, compression ratio). The screw diameter should be between 18-40 mm. The control system of the machine shall be capable of maintaining the operating conditions within the following ranges:

- Injection time $t_I$ ± 0.1 s
- Hold pressure $P_H$ ± 5 %
- Hold time $t_H$ ± 5 %
- Melt temperature $T_M$ ± 3ºC
- Mould temperature $T_C$ ± 3ºC up to 80 ºC; ± 5 ºC above 80 ºC
- Mass of the moulding « ± 2 %
- Pressure sensor control recommended

The shot volume of the ISO samples 'A', 'B' and 'D2' (see next section) is ± 30 $cm^3$. The projected area (Ap) varies from 60 $cm^2$ for the 'A' sample to 150 $cm^2$ for the 'F' samples. Multiplying these values with the maximum injection moulding pressure in the cavity will result in the required minimum clamping force of the machine.

## 3.3 ISO mould requirements

An ISO mould is not only a mould that contains cavities of ISO samples with the right specimen geometry. The ISO institute prescribes that it has to be a quick-change system. ‘Family-tools’, moulds with different sample geometries, are not allowed. Beside specimen geometry, requirements concern e.g. layout, runner and gating dimensions, shot volume, the use of ejector pins, pressure sensors and thermocouples. Also very important is the temperature balance in the mould. Temperature differences between two points on the mould contact / cavity surface should be less than 5º C.

## 3.4 ISO required specimens

A company, which wants to test according to ISO only, needs 6 different test samples, which however need to be prepared in a special ISO mould with specific requirements. These 6 test samples are:

- ISO 'A' : two (2) tensile bars 170 x 10 x 4 mm with Z-runner lay-out
- ISO 'B' : four (4) bars 80 x 10 x 4 mm with double T-runner lay-out
- ISO 'C' : four (4) short tensile bars 60 x 10 x 3 mm with double T-runner lay-out
- ISO 'D1' : two (2) plaques 60 x 60 x 1 mm with double film gating lay-out
- ISO 'D2' : two (2) plaques 60 x 60 x 2 mm with double film gating lay-out
- ISO 'F' : two (2) plaques 90 x 80 x 3 mm with double film gating lay-out

## 3.5 Processing conditions for injection moulding of thermoplastics

| *Material* | *MeltT* (ºC) | *MouldT* (ºC) | *AIV* (mm/s) | *CT* (s) | *HT* (s) | *TCT* (s) | *Reference* |
|---|---|---|---|---|---|---|---|
| **ABS** | | | | | | | |
| All grades | 250 | 60 | 200 ± 100 | | | | IS 2580 - 2 : 94 |
| Flame retarded | 220 | 60 | 200 ± 100 | | | | |
| **SAN** | 240 | 60 | 200 ± 100 | | | | IS 4894 - 2 : 94 |
| **ASA** | 250 | 60 | 200 ± 100 | | | | IS 6402 - 2 : 94 |
| **AEPDS** | 250 | 60 | 200 ± 100 | | | | IS 6402 - 2 : 94 |
| **ACS** | 250 | 60 | 200 ± 100 | | | | IS 6402 - 2 : 94 |
| **MABS** | 245 | 60 | 200 ± 100 | | | | IS 10366 - 2 : 94 |
| **PS** | 220 | 45 | 200 ± 100 | | | | IS 1622 - 2 : 94 |
| **PS - I** | | | | | | | |
| General purpose | 220 | 45 | 200 ± 100 | | | | IS 2897 - 2 : 94 |
| Flame retarded | 210 | 45 | 200 ± 100 | | | | |
| **PP** | | | | | | | |
| MFR < 1.5 g/10 min | 255 | 40 | 200 ± 20 | | 40 | 60 | |
| MFR ≥ 1.5 < 7 g/10 min | 230 | 40 | 200 ± 20 | | 40 | 60 | IS 1873 - 2 : 97 |
| MFR ≥ 7 g/10 min | 200 | 40 | 200 ± 20 | | 40 | 60 | |
| **PE** | 210 | 40 | 100 ± 20 | 35 ± 5 | | 40 ± 5 | IS 1872 - 2 : 97 |
| **EVOH** | | | | | | | |
| Unfilled, Ethylene | | | | | | | |
| content > 15 but ≤ 30 | 220 | 5 | 150 | 45 | 15 | 50 | |
| content > 30 but ≤ 45 | 200 | 50 | 150 | 45 | 15 | 50 | |
| content > 45 but ≤ 60 | 180 | 50 | 150 | 45 | 15 | 50 | IS 14663 - 2 : 98 |
| Filled (≤ 30), Ethylene | | | | | | | |
| content > 15 but ≤ 60 | 230 | 60 | 150 | 35 | 12 | 40 | |
| Filled (> 30), Ethylene | | | | | | | |
| content > 15 but ≤ 60 | 250 | 80 | 150 | 35 | 12 | 40 | |
| **PC** | | | | | | | |
| Unreinforced | | | | | | | |
| MFR > 15 g/10 min | 280 | 80 | 200 ± 100 | | | | |
| MFR > 10 ≤ 15 g/10 min | 290 | 80 | 200 ± 100 | | | | |
| MFR > 5 ≤ 10 g/10 min | 300 | 80 | 200 ± 100 | | | | IS 7391 - 2 : 95 |
| MFR ≤ 5 g/10 min | 310 | 90 | 200 ± 100 | | | | |
| Glass fibre reinforced | 300 | 110 | 200 ± 100 | | | | |
| **Acetals** | | | | | | | |
| Homopolymer | | | | | | | |
| MFR ≤ 7 g/10 min | 215 | 90 | 140 ± 100 | | | | |
| MFR ≥ 7 g/10 min | 215 | 90 | 300 ± 100 | | | | |
| Homopolymer, impact modified | | | | | | | |
| MFR ≤ 7 g/10 min | 210 | 60 | 140 ± 100 | | | | FDIS 9988 - 2 : 99 |
| Copolymer | | | | | | | |
| MFR ≤ 4 g/10 min | 205 | 90 | 140 ± 100 | | | | |
| MFR > 4 g/10 min | 205 | 90 | 200 ± 100 | | | | |
| Copolymer, impact modified | 205 | 80 | 200 ± 100 | | | | |
| **PA 6** | | | | | | | |
| Unfilled | | | | | | | |
| VN ≤ 160 mg/l | 250 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| VN ≥ 160 mg/l to ≤ 200 mg/l | 260 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | IS 1874 - 2 : 95 |
| VN ≥ 200 mg/l to ≤ 240 mg/l | 270 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| Filled, VN ≤ 160 mg/l | 290 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| **PA 66** | | | | | | | |
| Unfilled, VN ≤ 200 mg/l | 290 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| Filled, VN ≤ 200 mg/l | | | | | | | |
| glass ≥ 10 to ≤ 50% | 290 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | IS 1874 - 2 : 95 |
| glass > 50 to ≤ 70% | 300 | 100 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |

