WORK INSTRUCTION

SUPPLY OF MOLD FOR ELEMENTS IN THERMOPLASTIC MATERIAL

Subject	This document is concerned with reference standards and methodologies to use in mold project and manufacture for the production of **plastic material components**, hereinafter named “mold”.
Purpose	The aim of this document is: • to give the mold *Supplier* the operative rules relevant to the project and the manufacture; • to fix the project and manufacture normalizations.
Application field	It applies to project and manufacture mold for plastic material components of Gewiss S.p.A.

Revision	**Descption revisions**	**Date**
Rev. 0	New edition	27/07/2020

D.Lgs. 231/01	This instruction work integrates the general rules of conduct adopted by the Company and contained in particular in the Gewiss Organization Management and Control Model in order to prevent potential illegal conduct pursuant to D.Lgs. 231/2001.	
Applicable documents	- Form GW537 "Mold Sampling” - Form GW543 “Mold specifications”	
Annexes	- Annex 1 “Automatic clamping“ - Annex 2 “Operating tolerances“ - Annex 3 “Injection bush : external measures / oriented type / airtight devices” - Annex 4 “Injection bush : traditional injection bush” - Annex 4A “Injection bush: insulated runner” - Annex 5 “Multiple insulated runner injection” - Annex 5A “Multiple insulated runner injection detail (part. 1)” - Annex 5B “Seal plates screw and bracket” - Annex 6 “Hot runners molds connection” - Annex 6A “Moulds equipotential link” - Annex 7 “Drawing Gewiss table filling in example” - Annex 8 “Mold data base” - Annex 9 “Static Axial Seal table – English set O-Ring” - Annex 10 “Static Radial Seal table – English set O-Ring” - Annex 11 “Cavities identification criteria” - Annex 12 “Moulding machines park” - Annex 13 “Mold plates clamping axle base” - Annex 14 “Prismatic conic centerings” - Annex 15 “Slide retainer” - Annex 16 " Ejector CT" - Annex 17 "Ejector ST" - Annex 18 " Ejector CRT" - Annex 19 " Ejector LMT"	- Annex 20 " Ejector CNT" - Annex 21 "Column" - Annex 22 "Bush" - Annex 23 "Spring" - Annex 24 "Pin" - Annex 25 "Headless screw" - Annex 26 "Screw TCEI" - Annex 27 "Screw CT" - Annex 28 "Slides columns" - Annex 29 "Motion Control" - Annex 30 "Automatic centering" - Annex 31 "Materials and thermal treatments" - Annex 32 "Type of injections" - Annex 33 "Compliance mold Verification Form" - Annex 34 "Check flow rate conditioning circuits " - Annex 35 "Standardized Finishing Table" - Annex 36 "Examples for Standardization" - Annex 37 "Mold closing bracket" - Annex 38 "Specifications Supplier mold" - Annex 39 ” Extended eyebolts” - Annex 40 ” Threads for disassembly ejection unit” - Annex 41 ” Equipment Tags”

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0. FLOW-CHART

[not necessary]

1. RESPONSIBILITY

The *SUPPLIER* projects and manufactures the components on the basis of:

- information given in specific and general specifications;
- normalizations and specifications of this document;
- as specified in the order of purchase.

1.1 GEWISS - SUPPLIER RELATIONS

During the mold manufacturing process, the *Supplier* will have to contact 3 Gewiss interlocutors according to his needs:

1. *PURCHASE DEPT. (*it is responsible for formalizing and managing the contacts, sending and receiving the operational documents);
2. *TECHNICAL DEPT. (*it is responsible for the product and the parts which form the product, issues and updates or modifies the drawings of single manufactures and product assembly);
3. *ENGINEERING DEPT (*it is responsible for the technological decisions which affect the production process; when required, it can provide the *Supplier* and the *GEWISS* parties with technological support and check on the manufacturing progress).

1.2 SUPPLIER'S RESPONSIBILITY AND OBLIGATIONS

The *Supplier* undertakes to design and manufacture according to the instructions written in this document, in the relevant mold specifications and in the purchase order. The order is regulated by the "General Conditions of Supply Gewiss" applicable to the supplier undertakes to respect.

Any derogation from the instructions given at the moment of the order must be formalized and authorized by GEWISS.

In particular *Supplier* is responsible for:

1. the project and the working processes he has to carry out;
2. the materials quality and relevant treatments;
3. the respect of the timing provided for in the operative plan:
4. the mold industrialization activity if required by the specific specifications. Mold industrialization means the study of the mold design and all the choices required to guarantee the production of the semi-finished product that respects the 2D / 3D design, the required quality, the cycle and the technological mode required by the specific specifications, including the request/proposal and discussing with the Technical Dep. about optimizations to apply to the semi-finished product in order to meet the above targets.

The *Supplier* must do the sampling (according to the instructions written in the order) and must get the mold ready in order to obtain the mold and the manufacture approval.

These approvals will be given exclusively if :

- the manufacture is in conformity with the drawing;
- the mold produces at the same condition and working schedule as per the mold specifications;
- the mould is conform to the specifications (see table in Annex 33);
- up-dated and complete project delivered to Gewiss with the ways and formats provided;
- is present the maintenance handbooks and/or conversions, if necessary.

1.3 SUPPLY TERMS

The mold must be delivered ready to use, with all mechanical and, when available, the electrical, pneumatic, oil-pressure elements necessary to work, already assembled and in according to the safety requirement required to the reference regulations.

The mold shall be delivered properly packed depending on the kind of forwarding previously agreed upon (by land, by air or by sea).

The mold shall entirely meet the normalization requirements.

The project shall be delivered together with the mold, already updated with the latest modifications made in the original project. (If it is realized abroad, the drawing tables and the descriptions must be written both in Italian and English).

The models and electrodes for the finishing (used to manufacture) must be considered as integral part of the order and therefore of the mold supply.

The use of steels different from those mentioned in the mold specifications, shall be authorized by the *ENGINEERING DEPARTMENT* upon check of the chemical material characteristics and of the necessary heat treatments cycle.

Only the updated specifications delivery will authorize the *Supplier* to use such materials.

The components necessary for the conversions and the spare parts requested shall be clearly identified (by mold number) and supplied, duly protected, in closed boxes.

2. ORDER DOCUMENTS

2.1 MOLD ORDER

The *PURCHASE DEPARTMENT* sends the order to the *Supplier.* The order includes the economic and delivery terms of the goods and/or of the requested working process.
The mold and the mold specifications numbers are specified in the order, as reference, for official communications to GEWISS.

2.2 MANUFACTURE DRAWING

The design of the product is supplied with:

- three- dimensional mathematic in STEP or CATIA format
- and/or a bidimensional drawing in PDF and/or DXF format.
- Technical data sheet plastic materials used to produce the piece.

From this point of view, the dimensions of the manufacture, measured after mold shrinkage, must correspond to the dimensions indicated, taking into consideration general and/or specific tolerances.

At the bottom of the drawing you will find a table listing the following technical data:

- manufacture code;
- production plastic material;
- general tolerances;
- eventual index of the latest modification;
- general and/or specific finish degree (see chapter 4.13).

2.3 PROGRESS

Confirming the order, the supplier will attach the overall scheduling of the progress of works; this progress will be verified by the Engineering Dept. every fifteen days with a file and/or with a digital photo report.

2.4 MOLD SPECIFICATIONS

2.4.1 Operative sections

The indications mentioned in the mold specifications are assembled, by analogy, into main numbered sections so defined and traceable thanks to the relevant numeration into the copy of the form reported in the following page:

1. Mold data
2. Mold technological data
3. Notes relevant to mold and sampling

GEWISS

EQUIPMENT SPECIFICATIONS

MANUFACTURING	*Date:*	*State:*	*Classes:*	*Supplier:*
EQUIPMENT N°	EQUIPMENT DESCRIPTION			

1

Width
Length
Height
Cavity n°
Molding center
Ideal injection press
Cicle
Manufacture material
Shrinkage
Injection
Automatic molding
Automatic clamping
Extraction
Extraction micro
Plates material
Extraction group material
Insert material
Hardeness insert
Hardened
Movements
Weight

2

MATERIAL	CAVITY Q.TY	DESCRIPTION	NOTE

NOTES:

3

THE MATERIALS AND THE COMPONENTS USED WILL HAVE TO BE OF THE BEST QUALITY WITH SUITABLE THERMIC TREATMENTS.
THE EXECUTION WILL HAVE TO BE ACCURATE AND CARRIED OUT PERFECTLY THUS GUARANTEEING THE CYCLE MANUFACTURING OF THE PIECES.
THE PROCESS MUST RUN AT FULL CAPACITY BEFORE CONSIDERING THE MANUFACTURED ARTICLES VALID.FOR THE OTHER SUPPLY SPECIFICATIONS (STANDARDISATION, GUARANTEE,PROJECT ETC.) PLEASE REFER TO THE RELEVANT GENERAL SPECIFICATIONS AND TO THE TECHNICAL SPECIFICATIONS HEREWITH ENCLOSED.

Filled in by	Engineering dept signature

GW543-1-06-E

N.B.: THE PHOTOCOPY OF THIS FORM IS ATTACHED, ONLY AS AN EXAMPLE.THE UPDATED MODEL IS AVAILABLE ON THE GEWISS INTRANET.

2.4.2 Mold data

A) Date
The date mentioned in the mold specifications is the issue one. In case of specifications updating, also this date shall be updated.

B) State
It indicates if the mold specifications are temporary or definitive.

C) Class
It indicates the mold class.

D) Supplier
It indicates the mold constructor.

E) Mold number
It is the identifying code.

F) Mold description
It corresponds to the mold description, as specified in the order.

G) Signature
The *Engineering Department* is the issuer to whom you may refer for any modification or updating.

2.4.3. Mold technical data

The following topics may be present or not, depending if the mold industrialization is in charge to Gewiss or Supplier.

1. *Mould Normalization*
   It indicates which kind of mold must be manufactured.

2. *Mold industrialization*
   It indicates who is responsible of the mold industrialization.
   When the supplier is in charge of the mold industrialization, the specification issued by the Industrialization is reduced to a minimun and the supplier must attached to the estimate a equipment specifications obtained by filling in Annex 38.
   Gewiss can request a mold quote without forward any Equipment Specifications, also in this case the supplier must attach to the estimate its equipment specifications obtained by filling in Annex 38.

3. *CAE analysis*
   It indicates who is responsible for CAE analysis.

4. *Family Mould*
   It indicates if multiple codes are to be stamped.

5. *Conversions*
   It indicates if conversions are required and, where appropriate, what dots are involved.

6. *Automatic molding*
   It indicates if to produce automatically or not.

7. Number of cavities
   It indicates the total number of cavities in the mould. In case of family molds the amount of cavities for each code is indicated in brackets.

8. *Molding center*

9. Ideal press
   The subdivision by center allows a selection of presses; in case of technical difficulties during the manufacture of the mold with the specifications of the press provided, you can switch to another press in the same center without influencing the production costs. The passage to a superior press must be authorized by issuing an uptaded specification.
   The following table identifies the correspondence between the tonnage of the presses and the molding center:

TONNAGE	MOLDING CENTER
Babypress ≤ 7Ton	0
>7Ton ≤ 125Ton	1
>126Ton ≤ 250Ton	2
>251Ton ≤ 400Ton	3
>401Ton ≤ 850Ton	4
>851Ton ≤ 1.400Ton	5
>1.400Ton	6

10. Size press mold
    It is the reference press to determine the mold size; if there are indicated more presses, this indicates that the mold must be able to mount indifferently on all specified presses.

11. Cycle
    The scheduled production cycle, according to the manufactured article, to the material and to the foreseen costs. It is a necessary indication for the technological design of the mold, to check during the sampling. The mold will consider as suitable for the production only if this indication is respected.

12. *Shrinkage*

Corresponds to the average retreat of the Material. In case of different withdrawals, the "notes" section will contain the necessary indications.

SHRINKAGE DEFINITION

Linear Stamping Retraction LMS (%) = (1- LM/LC) * 100

LMS = Linear Stamping Retraction
LC = Cavity length mold
LM = printed manufactured measured length between 24 and 168 hours after the production in a normalized environment

Reverse formulas

Manufactured length **LM = (1 - LMS (%)/ 100) * LC**

Mold cavity length **LC = (1 - LMS (%)/ 100)$^{-1}$ * LM**

13. *Note about shrinkage*

Any indications regarding the shrinkage.

14. *Hardened*

The value “YES” of the Hardened characteristic means: all the cavity and core inserts, any movements and relative guides, all auxiliary inserts must be hardened to no less than 48 HRC, only the mold plates, the spacers and the tables are not hardened unless specifically requested by the equipment specifications.

15. *Manufactured article material*

It corresponds to the Material as stated in the drawing of the manufactured article.

16. *Type of injection*

Type, shape and size of the channel used to feed the workpiece. The indication is to read in the flow direction of the plastic material, then from the point near the nozzle, to the point of injection artifact.

17. *Mold lubrication*

It indicates if the slides should be lubricated or if it has to run dry.
Nb: in the case of dry running, a typical case of products which must be chromed or painted, put the tag supplied by Gewiss on the mold as shown in Annex 41, the mold must not be lubricated with oil-grease, use DLC anti-wear coatings as much as possible on ejectors and movements inserts.

18. *Gripping piece mode*

It indicates the possible way for taking the part during the extraction phase.

19. *No. Pieces of Sampling*

Number of pieces to produce during the first sampling

20. *Plate width (mm) indicative*
    Horizontal measurement of the plates of the mould (vertical transition between the columns).

21. *Plate length (mm) indicative*
    Vertical measurement of the plates of the mould.

22. *Mold height (mm) indicative*
    Total measurement of the closed mold between the 2 fixing plates to the press. This measurement shall be at least 1 mm above the minimum thickness and at least 1 mm below the maximum thickness as indicated in Annex 12, in function of the ideal press.

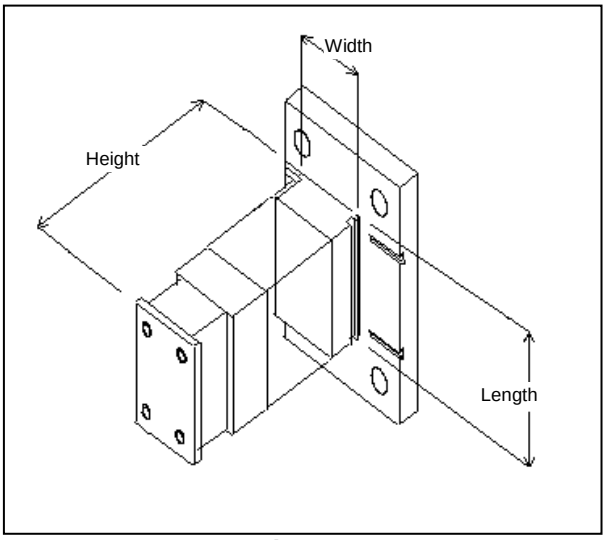

Fig. 1

23. *Micro-switch extraction*
    Indicates if it is necessary to insert the micro-switch extraction and what type to use.