| *Material* | *MeltT* (ºC) | *MouldT* (ºC) | *AIV* (mm/s) | *CT* (s) | *HT* (s) | *TCT* (s) | *Reference* |
|---|---|---|---|---|---|---|---|
| **PA 46** | | | | | | | |
| Unfilled, VN ≤ 260 mg/l | 315 | 120 | 200 ± 100 | | 25 ± 5 | ≤ 50 | IS 1874 - 2 : 95 |
| Filled, VN ≤ 260 mg/l, glass ≤ 50% | 315 | 120 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| **PA 69** | | | | | | | |
| Unfilled, VN ≤ 200 mg/l | 270 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | IS 1874 - 2 : 95 |
| **PA 610** | | | | | | | |
| Unfilled, VN ≤ 200 mg/l | 270 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | IS 1874 - 2 : 95 |
| **PA 612** | | | | | | | |
| VN ≤ 150 mg/l, glass ≤ 10% | 240 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| VN > 150 to ≤ 200 mg/l, glass ≤ 10% | 250 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| VN > 200 to ≤ 250 mg/l, glass ≤ 10% | 270 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| VN ≤ 140 mg/l, glass ≥ 10 but ≤ 30% | 250 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | IS 1874 - 2 : 95 |
| VN ≤ 140 mg/l, glass > 30 but ≤ 50% | 260 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| VN > 140 to ≤ 180 mg/l, glass ≥ 10 to ≤ 30% | 260 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| VN > 140 to ≤ 180 mg/l, glass ≥ 30 to ≤ 50% | 270 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| **PA 11** | | | | | | | |
| Unfilled | | | | | | | |
| VN ≤ 150 mg/l | 210 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| VN > 150 to ≤ 200 mg/l | 230 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| VN > 200 to ≤ 240 mg/l | 250 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| Filled | | | | | | | |
| VN ≤ 130 mg/l, | | | | | | | |
| glass ≥ 10 but ≤ 30% | 220 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | IS 1874 - 2 : 95 |
| glass > 30 but ≤ 50% | 230 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| VN > 130 to ≤ 240 mg/l, | | | | | | | |
| glass ≥ 10 to ≤ 20% | 250 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| glass ≥ 20 to ≤ 50% | 260 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| **PA 12** | | | | | | | |
| Unfilled, Plasticizer > 5% | | | | | | | |
| VN ≤ 150 mg/l, glass ≤ 10% | 200 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| VN > 150 to ≤ 200 mg/l, glass ≤ 10% | 210 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| VN > 200 to ≤ 240 mg/l, glass ≤ 10% | 220 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| Glass ≤ 10%, Plasticizer ≤ 5% | | | | | | | |
| VN ≤150 mg/l, glass ≤ 10% | 200 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| VN > 150 to ≤ 200 mg/l, glass ≤ 10% | 210 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| VN > 200 to ≤ 240 mg/l, glass ≤ 10% | 220 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| VN ≤ 140 mg/l, glass ≥ 10 but ≤ 30% | 250 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | IS 1874 - 2 : 95 |
| VN ≤ 140 mg/l, glass > 30 but ≤ 50% | 260 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| VN > 140 to ≤ 180 mg/l, glass ≥ 10 to ≤ 30% | 260 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| VN > 140 to ≤ 180 mg/l, glass ≥ 30 to ≤ 50% | 270 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |

| *Material* | *MeltT* (ºC) | *MouldT* (ºC) | *AIV* (mm/s) | *CT* (s) | *HT* (s) | *TCT* (s) | *Reference* |
|---|---|---|---|---|---|---|---|
| **PA MXD-6** | | | | | | | |
| Unfilled | | | | | | | |
| VN ≤ 130 mg/l | 250 | 130 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| VN > 130 mg/l but ≤ 160 mg/l | 260 | 130 | 200 ± 100 | | 25 ± 5 | ≤ 50 | IS 1874 - 2 : 95 |
| Filled | | | | | | | |
| VN ≤ 130 mg/l, | | | | | | | |
| glass ≥ 20 to ≤ 50% | 270 | 130 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| VN > 130 to ≤ 160 mg/l, | | | | | | | |
| glass ≥ 20 to ≤ 50% | 280 | 130 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| **PA NDT/INDT** | | | | | | | |
| Unfilled, VN ≤ 160 mg/l | 280 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | |
| Filled, VN ≤ 120 mg/l, | | | | | | | |
| glass ≥ 20% but ≤ 50% | 300 | 80 | 200 ± 100 | | 25 ± 5 | ≤ 50 | IS 1874 - 2 : 95 |
| **PBT** | | | | | | | |
| Unfilled | 260 | 80 | 200 ± 100 | | 20 ± 5 | 40 ± 5 | |
| Unfilled, Impact modified and | | | | | | | |
| flame retarded | 250 | 80 | 200 ± 100 | | 20 ± 5 | 40 ± 5 | IS 7792 - 2 : 98 |
| Filled | 260 | 80 | 200 ± 100 | | 20 ± 5 | 40 ± 5 | |
| Filled, Impact modified and | | | | | | | |
| flame retarded | 250 | 80 | 200 ± 100 | | 20 ± 5 | 40 ± 5 | |
| **PET** | | | | | | | |
| Unfilled, amorphous | 285 | 20 | 200 ± 100 | | 20 ± 5 | 40 ± 5 | |
| Unfilled, semicrystalline | 275 | 135 | 200 ± 100 | | 20 ± 5 | 40 ± 5 | |
| Filled | 285 | 135 | 200 ± 100 | | 20 ± 5 | 40 ± 5 | IS 7792 - 2 : 98 |
| Filled, nucleated | 285 | 110 | 200 ± 100 | | 20 ± 5 | 40 ± 5 | |
| Filled, flame retarded | 275 | 135 | 200 ± 100 | | 20 ± 5 | 40 ± 5 | |
| Filled, nucleated and flame | | | | | | | |
| retarded | 275 | 110 | 200 ± 100 | | 20 ± 5 | 40 ± 5 | |
| **PCT** | | | | | | | |
| Unfilled, amorphous | 300 | 20 | 200 ± 100 | | 20 ± 5 | 40 ± 5 | |
| Unfilled, semicrystalline | 300 | 120 | 200 ± 100 | | 20 ± 5 | 40 ± 5 | IS 7792 - 2 : 98 |
| Filled | 300 | 120 | 200 ± 100 | | 20 ± 5 | 40 ± 5 | |
| **PEN** | | | | | | | |
| Unfilled, amorphous | 300 | 20 | 200 ± 100 | | 20 ± 5 | 40 ± 5 | |
| **PK - EP** | | | | | | | |
| $T_m$ > 205°C to ≤ 215°C, | | | | | | | |
| 0 to 50% filled | 235 | 80 | 200 ± 100 | | 15 ± 5 | ≤ 35 | |
| $T_m$ > 215°C to ≤ 225°C, | | | | | | | |
| 0 to 50% filled | 245 | 80 | 200 ± 100 | | 15 ± 5 | ≤ 35 | |
| $T_m$ > 225°C to ≤ 235°C, | | | | | | | |
| 0 to 50% filled 255 | 80 | 200 ± 100 | | | 15 ± 5 ≤ 35 | FDIS 15526–2 : 99 | |
| $T_m$ > 235°C to ≤ 245°C, | | | | | | | |
| 0 to 50% filled | 265 | 80 | 200 ± 100 | | 15 ± 5 | ≤ 35 | |
| $T_m$ > 245°C to ≤ 255°C, | | | | | | | |
| 0 to 50% filled 275 | 80 | 200 ± 100 | | | 15 ± 5 ≤ 35 | | |
| **PK – E** | | | | | | | |
| $T_m$ > 255°C, 0 to 50% filled | 275 | 80 | 200 ± 100 | | 15 ± 5 | ≤ 35 | DIS 15526-2 : 98 |
| **PMMA** | | | | | | | |
| MFR ≤ 1 g/10 min | 270 | VST - 40* | 200 ± 100 | 50 ± 5 | | | |
| MFR > 1 but ≤ 2 g/10 min | 260 | VST - 40* | 200 ± 100 | 50 ± 5 | | | |
| MFR > 2 but ≤ 4 g/10 min | 250 | VST - 40* | 200 ± 100 | 50 ± 5 | | | IS 8257 - 2 : 96 |
| MFR > 8 but ≤ 16 g/10 min | 230 | VST - 40* | 200 ± 100 | 50 ± 5 | | | |
| MFR > 16 g/10 min | 220 | VST - 40* | 200 ± 100 | 50 ± 5 | | | |
| **PPE** | | | | | | | |
| Unfilled | | | | | | | |
| DTUL @ 1.8 MPa > 200°C | 340 | 120 | 200 ± 100 | | 20 ± 5 | ≤ 50 | FDIS 15103-2 : 99 |