24. *Process Control*
    It indicates any sensors to put into the mold.

25. Conditioning System
    It indicates how to get mold conditioning.

26. *Plugs dowels*
    It indicates the type of plugs to put in the cooling circuits of the dowels

27. *Plugs plates*
    It indicates the type of plugs to put in the cooling circuits of the plates.

28. Clamping
    Three solutions are provided:
    - manual
    - automatic
    - manual with centering

    The seats for manual clamping must be realized always. The "automatic" indication indicates the need to make the appropriate seats on the injection and bottom plates, as indicated in Annex 1 and 13. The "manual with centering" indication indicates the need for a single seat on the injection plate as indicated in Annex 30.

29. *Type of Extraction*
    It indicates the type of extraction required, the type of mechanical connection to the press, the type of any additional devices.

30. *Extraction Return*
    It indicates the type of device to use to ensure the return of the extraction tables.

31. *Material of the moldbase*
    Type of material used to manufacture the die-plates, the elements surronding the die which are subject to high stress.

32. *Mold insulation*
    It indicates the type of insulation to apply to the mold.

33. *Plate centering*
    It indicates how to get centering between the two half molds.

34. *Extraction material*
    Type of material to use to construct the extraction table plates, bottom plate and spacers.

35. *Cavities Materials*
    Type of materials to use to construct the cavities dowels.

36. *Inserts Material*
    Type of materials to use to build the inserts dowels.

37. *Hardness cavities*
    The required heat treatment is specified in § 4.16.

38. *Movements*
    Generic indication of the type of movement to take in order to disengage the undercut of the figure, or promote the release of the piece.

39. *Surface Treatments*
    Indica eventuali trattamenti superficiali da eseguire su parti stampanti e/o di movimento.

It indicates any surface treatments to do on printer parts and/or motion parts.

40. *Handling of pieces*
    Production Standard, Special according to specific instructions.

41. *Weight (kg) indicative*
    Indicates the weight of the mold.

42. Type of object
    It indicates the ABC class of mold in function of complexity, print run, precision, aesthetics and molding center.

43. *Material*
    It identifies the code of the item produced by the cavities.

44. *Cavity*
    It identifies the imprint of the mold with an alphanumeric mark. This mark shall be printed on the piece, in accordance with the criteria indicated in Annex 11.

45. *Q.ty (Quantity)*
    It identifies the of cavities number of the same type to achieve.

46. *Description*
    It identifies the element produced by the cavity.

The supplier must indicated any suggestions/variations to the present information in the offer for the negotiation. After the definiton of the manufacturer and when the mold is completed, GEWISS checks the data in order to loading them in the data sheet

See the following sample of specifications:
- mold industrialization by Gewiss mold;
- mold industrialization by supplier.

Example mold industrialization by Gewiss

CAPITOLATO EQUIPMENT

MANUFACTURING	Data: 16/03/17	Stato: DEFINITIVO	Classe: STAMPO PLASTICA	Fornitore: 15885

NR. EQUIPMENT: **11PI0368**

DEFINIZIONE EQUIPMENT: **PARTICOLARI PULSANTIERA KNX CHORUS**

Normalizzazione	STANDARD	Controllo di processo	Sensori P Kistler in cavità
Industrializz. Stampo	In carico a Gewiss		Sede temocoppia in tasselli
Analisi CAE	In carico a Gewiss	Sistema condizionamento	Senza tappi in parti stampanti
Stampo Famigliare	si		Fori nelle piastre
Coversioni	Tasselli Matrice		Fori nelle guance
Stampaggio automatico	si		Fori nei tasselli
N. impronte	4 (1+1+1+1)	Tappi cond. tasselli	Tappi Balzi
Centro di stampaggio	0-100 ton	Tappi cond. piastre	Tappi Hasco Z 941 /R1/4
Pressa ideale	100 ton	Tipologia estrazione	Estrattori tondi
Pressa x Dimens. Stampo	BMB MC 100		Estrattori rivestiti in DLC
	ARBURG 50		Estrattori a Lama
Staffaggio	Manuale	Ritorno estrazione	Gambi di ritorno
Ciclo (anagrafica EQ)	20 s		Molle
Ritiro	0,7 %		AGS
Nota Ritiro	Da scheda tecnica materiale	Materiale piastre	1.2312
Temprato	si	Isolamento stampo	Nessuno
Materiale manufatto	18037044 PC XF LR D GW 5016	Centraggio piastre	3 conici prismatici Gewiss
Tipo iniezione	Carota tradizionale D.4-D.6.	Materiale estrazione	C45
	Canali Trapezoidali D.4	Materiale Matrici	STAVAX (W.NR.1.2083)
	Tunnel	Materiale Punzoni	ORVAR 2 (W.NR.1.2344)
Lubrificazione Stampo	Funzionamento a secco	Durezza impronte	50 HRC
Modalità presa pezzo	Robot-Mano con ventose	Movimenti	Stecca basculante
N° Pezzi Campionatura	100 per tipo		Spine inclinate grani sfera
Movimentazione Pezzi	Standard	Trattamenti Superficiali	Sui Movimenti W/CC
Larghezza	344 mm		Non eseg. su parte stampante
Lunghezza	346 mm	Peso	250 kg
Altezza (pacco)	300 mm	Tipo oggetto	CLASSE B (12)
Micro estrazione	palmare in piastra di fondo		

MATERIALE	IMPRONTA	Q.TA'	DESCRIZIONE	NOTA
50085349	AA-CF03	1	TASTO 1M 2 GEMME LOCAL.PULS.KNX CH/BK	
50085471	DX	1	SOTTOTASTO 1M PULS.KNX CH/BK	
50085331	AB-CF03	1	TASTO 1M 2 GEMME LOCAL.PULS.KNX CH/WH	
50085463	DX	1	SOTTOTASTO 1M PULS.KNX CH/WH	
50085356	AB-CF03	1	TASTO 1M 2 GEMME LOCAL.PULS.KNX CH/TI	
50085489	DX	1	SOTTOTASTO 1M PULS.KNX CH/TI	
50085372	BA-CF03	1	TASTO 1M 2 GEMME ICONE PULS.KNX CH/WH	
50085471	DX	1	SOTTOTASTO 1M PULS.KNX CH/BK	
50085380	BB-CF03	1	TASTO 1M 2 GEMME ICONE PULS.KNX CH/BK	
50085463	DX	1	SOTTOTASTO 1M PULS.KNX CH/WH	
50085398	BB-CF03	1	TASTO 1M 2 GEMME ICONE PULS.KNX CH/TI	
50085489	DX	1	SOTTOTASTO 1M PULS.KNX CH/TI	
50085471	CA-CF03	1	SOTTOTASTO 1M PULS.KNX CH/BK	
50085653	DX	1	TASTO 1M 1 GEMMA ICONE PULS.KNX CH/BK	
50085463	CB-CF03	1	SOTTOTASTO 1M PULS.KNX CH/WH	
50085646	DX	1	TASTO 1M 1 GEMMA ICONE PULS.KNX CH/WH	
50085489	CB-CF03	1	SOTTOTASTO 1M PULS.KNX CH/TI	
50085661	DX	1	TASTO 1M 1 GEMMA ICONE PULS.KNX CH/TI	

Firma compilatore	Firma Industrializzazione

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GEWISS	CAPITOLATO EQUIPMENT			
MANUFACTURING	Data: **16/03/17**	Stato: **DEFINITIVO**	Classe: **STAMPO PLASTICA**	Fornitore: **15885**
NR. EQUIPMENT: **11PI0368**	DEFINIZIONE EQUIPMENT: **PARTICOLARI PULSANTIERA KNX CHORUS**			

- CONVERSIONE MATRICI NEI TASTI CON FINITURA LUCIDA ED EROSA.
- ESEGUIRE DISCHETTO D.22X1 PRESA CANALE ALIMENTAZIONE TRAMITE MANIPOLATORE.