| *Material* | *MeltT* (ºC) | *MouldT* (ºC) | *AIV* (mm/s) | *CT* (s) | *HT* (s) | *TCT* (s) | *Reference* |
|---|---|---|---|---|---|---|---|
| **PPE +PS** | | | | | | | |
| Unfilled | | | | | | | |
| DTUL @ 1.8 MPa ≤ 90°C | 260 | 60 | 200 ± 100 | | 20 ± 5 | ≤ 50 | |
| DTUL @ 1.8 MPa > 200°C | 340 | 120 | 200 ± 100 | | 20 ± 5 | ≤ 50 | |
| ≤50% filled | | | | | | | |
| DTUL @ 1.8 MPa > 90°C to ≤ 110°C | 240 | 60 | 200 ± 100 | | 20 ± 5 | ≤ 50 | |
| DTUL @ 1.8 MPa > 110°C to ≤ 130°C | 280 | 80 | 200 ± 100 | | 20 ± 5 | ≤ 50 | |
| DTUL @ 1.8 MPa > 130°C to ≤ 150°C | 290 | 90 | 200 ± 100 | | 20 ± 5 | ≤ 50 | FDIS 15103-2 : 99 |
| DTUL @ 1.8 MPa > 150°C to ≤ 160°C | 310 | 120 | 200 ± 100 | | 20 ± 5 | ≤ 50 | |
| DTUL @ 1.8 MPa > 160°C to ≤ 170°C | 320 | 120 | 200 ± 100 | | 20 ± 5 | ≤ 50 | |
| DTUL @ 1.8 MPa > 170°C to ≤ 200°C | 340 | 120 | 200 ± 100 | | 20 ± 5 | ≤ 50 | |
| **PPE +PA** | | | | | | | |
| ≤50% filled | | | | | | | |
| DTUL @ 1.8 MPa > 160°C to ≤ 180°C | 290 | 90 | 200 ± 100 | | 20 ± 5 | ≤ 50 | FDIS 15103-2 : 99 |
| DTUL @ 1.8 MPa > 180°C | 300 | 100 | 200 ± 100 | | 20 ± 5 | ≤ 50 | |

Thermoplastic polyester/polyether elastomers

| | | | | | |
|---|---|---|---|---|---|
| MeltT | = | Melt temperature in ºC | DIS | = | Draft International Standard |
| MouldT | = | Mould surface temperature in ºC | FDIS | = | Final Draft International Standard |
| AIV | = | Average injection velocity in mm/s | IS | = | International Standard |
| CT | = | Cooling time in s | | | |
| HT | = | Holding time in s | | | |
| TCT | = | Total cycle time in s | | | |

## 3.6 Tests to execute with ISO specimens

**ISO A**

| | |
|---|---|
| - Tensile test | ISO 527-2, type 1A |
| - Tensile creep test | ISO 899-1 |
| - Hardness, ball indentation | ISO 2039-1 |
| - Comparative tracking index (CTI) | IEC 112 |
| - Linear Expansion | --- |

**ISO B**

| | |
|---|---|
| - Tensile properties (small properties) | ISO 639 |
| - Flexural test | ISO 178 |
| - Flexural creep test | ISO 6602 |
| - Flexural creep (3 point loading) | ISO 899-2 |
| - Compressive test | ISO 604 |
| - Impact strength - Charpy | ISO 179 |
| - Impact strength - Izod | ISO 180 |
| - Impact strength - Tensile | ISO 8256 |
| - Temperature of deflection under load (HDT) | ISO 75 “flat wise position” |
| - Vicat softening temperature | ISO 306 |
| - Environmental stress cracking | ISO 4599 |
| - Environmental stress cracking | ISO 4600 |
| - Density | ISO 1183 |
| - Oxygen index | ISO 4589 |
| - Electrolytic corrosion | IEC 426 |

**ISO C**

| | |
|---|---|
| - Impact strength - tensile | ISO 8256 |
| - Environmental influences like | --- |
| ▪ liquid chemicals | --- |
| ▪ heat | --- |
| ▪ weathering | --- |

**ISO D1**

| | |
|---|---|
| - Electrical properties | --- |
| - Absorption of water | --- |
| - Dynamic mechanical properties | ISO 6721-2 |

**ISO D2**

| | |
|---|---|
| - Impact multi-axial (falling dart) | ISO 6603 |
| - Shrinkage | ISO 294-4 |
| - Optical properties | --- |
| - Weathering influences on coloured plastics | ISO 4892-2 |
| - Mechanical anisotropy | --- |
| - Weld lines | --- |

**ISO F**

| | |
|---|---|
| - Tensile properties | ISO 527-2, type 1BA |

# 4. WHAT DOES THE AIM MOULD SYSTEM LOOK LIKE?

## *4.1 System*

The systems mould base consists of a fixed half and a moving half. The fixed half contains an interchangeable mirror plate and at the moving half you can slide-in different product forming inserts.

Below you will find a table with approximate figures concerning the different parts of the flexible AIM Mould System:

| | L x W x H | Weight |
|---|---|---|
| Mould base ("Euromap"): | 346 x 296 x 223 mm | 90 kg |
| Mould base ("SPI") | 296 x 296 x 223 mm | 85 kg |
| Mirror plate: | 196 x 100 x 38 mm | 5-6 kg |
| Product forming insert: | 196 x 100 x 38 mm | 5-6 kg |

Maximum mould temperature for our standard mould bases is 10-140ºC.

## *4.2 Mounting requirements*

The mould base fits most standard moulding machines. The data mentioned below are for the two different standard mould bases (see page 14/30). These standard mould bases can be adjusted for fitting almost every moulding machine.

### "Euromap"

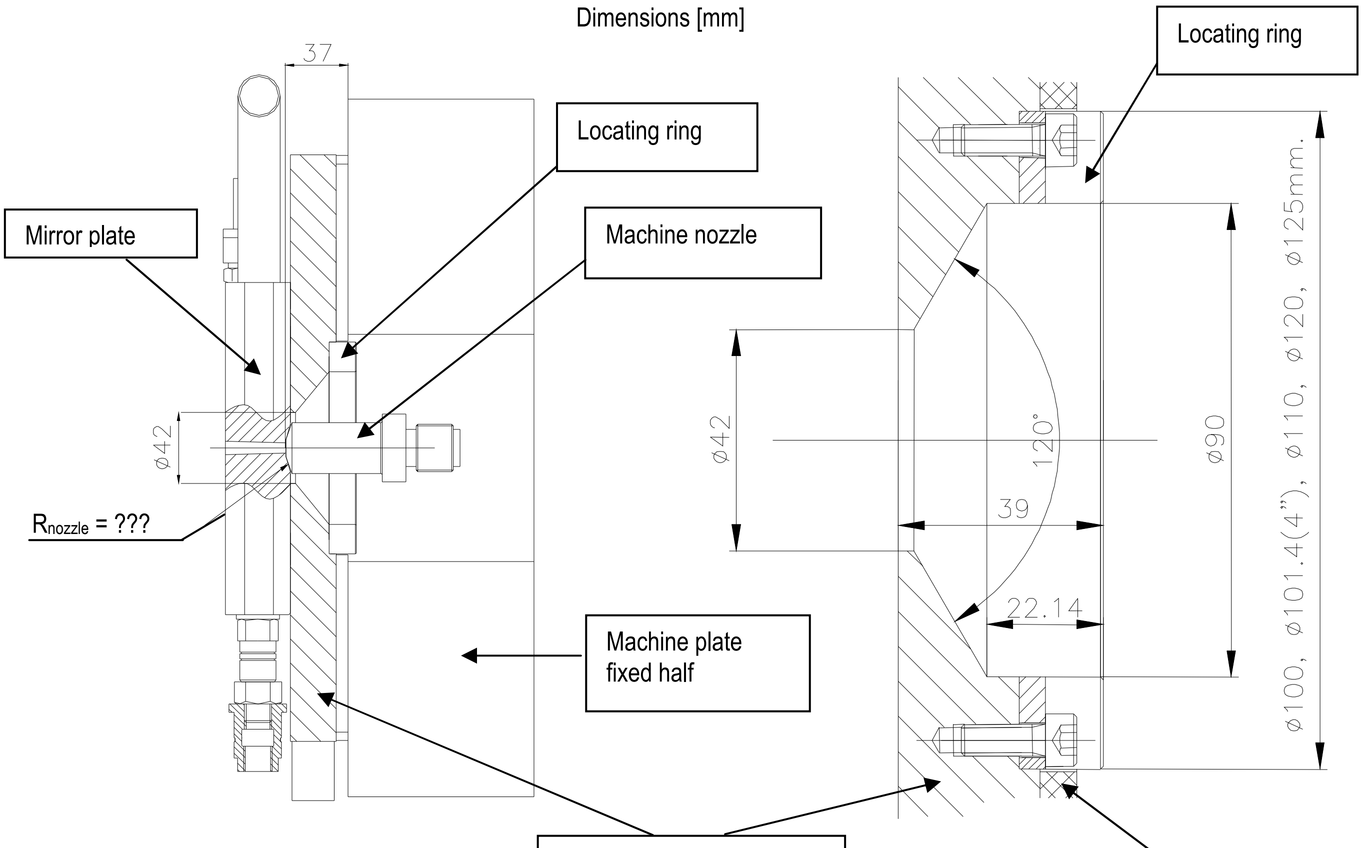
| | |
|---|---|
| Machine plate dimensions should allow mould plates of: | 346 x 296 mm |
| Machine mounting height should fit: | 223 mm |
| with additional adapter plate: | 259 mm |
| Central ejector pin (when mounted) should fit into machine: | ø35 x 80 mm |
| Locating ring (fixed half only) diameter is: | ø125 mm |
| Mounting hole 'Euromap' system for: | M12 |
| - Hole distance horizontally: | 140 or 210 mm |
| - Hole distance vertically: | 280 mm |
| Water / oil tube connection | Female BSP R3/8" and R1/4" (British Standard Pipe) |

### "SPI"

| | |
|---|---|
| Machine plate dimensions should allow mould plates of: | 296 x 296 mm |
| Machine mounting height should fit: | 223 mm |
| with additional adapter plate: | 259 mm |
| Central ejector pin (when mounted) should fit into machine: | ø35 x 80 mm |
| Locating ring (fixed half only) diameter is: | ø100, ø101.6 (4"), ø110 or ø120 mm |
| Mounting hole 'SPI' system for: | M16 (.625") |
| - Hole distance horizontally: | 250 and 254 (10") mm |
| - Hole distance vertically: | 250 and 254 (10") mm |
| Water / oil tube connection | Female BSP R3/8" and R1/4" (British Standard Pipe) |

## 4.3 Nozzle requirements

The nozzle goes approximately 37 mm into the mould base before it touches the mirror plate (picture 4.1). **This means that __the nozzle should pass the machine plate for at least 40 mm (e.g. 45 mm)__**. The hole in the mould base is Ø42 mm (picture 4.2) so that **the maximum diameter of the nozzle should be less than Ø42 mm (e.g. Ø40 mm)**. The back of the mirror plate is (standard) prepared for flat nozzle. **__Please inform us about nozzle radius, before order__** (picture 4.1). Based on our experience we advise to use a nozzle with a hole diameter of approximately 2/3x sprue diameter. **As the sprue diameter is 6 mm (standard), we advise a nozzle hole diameter of 4 mm.**




Picture 4.1

Picture 4.2

## 4.4 Cooling medium

Water with a rust preventing additive can be used as cooling medium. Alternatively following oil-types are recommended:

| | |
|---|---|
| ARAL | : Farulin U |
| BP | : BP Transcal LT |
| ESSO | : Essothermalöl T |
| MOBIL | : Mobiltherm 603 |
| SHELL | : Thermia Oil B |
| HOUGHTON | : Transtherm 496 |

These are high-viscous mineral oils on paraffin base without additives.