MATERIALI E COMPONENTI IMPIEGATI DOVRANNO ESSERE DELLA MIGLIORE QUALITÀ CON TRATTAMENTI TERMICI ADEGUATI.
L'ESECUZIONE DOVRÀ ESSERE ACCURATA ED ESEGUITA A PERFETTA REGOLA D'ARTE ONDE PERMETTERE LA PRODUZIONE DEI PEZZI IN CICLO. IL PROCESSO DEVE ESSERE PORTATO A REGIME PRIMA DI CONSIDERARE VALIDI I PEZZI PRODOTTI.
PER TUTTE LE RESTANTI SPECIFICHE DI FORNITURA (NORMALIZZAZIONE, GARANZIA, PROGETTO, ECC.) FARE RIFERIMENTO AL CAPITOLATO GENERALE RELATIVO (Istruzione Operativa I504 disponibile nell'area web dedicata).
NB:RISPETTARE TASSATIVAMENTE LE INDICAZIONI RELATIVE ALLA MOVIMENTAZIONE CON GOLFARI (VEDI PAR. 4.3).
PER AVERE IL BENESTARE AL MEZZO E' NECESSARIO CONSEGNARE IL PROGETTO ALLA PRIMA CAMPIONATURA.

Firma compilatore	Firma Industrializzazione

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Example mold industrialization by supplier

CAPITOLATO EQUIPMENT

MANUFACTURING	Data: 16/03/17	Stato: DEFINITIVO	Classe: STAMPO PLASTICA	Fornitore: 15885

NR. EQUIPMENT: **11PI0370**

DEFINIZIONE EQUIPMENT: **TASTI 2 MOD. PULSANTIERA KNX CHORUS**

Normalizzazione	STANDARD	Temprato	si
Industrializz. Stampo	In carico al Fornitore	Materiale manufatto	18036285 PC HF LR D GW 5105
Analisi CAE	In carico al Fornitore	Tipo iniezione	Tunnel
Stampo Famigliare	si	Lubrificazione Stampo	Funzionamento a secco
Coversioni	Tasselli Matrice	Modalità presa pezzo	Nessuna, caduta in estrazione
Stampaggio automatico	si	N° Pezzi Campionatura	100 per tipo
N. impronte	2 (1+1)	Movimentazione Pezzi	Standard
Centro di stampaggio	0-100 ton	Micro estrazione	si
Pressa ideale	100 ton	Ritorno estrazione	AGS
Pressa x Dimens. Stampo	BMB MC 100		Molle
	ARBURG 50		Gambi di ritorno
Staffaggio	Manuale con Centraggio	Trattamenti Superficiali	A discrezione Fornitore
Ciclo (anagrafica EQ)	20 s	Tipo oggetto	CLASSE B (12)
Nota Ritiro	Da definire (Gewiss+Fornitore)		

MATERIALE	IMPRONTA	Q.TA'	DESCRIZIONE	NOTA
50085737	AA-CF03	1	TASTO 2M 2 GEMME ICONE PULS.KNX CH/BK	
50085729	AB-CF03	1	TASTO 2M 2 GEMME ICONE PULS.KNX CH/WH	
50085745	AB-CF03	1	TASTO 2M 2 GEMME ICONE PULS.KNX CH/TI	
50085695	BA-CF03	1	TASTO 2M 1 GEMMA ICONE PULS.KNX CH/BK	
50085687	BB-CF03	1	TASTO 2M 1 GEMMA ICONE PULS.KNX CH/WH	
50085703	BB-CF03	1	TASTO 2M 1 GEMMA ICONE PULS.KNX CH/TI	

MATERIALI E COMPONENTI IMPIEGATI DOVRANNO ESSERE DELLA MIGLIORE QUALITÀ CON TRATTAMENTI TERMICI ADEGUATI.
L'ESECUZIONE DOVRÀ ESSERE ACCURATA ED ESEGUITA A PERFETTA REGOLA D'ARTE ONDE PERMETTERE LA PRODUZIONE DEI PEZZI IN CICLO. IL PROCESSO DEVE ESSERE PORTATO A REGIME PRIMA DI CONSIDERARE VALIDI I PEZZI PRODOTTI.
PER TUTTE LE RESTANTI SPECIFICHE DI FORNITURA (NORMALIZZAZIONE, GARANZIA, PROGETTO, ECC.) FARE RIFERIMENTO AL CAPITOLATO GENERALE RELATIVO (Istruzione Operativa I504 disponibile nell'area web dedicata).
NB:RISPETTARE TASSATIVAMENTE LE INDICAZIONI RELATIVE ALLA MOVIMENTAZIONE CON GOLFARI (VEDI PAR. 4.3).
PER AVERE IL BENESTARE AL MEZZO E' NECESSARIO CONSEGNARE IL PROGETTO ALLA PRIMA CAMPIONATURA.

Firma compilatore	Firma Industrializzazione

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2.4.4 Mold sampling and notes

Notes
In the notes space you can find the data relevant to the following matters.

1. Additional explanation of the number of cavities in the mold (for the most complicated cases);
2. quantity of pieces to be obtained with the first sampling and any other specifications;
3. material change management: alternative sampling material (also indicate the code), or for the production of different versions for color, finishing, version;
4. change version - Interchangeable inserts: explanations about the change-versions. Indications about the possibility of printing simultaneously or alternatively for family molds;
5. selection of print imprints: linked to the previous point, establishes the procedure for implementing the choice of manufactures to produce. It is preferable to use the swivel or multi-position bush technique (see § 4.6.6);
6. particular identification and dowels: This reference refers to interchangeable dowels, which must be identified even if taken individually (compatible with the dimensions);
7. size of the injection: the size of the channel used to feed the piece;
8. spare parts to provided;
9. sequence of operations in and out of the press;
10. definition of pick or drop of piece or sprue;
11. definition of detachment or cutting of sprue;
12. Robot workings/ Robot accessories;
13. machining on-board press / mounting inserts;
14. containers for transport and protection;
15. precautions and protections for subsequent work;
16. Raw material consumption / material recycling;
17. Control gauges - manufacture test.

2.4.5 Mold study

The *Engineering Department* will give, if necessary, a copy of the manufacture drawing, which contains all information necessary for the correct laying of the moulding cavity or a “study” of mold project.

In particular these documents can include:

1. injection point (form, position, dimensions);
2. mold closing line;
3. gas vents position;
4. burr punching possible movements;
5. inserts splitting up;
6. ejector pins position;
7. conditioning circuit course;

8. moulding insert external dimensions (referred to manufacture drawing)
9. moulding cavities layout;
10. feeding runners development;
11. plates and accessories dimensions;
12. pull-out mechanism, movement and development device.

These documents must be considered an obligation for the defined parts.

Position the cavities horizontally to the assembly direction in the moulding machine in order to avoid faults due to dripping and/or supply trickle during the moulding.

3. STANDARD MOLD NORMALIZATIONS

3.1 COMPONENTS

3.1.1 Terms

In this chapter you will find the terms normally used to describe mold components and functions. Contact the *Engineering Department* if you need further explanations.

3.1.2 Identification

It is necessary to number, in an unmistakable way, the mold parts (plates, inserts, movable elements…). In order to avoid any possible mistake in the assembly phase, write in a well visible way the identification letter of every cavity on the insert. Spare parts or conversion elements, if existing, must be numbered in the same way.

Each component of the mold (except the component normalized that does not undergo machining) must be identifiable and must therefore include the following data:

- N° Equipment
- Position of the bill of materials equipment
- Insert weight
  On each mold component weighing more than 10 kg the relative weight must be engraved, by laser or percussion engraving, in an easily visible part of the same, give priority to writing on the mold closing surface - if the weight is less than 10 kg do not write the insert weight.

Example: 20PI0001-B001-12Kg

3.1.3 Cavity splitting up

In the planning phase, consider the splitting up for:

1. breaking risk areas;
2. areas subjected to wear;
3. difficult access areas to facilitate the buffing;

4. final filling areas to be able to remove gathered gas;
5. complex shape areas to be able to pull out possible moulded pieces held in cavity.

Apply the following provisions:

a) The squaring of each insert (core, cavity, auxiliary) must be done by grinding machine.

b) The threaded holes for fixing the inserts must be made with CNC machines.

c) All machining sign (milling, turning, erosion) on the all inserts must be eliminated by polishing to limit the difficulties of extraction, visibility of the processing marks on the products, limit the triggering of cracks and corrosion on the inserts, to eliminate any irregularities on the surfaces.

d) The minimum radii not listed in the manufactured drawing must be performed.

e) Eliminates all the arris (the sharp edge or salient angle formed by the meeting of two surfaces) that can trigger seize up and primarily that can cut maintenance operators

3.2 MOLD IDENTIFICATION

The mold is identified and recognized by its number, which corresponds to the number mentioned in the equipment specifications, in the order and relevant documents. This number must be specified in every document in the GEWISS-*Supplier* correspondence.

A supplied Gewiss tags must be applied onto the mold as indicated in ANNEX 41; these tags must be in stainless steel (W. 1.4006 – AISI 304) thickness 1 mm:

Fig. 2 - MOLD IDENTIFICATION TAG and COMPANY TAG

The tags must be fixed by cupper blind rivets D=3mm.

The fixing area is obtained on the two spacers as indicated in Annex 41 (two tags for each spacer).

On the upper side of the injection and ejector plate, indicate by printing the following data (height of the characters: from 4 to 6 mm):

N° Equipment
Equipment desctription

e.g.:
20PI0001
BELL PACK SYS

In the event that a mold is equipped with more than one extraction or injection side due to the presence of versions, the specifications may require the addition of a letter at the end of the appliance code only for these parts, example: 20PI0001A and 20PI0001B.
If there are this type of versions, it will be necessary to position the relative tag with the half-Mold code also on the relative side preferably in the center of the plate (on both sides) parallel to the one affixed to the spacers, see Annex 41.

3.3 MOLD MOVEMENT

On the upper and lower sides, the mold must be provided with threaded holes for lifting eyebolts assembly.

For the holes dimensions, the relative machining allowances and the maximum permissible loads refer to the ISO 3266 tables that require the adoption of ISO 261 and ISO 965 for General Planes and Tolerances of the ISO Metric Thread.
The thread tolerance must be Class 6H (ISO 965).

In any case, make reference to the following indications.

1. Minimum thread of eyebolt seat for mold lifting: **M 16**;
2. The equipment must be equipped with not less than 4 seats for eyebolts, at least two for the injection side plate and two for the extraction side plate (up and down side);
3. Each seat in the extraction and injection plates must be able to support the entire weight of the equipment (total weight of the mold), even if the lifting must always be done using the two eyebolts.
4. The eyebolts for lifting the mold must be obtained directly on the mold holder plates
5. The lifting must keep the mold parallel to the vertical, whether the mold is raised closed, or that the two parts (extraction side and injection side) are raised separately / independently.
6. It is absolutely forbidden to interpose intermediate elements such as brackets, extensions, plates / plates, adapters, etc. between the eyebolts and the mold-holder plates, in the event of difficulties with the dimensions, use the extended eyebolts shown in Annex 39, or increase the size of the plates to be able to mount the eyebolt correctly on the mold, do everything possible to have the base of the two eyebolts at the same height in the vertical direction.

7. Each component of the mold weighing more than 10 kg must have at least two threaded holes for handling with eyebolts (the use of eyebolts M 8/10/12 is allowed for components other than the mold holder plates).
8. The eyebolt seat material (plate and dowel materials) must have a tensile tensile strength Rm ≥ 350 N / mm².
9. Use only the following threads for eyebolt seats with class of tolerance ISO2 - 6H.

Choice of threads for eyebolts				
Thread Seat eyebolt	**Minimum useful thread length [mm]**	**Maximum mold weight / Partial assembly of components / Single components**	**Minimum eyebolt support diameter (solid material diameter around the thread) [mm]**	**Use note**
M 8	17	90 Kg	20	Do not use for mold lifting
M 10	20	140 Kg	25	Do not use for mold lifting
M 12	25	230 Kg	30	Do not use for mold lifting
M 16	30	340 Kg	35	
M 20	35	700 Kg	40	
M 24	40	1.200 Kg	50	
M 30	50	1.800 Kg	65	
M 36	60	3.200 Kg	75	
M 42	70	4.600 Kg	85	
M 48	80	6.300 Kg	100	
M 56	90	8.600 Kg	110	
M 64	105	11.500 Kg	121	

It is recommended to respect the depth of the thread to ensure the correct screwing of the eyebolt, the tolerance of execution, the quantity of solid material to be left around the thread (if the minimum eyebolt support diameter is 40 mm it means that the center of the eyebolt thread does not it can be less than 20 mm from the edge of the component or from a quarry in the immediate vicinity).

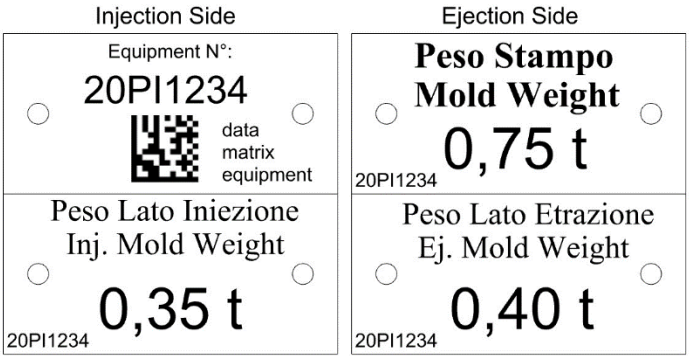
The use of threads not included in the table above is prohibited

All those who lift the mold / partial mold assemblies / single components must always follow the instructions indicated in the user manuals of eyebolts-slingin-any lifting systems used/supplied, both for the loading and the methods of use. This table (Choice of threads for eyebolts) is only used to choise the thread of the eyebolts to be performed in the mold.

Mark the "M XX" indication near the holes, to avoid wrong uses.

In function of the molding center and the specifications in Annex 37, insert a bracket that, secured to the plates by two screws, prevents the opening of the mold during the handling phases.

Place the Gewiss supplied AISI 304 tags (thikness 1 mm) fixed with 2 copper blind rivets, completely encased on the two principal holding plates, engraved with the weight of the relative side of the mold; the total weight of the mold; the mold code, see technical specifications in Annex 41.



3.4 PLATES

3.4.1 Dimensions

For the choise of the plates make reference to the table of the annexes 12 and 13 and, in particular, to the following indications:

A: mold width (corresponding to the moulding machine pin passing);
M: clamping plate thickness (verify the indications mentioned in chapter 4.5);
S: plate minimum working thickness (the plate height will be S+ insert holder pocket thickness);
T: mold height;
O: supports minimum width;
R: quantities and type of supports fastening screws.