# 5. WHAT CAN WE OFFER YOU?

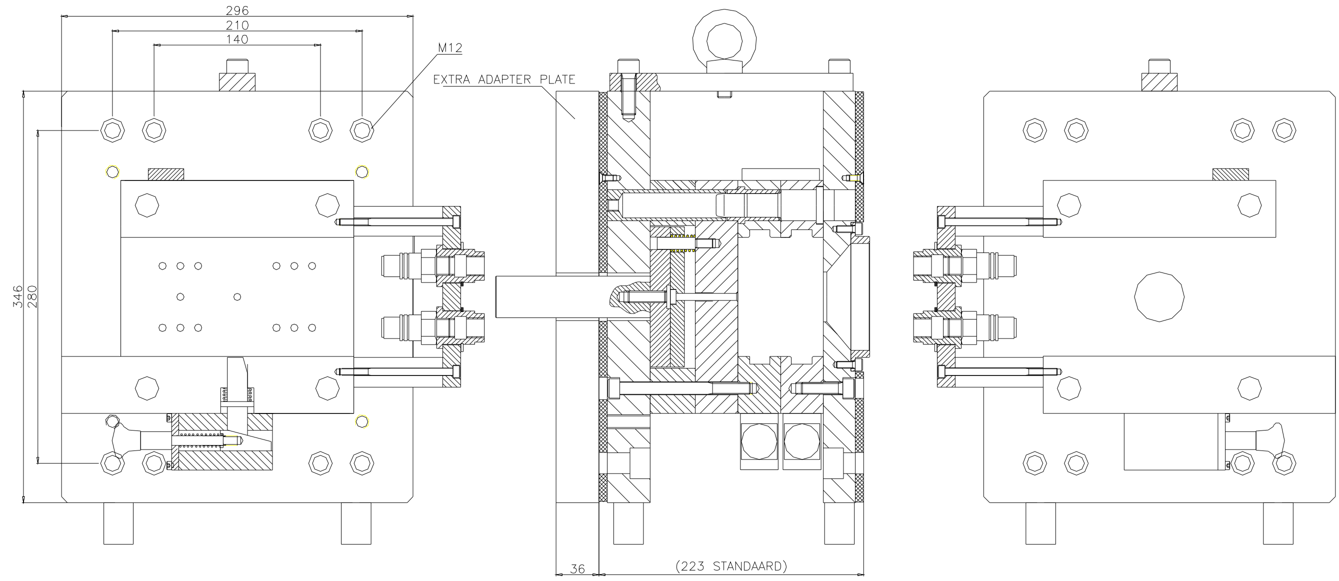
## *5.1 Mould Base*

### 5.1.1 “Euromap” (see also ‘mounting requirements’ page 12/30)

For normal use (mould temperatures 10-140ºC), with glass fibre insulation plate

Moving half mould base

Fixed half mould base

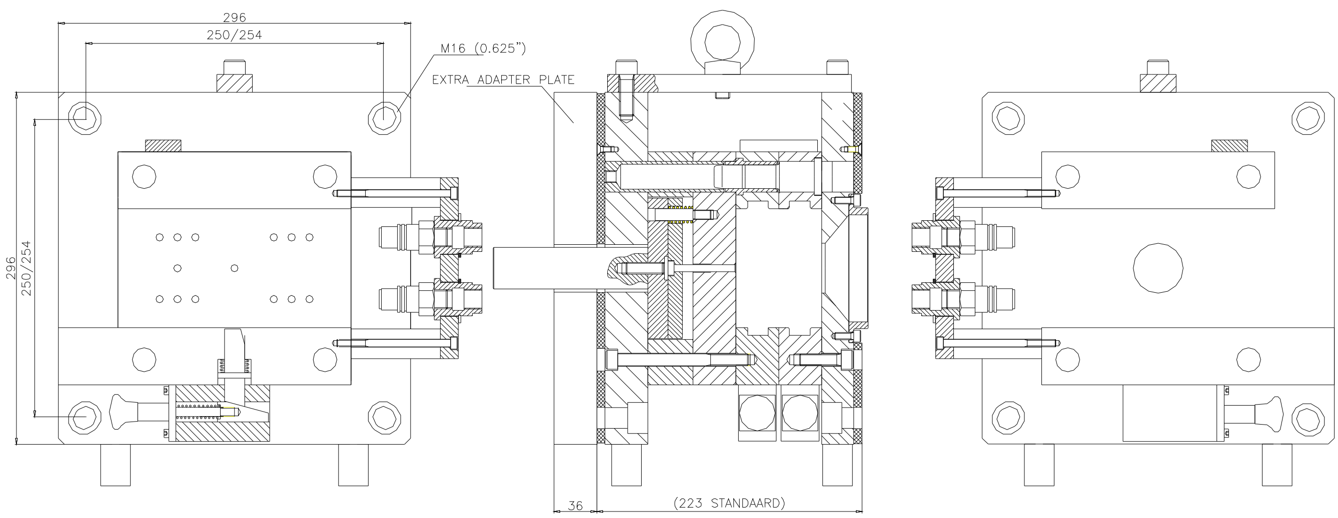



### “SPI” (see also ‘mounting requirements’ page 12/30)

For normal use (mould temperatures 10-140ºC), with glass fibre insulation plate

Moving half mould base

Fixed half mould base



### 5.1.2 Mould base adjustments (see also page 12/30)

- **Adapter plate**
  Plate is used to enlarge the "mould-height", when the mould is too small for your injection-moulding machine.

- **Locating ring**
  In case the standard locating ring does not fit on your injection-moulding machine, a ring with other dimensions can be supplied.

- **Hole size**
  If your machine does not have holes for bolts M12 or M16 (.625"), we can make them every size.

- **Hole pattern**
  If your machine plates does not have an identical "Euromap" or "SPI" hole pattern (like indicated above), we can make holes according to another pattern.

- **Pneumatic cylinder**
  A pneumatic cylinder can be mounted for pneumatic release/secure of mirror plate and insert instead of the (standard mounted) mechanical locking system.

- **Sprue bush**
  If the nozzle of your machine is not 37mm or longer then we can modify the mould base with a sprue bush so that you can use your shorter nozzle.

- **Ejector rod**
  If your machine is not Japanese then we will provide an ejector rod with the mould base. Japanese machines already have an ejector rod mounted in the machine.

### 5.1.3 'Oil heated'

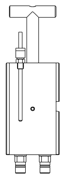
For high mould temperatures (140-200ºC), completely insulated

### 5.1.4 'Oversized'

For oversized specimen

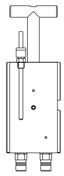
## *5.2 Mirror plates (fixed half inserts)*

### 5.2.1 AIM Mirror plate



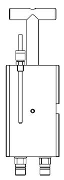
Mirror surface plate, polished N0/N1 (SPI-SPE 1-2) according ISO 1302 equipped with temperature sensor J-type (Fe-CuNi) with 5 meter cable.  (Temperature sensor K-type (NiCr-Ni) and longer cable at request).

### 5.2.2 AIM Mirror plate “Special”



Mirror surface plate, polished N0/N1 (SPI-SPE 1-2) according ISO 1302 equipped with temperature sensor J-type (Fe-CuNi) with 5 meter cable .  (Temperature sensor K-type (NiCr-Ni) and longer cable at request).
This Mirror plate is “special”, as this is prepared for mounting 1 or 2 pressure sensors with 0.4 meter cable: One pressure sensor position is made above the sprue in the central runner. This is an ISO recommended position for shrinkage measurement on the D2-plaque. The other position is located at the gate side of the tensile bar (AIM Insert ISO A; section 5.3.1). This Mirror plate can also be ordered without pressure sensors mounted (dummy prepared). In this case are dummies mounted and can the pressure sensors be mounted afterwards.

### 5.2.3 Custom made Mirror plate



Design to be discussed.

### 5.2.4 Mirror plate adjustments

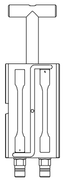
- **Nozzle radius**
  The back-side of the mirror plate is standard flat. Please inform us about the nozzle radius of the machine. In case of a flat nozzle, than this will fit to the mirror plate. Pleas check also the length of the nozzle (see nozzle requirements section 4.3).