The thickness of all plates and spacers must be finished by grinding respecting the dimensional and parallelism tollerance H4.

The plate is choosen considering the needed minimum thickness S that allows to keep the bending within acceptable limits. It is necessary to check the maximum deflection of the plates for each new project.

The extraction plate has the most difficult condition.

The momentum of inertia of that plate is $I = \frac{T \times S^3}{12}$

Considering the plate as a beam subject to a loan uniformly distribuited and leant on the 2 extremity (simple bending) the maximum deflection is :

$$D_{max} : \frac{5 \times P \times (N+2)^3}{384 \times E \times I}$$

where:

P = Strength of moulding machine closing
E = Module of elasticity (equal to 200.000 N/mm² for steels)
N = Ejection plates width
(N+2) = Space between supports

The dimensions Smin (see annex 13) have been calculated at worst (load P, space L at maximum, and T at least) adopting an acceptable deflection of 0,03 mm.

Keep into consideration that the mould can be installed on a moulding machine with higher tonnage (it's possible that a mould settled for a 100 Ton capacity can also run on a machine of 200 Ton).

The criticism level of the process can require in a few cases the adoption of a lower acceptable deflection and the application of suitable support plugs located into areas of maximum deflection; in this case it is important to verify not to make weakening on extraction plates. Normally are arranged into free spaces, trying to dimension them at the maximum possible to give a suitable compression resistance compatibly with the available spaces.

In case of deep cavities or movements that have to be built into plates make accurate checks of resistance. For example it is not allowed make housing for inserts with S < of ½ H, in order to never exceed the neutral axis of the plate.

The adoption of lower dimensions as to the ones resultant by the described methods, must be authorized by Industrialization during the plan checking phase.

3.4.2 Chamfering and vents

Chamfer and glean all the outside parts of the mold, the inserts, the ejector plates and in any case of every accessible edge (cham. 2 x 45°).

Chamfer all bushes insertion holes, screws, pins, punches, etc. in plate (cham. 1 x 45°).

Consider a vent with suitable dimensions under the bushes and centering pins, to avoid both lubrificating fluid heaps and the "sucker effect" during the mold opening/closing phases.

One of the two plates shall have chamfering of 30mm x 45° and 5 mm height at the four edges, on the closing surface, to improve the mold manual opening operations.

3.4.3 Linings up and plates centerings

Making reference to annex 13, we will have:

B: lining up axle base
C: distance between guide pins and guide bushes from plates rim
De: diameter of guide bushes and guide pins broaching in plate
Di: centering diameter between bushes and pins

If the cavities has sloping tiles, it is recommended to always mount 3 or 4 prismatic conical centers arranged along the median axes of the mold, in the case of 3 centering centers 2 must be moved horizontally. Observe the construction shown in Annex 14. Always arrange the centers with their axis passing through the center of the mold.

In case of need (according to ENGINEERING DEPARTMENT) it is possible to modify the coupling angle that must always be lower than the minimum angle of the cavity restriking.

The difference between coupling and restriking taper shall be at least of 30' (i.e: restriking angle 1°30', coupling angle 1°).

3.4.4 Ejector plates, supports and clamping plate lining up.

The lining up elements are defined in annex 13 (P).

For the execution, make reference to annexes 1 and 2.

If there is a different heat change between cavity inserts and inserts holder plate it is allowed to discharge the ejector plates guide pins in the ejector plate section in order to avoid ejector plates stubborness caused by thermal expansion.
For clamping plate, support and ejector plate broaching, use pins of the same type and lenght as the ones used for the guide ejector plate, to improve assembly activities and reduce components variety. Always insert threads to facilitate the assembly and disassembly of the spacers-tables-bottom plate from the extraction plate (see example Annex 40).

If the mold clamping is automatic, fillet the clamping plate, the support and the ejector plate in the above-mentioned way.

The same is valid if electrical checks are applied on the ejector plate (end switch).

3.5 ASSEMBLY ON MOULDING MACHINE

3.5.1 Manual clamping

It is always necessary to realize the seats for the manual clamping.
With reference to Annex 13, we will have:

K: distance from moulding machine surface of fixed side
V: seats width
Z: groove depth of fixed side
W: clamping slots axle base
E: standard clamping width for molding machine type

For the movable part we generally use supports reenter or fall, taking into consideration the same dimensions.

Avoid discharging plates in correspondence of slides seal female cones, according to the requirements for a sure clamping.

Generally, avoid passing slots for clamping in injection side plate.

3.5.2 Automatic clamping

If requested by the specifications, execute automatic clamping seats, in conformity with the indications in Annex 1.

With reference to Annex 13, we will have:

Y: vertical axle base for clamping seats;
X: horizontal axle base for clamping seats.

The right mechanical realization and the respect of the indicated dimensions are essential for the assembly of fixing block (and, therefore, for the clamping). A “go-no go” gauge is available on request for the thread seat testing.

3.5.3 Locating ring

Molds must be provided with a locating ring on the injection side. This locating ring shall be exclusively of the type shown at fig. 3, made of W. 1.0503 material.

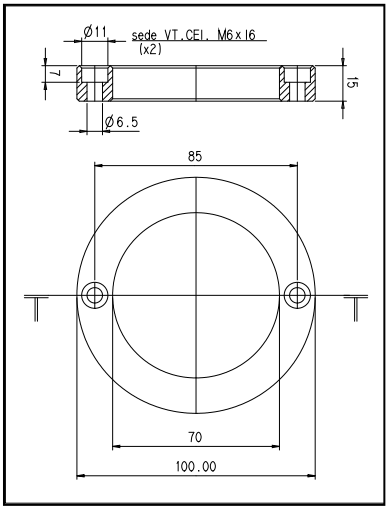


Fig. 3 – CENTERING RING

Provide the mold with the relevant seat at Ø 100 H7, 5 mm depth.

In cases where the insulating plate is required, increase the centering ring height so that it protrudes 10mm.

In any case the sprue bush removing must be possible without getting off the centering ring, excepting the molds with the multiple insulated/hot channel system.

In the mold design, consider this component as normalized, specifying it only in the mold assembly and in the bill of materials, without producing any drawing. The maximum dimensions must be present in the component name (f.e. CENTRAL RING d.100x15).

3.5.4 Quick clutch fittings for conditioning

The molds must be provided with all the fittings already mounted. These fittings must be only of the kind indicated below at figure n 4, made of brass (W. 2.0401). They are available from TECAUT (http://www.tecaut.com/) with the following code: NH09G ¼ GAS.

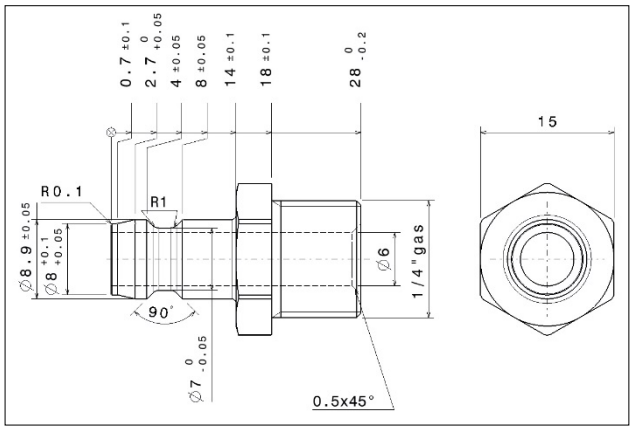


Fig. 4 – MALE FITTING

3.6 FEEDS

The feeding system, that is to say all the runners which bring the plastic material from the moulding machine nozzle to the cavity, is divided into three sections:

A - main feeding
B - distribution
C - injection

For each of the three sections, hereunder you will find the indications of models, dimensions and references, together with the paragraphs relevant to cold slug well and flow deviation systems.