- **Pressure or pressure/temperature sensor**
  In case a mirror plate “special” is required standard pressure or pressure/temperature sensors can be supplied.

- **Pressure sensor 2 or 5 meter extension cable**
  Standard pressure or pressure/temperature sensors have a cable length of 0.4 meter. In case a longer cable is required, 2 or 5 meter extension cable can be supplied.

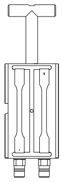
## 5.3 *ISO inserts (moving half)*

### 5.3.1a AIM Insert ISO A



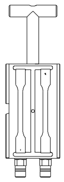
Specimen dimensions according ISO: 170 x 10 x 4 mm
Gating according ISO 294-1 (1996), Z-runner
1 central ejector pin & 2 ejector pins per specimen
Surface polish: standard N2 (SPI-SPE 2-3); cavity numbers engraved
Steel: Cr.-steel; HRc: 50-52; Draft: 1º

### 5.3.1b AIM Insert ISO A + Weldline (with exchangeable gate inserts)



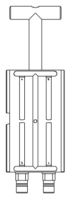
Specimen dimensions according ISO: 170 x 10 x 4 mm
Gating according ISO 294-1 (1996), Z-runner & double T-runner
1 central ejector pin & 2 ejector pins per specimen
Surface polish: standard N2 (SPI-SPE 2-3); cavity numbers engraved
Steel: Cr.-steel; HRc: 50-52; Draft: 1º

### 5.3.1c AIM Insert ISO A Weldline



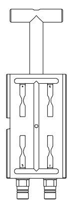
Specimen dimensions according ISO: 170 x 10 x 4 mm
Gating according ISO 294-1 (1996), double T-runner
1 central ejector pin & 2 ejector pins per specimen
Surface polish: standard N2 (SPI-SPE 2-3); cavity numbers engraved
Steel: Cr.-steel; HRc: 50-52; Draft: 1º

### 5.3.2 AIM Insert ISO B



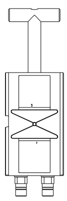
Specimen dimensions according ISO: 80 x 10 x 4 mm
Gating according ISO 294-1 (1996), double T-runner
1 central ejector pin & 2 ejector pins per specimen
Surface polish: standard N2 (SPI-SPE 2-3); cavity numbers engraved
Steel: Cr.-steel; HRc: 50-52; Draft: 1º

### 5.3.3 AIM Insert ISO C



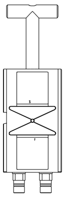
Specimen dimensions according ISO: 60 x 10 x 3 mm
Gating according ISO 294-2 (1996), double T-runner
1 central ejector pin & 2 ejector pins per specimen
Surface polish: standard N2 (SPI-SPE 2-3); cavity numbers engraved
Steel: Cr.-steel; HRc: 50-52; Draft: 1º

### 5.3.4a AIM Insert ISO D1



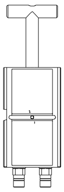
Specimen dimensions according ISO: 60 x 60 x 1 mm
Gating according ISO 294-3 (2002), double film-runner
1 central ejector pin & 2 ejector pins per specimen
Surface polish: standard N1 (SPI-SPE 1-2); cavity numbers engraved
Steel: Cr.-steel; HRc: 50-52; Draft: 1º

### 5.3.4b AIM Insert ISO D2



Specimen dimensions according ISO: 60 x 60 x 2 mm
Gating according ISO 294-3 (2002), double film-runner
1 central ejector pin & 2 ejector pins per specimen
Surface polish: standard N1 (SPI-SPE 1-2); cavity numbers engraved
Steel: Cr.-steel; HRc: 50-52; Draft: 1º

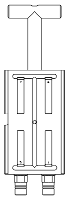
### 5.3.5 AIM Insert ISO F



Specimen dimensions according ISO: 90 x 80 x 2 mm
Gating according ISO 294-5 (2001), double film-runner
1 central ejector pin & 2 ejector pins per specimen
Surface polish: standard N1 (SPI-SPE 1-2); cavity numbers engraved
Steel: Cr.-steel; HRc: 50-52; Draft: 1º

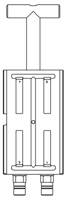
## *5.4 ASTM inserts (moving half)*

### 5.4.1a AIM Insert ASTM D256 Izod (3.2 mm)



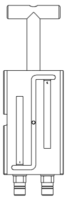
Specimen dimensions according ASTM D256 Izod: 63.5 (2.5”) x 12.7 (0.5”) x 3.2 (0.125”) mm
Gating according ASTM D3641-02 table I (2.1 x 12.7), double T-runner
1 central ejector pin & 2 ejector pins per specimen
Surface polish: standard N2 (SPI-SPE 2-3); cavity numbers engraved
Steel: Cr.-steel; HRc: 50-52; Draft: 1º

### 5.4.1b AIM Insert ASTM D256 Izod (6.4 mm)



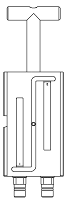
Specimen dimensions according ASTM D256 Izod: 63.5 (2.5”) x 12.7 (0.5”) x 6.4 (0.25”) mm
Gating according ASTM D3641-02 table I (4.3 x 12.7), double T-runner
1 central ejector pin & 2 ejector pins per specimen
Surface polish: standard N2 (SPI-SPE 2-3); cavity numbers engraved
Steel: Cr.-steel; HRc: 50-52; Draft: 1º

### 5.4.2a AIM Insert ASTM D6110 Charpy (3.2 mm)



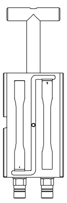
Specimen dimensions according ASTM D6110 Charpy: 127 (5”) x 12.7 (0.5”) x 3.2 (0.125”) mm
Gating according ASTM D3641-02 table I (2.1 x 12.7), Z-runner
1 central ejector pin & 2 ejector pins per specimen
Surface polish: standard N2 (SPI-SPE 2-3); cavity numbers engraved
Steel: Cr.-steel; HRc: 50-52; Draft: 1º

### 5.4.2b AIM Insert ASTM D6110 Charpy (6.4 mm)



Specimen dimensions according ASTM D6110 Charpy: 127 (5”) x 12.7 (0.5”) x 6.4 (0.25”) mm
Gating according ASTM D3641-02 table I (4.3 x 12.7), Z-runner
1 central ejector pin & 2 ejector pins per specimen
Surface polish: standard N2 (SPI-SPE 2-3); cavity numbers engraved
Steel: Cr.-steel; HRc: 50-52; Draft: 1º

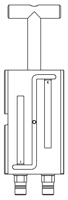
### 5.4.3 AIM Insert ASTM D638 type I Tensile (3.2 mm)



Specimen dimensions according ASTM D638 type I: 165 (6.5") x 13 (0.5") x 3.2 (0.125") mm
Gating according ASTM D3641-02 table I (2.1 x 19 mm), Z-runner
1 central ejector pin & 2 ejector pins per specimen
Surface polish: standard N2 (SPI-SPE 2-3); cavity numbers engraved
Steel: Cr.-steel; HRc: 50-52; Draft: 1º

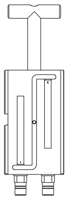
AXXICON

## 5.4.4a AIM Insert ASTM D648 HDT (3.2 mm)



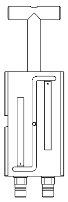
Specimen dimensions according ASTM D648: 127 (5") x 12.7 (0.5") x 3.2 (0.125") mm
Gating according ASTM D3641-02 table I (2.1 x 12.7), Z-runner
1 central ejector pin & 2 ejector pins per specimen
Surface polish: standard N2 (SPI-SPE 2-3); cavity numbers engraved
Steel: Cr.-steel; HRc: 50-52; Draft: 1º

## 5.4.4b AIM Insert ASTM D648 HDT (6.4 mm)



Specimen dimensions according ASTM D648: 127 (5") x 12.7 (0.5") x 6.4 (0.25") mm
Gating according ASTM D3641-02 table I (4.3 x 12.7 mm), Z-runner
1 central ejector pin & 2 ejector pins per specimen
Surface polish: standard N2 (SPI-SPE 2-3); cavity numbers engraved
Steel: Cr.-steel; HRc: 50-52; Draft: 1º

## 5.4.5 AIM Insert ASTM D790 Flexural (3.2 mm)

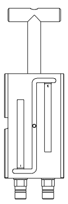


Specimen dimensions according ASTM D790: 127 (5") x 12.7 (0.5") x 3.2 (0.125") mm
Gating according ASTM D3641-02 table I (2.1 x 12.7), Z-runner
1 central ejector pin & 2 ejector pins per specimen
Surface polish: standard N2 (SPI-SPE 2-3); cavity numbers engraved
Steel: Cr.-steel; HRc: 50-52; Draft: 1º

**Note:** - **The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.**
**Gating according ASTM D3641-02 table I. Other gating dimensions at request.**

## *5.5 Other inserts (moving half)*

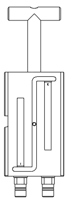
## 5.5.1a AIM Insert UL94 (1.5 mm)



Specimen dimensions: 125 x 13 x 1.5 mm
Gating according ISO 294-1 (1996), Z-runner
1 central ejector pin & 2 ejector pins per specimen
Surface polish: standard N2 (SPI-SPE 2-3); cavity numbers engraved
Steel: Cr.-steel; HRc: 50-52; Draft: 1º

Other dimensions (length, width, depth) at request

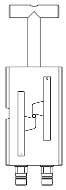
## 5.5.1b AIM Insert UL94 (3.0 mm)



Specimen dimensions: 125 x 13 x 3.0 mm
Gating according ISO 294-1 (1996), Z-runner
1 central ejector pin & 2 ejector pins per specimen
Surface polish: standard N2 (SPI-SPE 2-3); cavity numbers engraved
Steel: Cr.-steel; HRc: 50-52; Draft: 1º

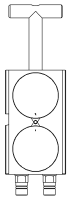
Other dimensions (length, width, depth) at request

## 5.5.2 AIM Insert UL94 “Special” (0.75 mm)



Specimen dimensions: 125 x 13 x 0.75 mm
Gating according Axxicon design, double film-runner
1 central ejector pin & 2 ejector pins per specimen
Surface polish: standard N2 (SPI-SPE 2-3); cavity numbers engraved
Steel: Cr.-steel; HRc: 50-52; Draft: 1º

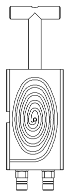
## 5.5.3 AIM Insert Disc



Specimen dimensions: Ø 85 x 3 mm
Gating and runner according Axxicon design
1 central ejector pin & 0 ejector pins per specimen
Surface polish: standard N1 (SPI-SPE 1-2); cavity numbers engraved
Steel: Cr.-steel; HRc: 50-52; Draft: 10º

Other dimensions (diameter, depth) at request

## 5.5.4a AIM Insert Spiral Flow “Axxicon” (2 mm)

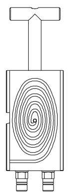


Specimen dimensions: 1150 x 5 x 2 mm
1 central ejector pin & 4 ejector pins per specimen
Surface polish: standard N2 (SPI-SPE 2-3); length (cm.) engraved
Steel: Cr.-steel; HRc: 50-52; Draft: 10º

Other dimensions (width, depth) at request

**Note:** Insert can not always run automatically

## 5.5.4b AIM Insert Spiral Flow “Axxicon” (3 mm)

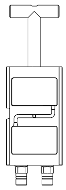


Specimen dimensions: 1150 x 5 x 3 mm
1 central ejector pin & 4 ejector pins per specimen
Surface polish: standard N2 (SPI-SPE 2-3); length (cm.) engraved
Steel: Cr.-steel; HRc: 50-52; Draft: 10º

Other dimensions (width, depth) at request

**Note:** Insert can not always run automatically

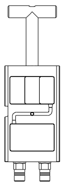
## 5.5.5 AIM Insert Colour Plaque



Specimen dimensions: 90 x 55 x 2 mm
Gating and runner according Axxicon design
1 central ejector pin & 0 ejector pins per specimen
Surface polish: standard N1 (SPI-SPE 1-2)
Steel: Cr.-steel; HRc: 50-52; Draft: 10º

Other dimensions (length, width, depth) at request

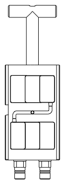
## 5.5.6 AIM Insert Colour Plaque & Step Chip



Specimen dimensions: 90 x 55 x (2 + 1, 2, 3) mm (3 levels)
Gating and runner according Axxicon design
1 central ejector pin & 0 ejector pins per specimen
Surface polish: standard N1 (SPI-SPE 1-2)
Steel: Cr.-steel; HRc: 50-52; Draft: 10º

Other dimensions (length, width, depth, levels) at request

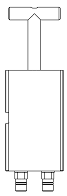
## 5.5.7 AIM Insert Step Chip



Specimen dimensions: 90 x 55 x (1, 2, 3) mm (3 levels)
Gating and runner according Axxicon design
1 central ejector pin & 0 ejector pins per specimen
Surface polish: standard N1 (SPI-SPE 1-2)
Steel: Cr.-steel; HRc: 50-52; Draft: 10º

Other dimensions (length, width, depth, levels) at request

## *5.6 Special inserts (moving half)*



Design to be discussed

## 5.7 Options

### 5.7.1 Insert and mirror plate coating

For inserts and mirror plates as extra protection against abrasive and/or corrosive materials (TiN and MCP). Please note that the MCP coating can influence the gloss of the surface of the product samples. This can be disadvantageous for optical or transparency tests, but not for mechanical tests.

### 5.7.2 Grains / textures

Most common used for colour plaques or step chips (visual checking). (Other inserts are possible as well)

### 5.7.3 Chain hole

A chain hole enables hanging of samples or to keep samples together with a chain. For example: colour plaques (other inserts are possible as well)

### 5.7.4 Logo (easy / difficult-on/in)

Logo's can be added in or on samples. For example on: colour plaques and step chips (other inserts are possible as well)

### 5.7.5 Notches

Possible, but standards do advise to machine them after moulding.

## 5.8 Service

### 5.8.1 Included services

- **Design and Manufacturing**
  This offer contains design and manufacturing of the mould(s) and or insert(s).
- **Quality Assurance**
  All articles manufactured by Axxicon Moulds Eindhoven BV are complying with the Quality Assurance system of Axxicon Moulds Eindhoven BV. The by Axxicon Moulds Eindhoven BV handled Quality Assurance system and its execution, apply to NEN-EN-ISO 9001 (2000) and is certified by Lloyd's Register Quality Assurance.
- **Internal testing**
  All AIM parts will be tested (with a material selected by Axxicon) and made ready for shipment in our "Mould Test Centre" in Eindhoven, the Netherlands.
- **Standard delivery terms**
  In this case Axxicon Moulds Eindhoven BV will deliver the goods Ex Works, Axxicon Moulds Eindhoven BV, Eindhoven, the Netherlands.
- **Manual & Gloves**
  For installation and maintenance purposes we provide you with a manual. Assembly drawings of the mould base and different insert options are included. For mirror plate and insert exchanging purposes we provide you with heat protecting gloves.

### 5.8.2 Extra services

- **Testing with customer**
  On request we can arrange an injection moulding test for the mould base(s) and / or the insert(s) at our Mould Test Centre (Eindhoven, the Netherlands) which can be attended by the customer. If you wish so, please confirm at written order.

- **Delivery Alternative**
  On request we can arrange Delivery Alternative (F.O.B., D.D.U., D.D.P., C.I.F. etc), against extra costs. If you wish so, please confirm at written order.

- **Installation and Training**
  Axxicon Moulds Eindhoven BV can provide installation including training of your personnel. Training may vary from injection moulding to maintenance of the mould. Installation and training normally takes about max 4 - 6 hours. If our company does installation of the mould the warranty terms will be extended with 3 extra months.

- **Moulding Simulation**
  On request we can provide you with a (simple) moulding simulation.

- **Measuring Report (Roughness)**
  On request we can provide you with a measuring report with the roughness of the cavity surfaces from the mirror plates and/or inserts (sections 5.2 till 5.6).

## *5.9 Accessories*

### 5.9.1 AIM Maintenance kit + spare-parts:

- Standard temperature version LT (< 100°C) → P007548
- High temperature version HT (< 250°C) → P007549

| Description | Quantity |
|---|---|
| Combination spanner 17/24/27 | 1 |
| Lubricant | 2 |
| Multi quick coupling | 6 |
| Multi quick coupling | 4 |
| Sealing | 10 |
| Pressure spring | 20 |
| Pressure spring | 6 |
| Ejector pin (For return plate) Mould Base | 6 |
| Plug | 8 |
| Seal ring | 8 |
| Allen key set | 1 |
| Heat resistant hand gloves | 1 |
| Flat countersunk screw | 16 |
| Hand grip support | 2 |
| Hand grip handle | 2 |
| Tool case for Maintenance Kit | 1 |
| Manual (on USB) | 1 |
| Package box | 1 |

AIM Maintenance kit + spare-parts

### 5.9.2 Spare-parts

For maintenance purpose we can supply several spare-part packages.

# 6. WHAT DO WE RECOMMEND?

## *6.1 General*

This recommendation assumes normal circumstances, without specific adjustments for high temperatures, abrasive materials etc.

## *6.2 ISO testing*

ISO has defined six (6) specimens with which you can do most ISO tests. A pressure sensor is required in case of shrinkage measurement (specified ISO location) on the 'D2' specimen. In other cases pressure sensors are recommended at least one (1) at the specified ISO location.

**Therefore we recommend as follows:**

- 1x AIM 'standard' mould base
- 1x AIM 'dummy prepared' mirror plate
- 1x AIM Insert ISO 'A' ; two (2) tensile bar cavities 170 x 10 x 4 mm with Z-runner layout
- 1x AIM Insert ISO 'B' ; four (4) bar cavities 80 x 10 x 4 mm with double T-runner layout
- 1x AIM Insert ISO 'D2'; two (2) plaque cavities 60 x 60 x 2 mm with double film-runner layout

**Optional:**

- 1 or 2 pressure sensors to be mounted in 'dummy prepared' mirror plate
- 1 x AIM 'standard' mirror plate (no sign of 'dummy' or pressure sensor on sample)
- 1 x AIM Insert ISO 'C': four (4) tensile bar cavities 60 x 10 x 3 mm with double T-runner layout
- 1 x AIM Insert ISO 'D1': two (2) plaque cavities 60 x 60 x 1 mm with double film-runner layout
- 1 x AIM Insert ISO 'F': two (2) plaque cavities 90 x 80 x 3 mm with double film-runner lay-out

## *6.3 Other specimen*

Although the AIM Mould System was designed according to ISO mould making standards, we also supply inserts with specimen according other standards, like e.g.: DIN, ASTM, BS, JIS etc.

Because these standards normally only prescribe the specimen geometry, these inserts will, in principle, be designed with the same runner and gate regulations as for the ISO inserts. This also means only identical cavities and thicknesses. In addition to that we design cavities with +1% shrinkage, which normally fits within the specimen tolerance for most materials.

For budgetary reasons, you might want to have different thicknesses in one (1) insert, like e.g. bars for UL94 with thickness 1.6 and 3.2 mm. This however causes a not balanced material flow like in 'family moulds'.

For offering such inserts we need additional information about:

- Test properties - Standard -> Name, number, sample type; e.g. ASTM D 638, Type V.

In case you want moulded notches (standards advise not to, they advise to machine them after injection moulding), we need the design of the notch because it can make a lot of difference in price. A design is also required in case of step chips, logos (in or on the specimen) and the use of holes.

# 7. WHY THE AIM MOULD SYSTEM?

## *7.1 Benefits*

Although the mould has preliminary been designed for producing ISO test specimen, it is also often used for making specimen, according to ASTM or other standards (JIS, DIN, BS, NEN etc.).

The use of product forming inserts, which can be exchanged in less than 20 seconds, enables you to do tests according to different standards, or to move from e.g. ASTM to ISO slowly not investing too much at once.

ISO does not allow "family-moulds" (moulds with different cavities) which means that every product forming insert normally will have 2 or 4 cavities, but all with the same size and geometry. This results in a better and more balanced flow of plastics and therefore in more consistent testing data.

Equally important is the correctness of the mould. As stated before, making a mould for test samples is more than only making the correct size and geometry of the cavity. But which traditional mould maker guarantees you that everything else is also correct?

The AIM Mould System results, under "exact testing" requirements, in optimal productivity because the moulded samples will automatically be ejected by the special designed ejector system and because mould exchange times almost disappear.

Developing new materials sometimes require intermediate tests and therefore a great flexibility of the mould. AIM Mould System enables you to quickly produce only a few test specimens for this purpose.

The use of thermocouples in every mirror plate and the possibility to mount a pressure transducer enables you to have a better control of the production conditions, which also results in better specimens.

Money is earned i.e. costs are saved by the short production- and exchange-times and the systems flexibility.

The AIM mould system is a standard one, which is used by a lot of international companies. Being standard means that the inserts you use are interchangeable with the inserts all over the world. The inserts can be temporary used at other plants of your company or even at your customers (with the same mould base).

Taking the above mentioned into account, all our customers (Raw Material Suppliers, Commoners, Research Institutes, Universities and OEMs from all over the world) find this an acceptable cost for all the benefits (conformity with ISO, flexibility, production capacity, etc.) they invest in.

# 8. SAMPLE OVERVIEW