3.6.1 Main feeds

Main feeds are those feeding runner sections covering the stretch from the nozzle to the mold closing surface and must be realized inside hardened bushes. For the outside dimensions of such bushes, make reference to Annex 3.

For an easy disjunction always check the taper, relevant to the length.

If 2 different bushes are required, number them on the external side with the relevant mold number.

Set the bush if it is shaped (from the feeding runner or from the cavity); setting shall be carried out only by faceting, as specified in Annex 3.

As regards the passing section, the standard executions are:

A - traditional core (streight or angled) Annex 4
B - single self insulating runner (streight or angled) Annex 4A

In “B” execution possible modifications due to different kinds of materials, item geometry/structure, runner quantity and length are to be agreed with the *Engineering Department.*

Non-standard execution, such as:

C - multiple self insulating runner (Annexes 5-5A-5B)
D - hot runners
E - third plate systems

are defined case by case and for such solution the *Engineering Department* will give some indications and the approval to the *Supplier* study. In the specific case of hot runners, the project must be verified with the nozzle/hot runners supplier before the mold is manufactured. For electric connections see paragraph 4.10.

3.6.2 Distribution

With distribution we mean the series of runners which, sliding on the mold closing surface, connect the main fill to the injection points.

The standard execution is:

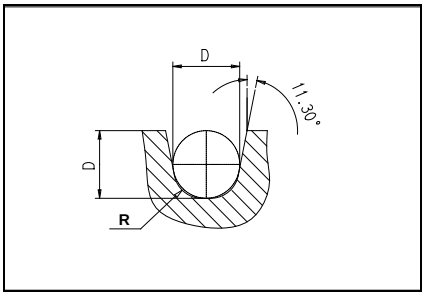
A - trapezoidal runner (fig. 5)

Executions such as:

B - full round runner
C - half-round runner

must be considered not standard, but can be used if the situations require them.

TRAPEZOIDAL RUNNER



BRUNCH RUNNERS

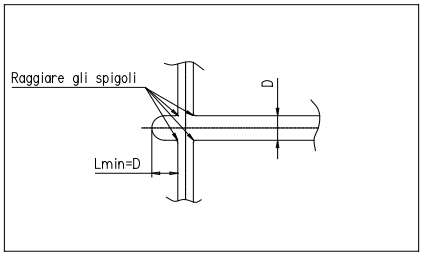


Fig. 5 - RUNNERS

The runners characteristic parameter is always the diameter of the inscribed circle, so the working section shall be equal to the circle area, as specified in the following table along with radius R value:

diameter D	working section	radius R
2.0 mm	3,1 mm	0,5 mm
2.5 mm	4,9 mm	0,5 mm
3.0 mm	7,1 mm	1.0 mm
3.5 mm	9,6 mm	1,0 mm
4.0 mm	12,6 mm	1,5 mm

diameter D	working section	radius R
4.5 mm	15,9 mm²	2,0 mm
5.0 mm	19,6 mm²	2,0 mm
5.5 mm	23,7 mm²	2,3 mm
6.0 mm	28,3 mm²	2,5 mm
8.0 mm	50,3 mm²	3,0 mm

Besides:

1. fill runners sliding areas must be hardened to avoid mintings (50+2 HRC);
2. obtain runners preferably on the mold movable side;
3. runner surfaces must be buffed with care;
4. runners must pass at a minimum distance of 2-3 times the inscribed diameter, from the moulding areas in order not to weaken them and to avoid trimmings;
5. runner sections must be dimensioned starting from the section nearest to the piece and, in case of branches, the main branch section must be equal to the output sections sum;
6. in the intersection area, remove the edges with radius and provide for wells for cold drills as specified at fig. 6.
7. in the case of molds with a number of cavity greater than 4, apply the melt flipper to achieve a better balance of the fillings;
8. finish the runners on hardened steel by milling machine to guarantee accuracy (dimensional tolerance : ± 0.02 mm).

3.6.3 Injection

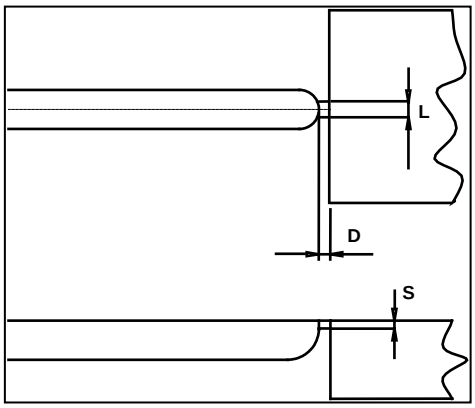
Injection is the definition of the area between the distribution runners and the piece.

Such area, which influences all the process, must be designed and realized with the utmost attention.

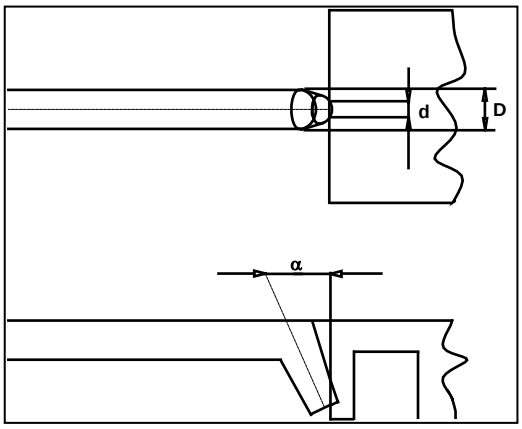
Standard executions are:

A - laminar	fig. 6
B - tunnel	fig. 7
C - fan	fig. 8

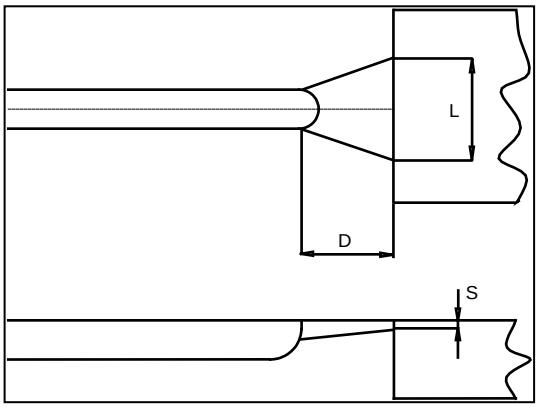
D - direct fig. 9



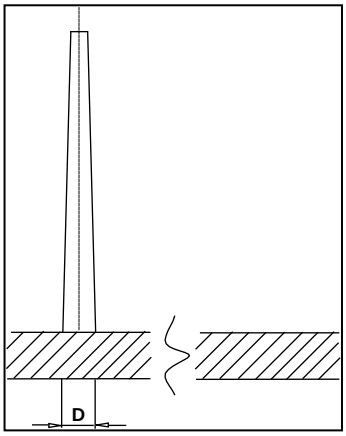
A - Laminar Fig. 6



B - Tunnel Fig. 7



C - Fan Fig. 8

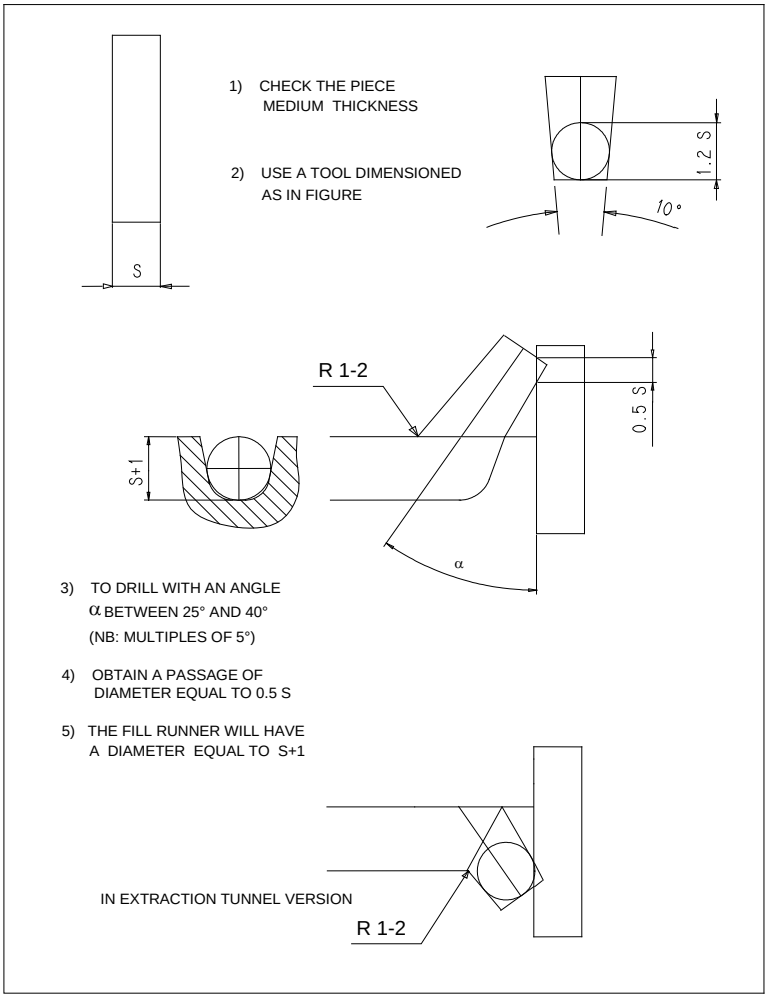


D - Direct Fig. 9

For more details concerning tunnel injection see Annex 32..

For further details on tunnel injection see Figure 10.

Fig. 10 - TUNNEL INJECTION – MECHANIC EXECUTION



The passing section minimum dimension shall be at least equal to 0.5 times the piece thickness.

In the version with extraction tunnel, always predict an ejector as close as possible to the injection, in particular, it is mandatory the ejector below the rib with injection point (see fig. 11). The tunnel must be execute by EDM machine and polishing must be taken care of to remove all signs of processing, all the arris at the exit must be eliminated.

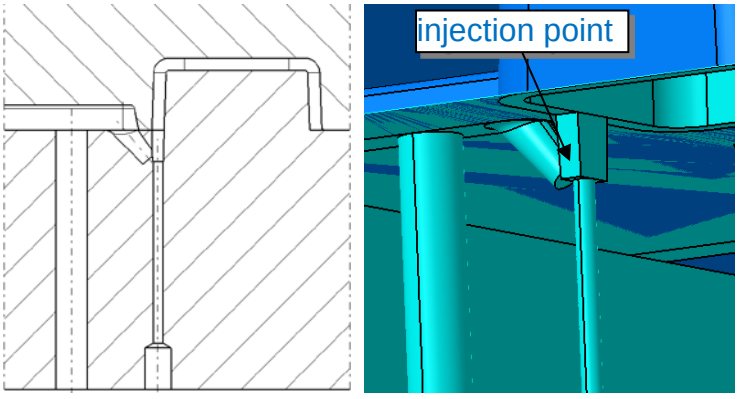


Fig. 11 - TUNNEL EXTRACTION VERSION

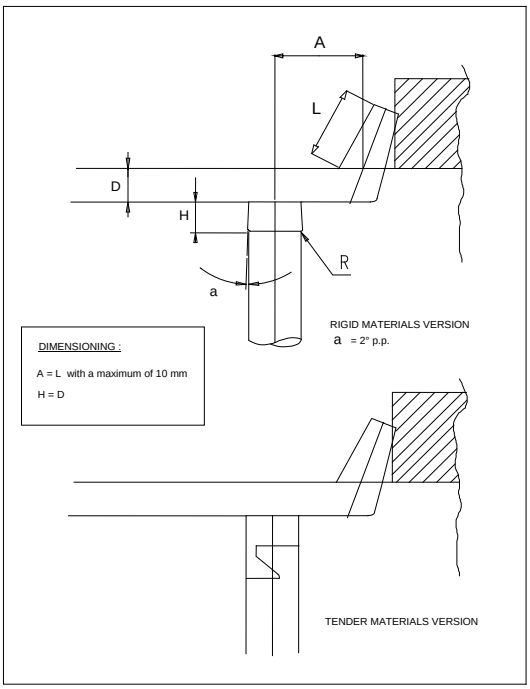
3.6.4 Cold slug well

Cold slug well must perform two main functions:

- hold the feedhead during the opening phases
- guide it during the extraction phases

The tipical form of cold slug wells is specified in fig. 12, to which you may refer for advised dimensions and distances.

COLD SLUG WELL FOR DISJUNCTION FROM FIXED SIDE MOLD



COLD SLUG WELL FOR GUIDE IN EJECTOR PHASE

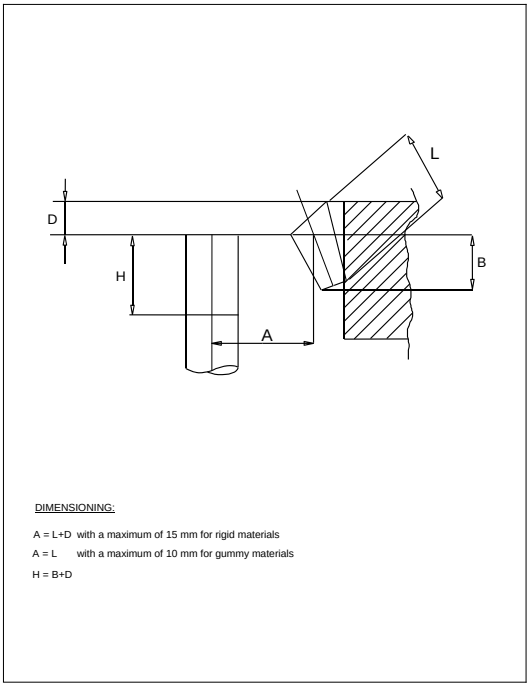


Fig. 12 – COLD SLUG WELL

The diameter must not generate anomalous masses; on the other hand the ejector pin must not be too little compared to its lenght.

With regard to the position, make reference to the following rules:

1. provide for a cold slug well next to the main fill (recommended diameter 4 mm);
2. provide for one cold slug well at least for every runners branch;
3. provide for one cold slug well for every fill tunnel;
4. a cold slug well is allowed for 2/4 tunnel if they are very near (max 20 mm between the tunnels), upon agreement with ENGINEERING DEPT.

3.6.5 Gas vents

Provide for the suitable air vents from the cavity.

Such vents must be placed in the filling final areas, in the case also along the running and/or other areas of the cavity.

For that reason, use also:

1. inserts junctions;
2. ejector pins, ejector sleeves and movable pins;
3. mold closing surfaces.

During the moulding, the vent could get obstructed, because of cokings; so, it is necessary to clean the area (if reachable) or carry out such activity automatically during the inserts or punches movements.

Therefore, avoid making vents by using fixed pins, whose efficacy decreases after a certain number of mouldings, making operators carry out difficult mold disassembly operations.

See annex 2 for mechanical vents construction on surface and movable components (ejector pins, inserts, ejector sleeves).

For particularly difficult cases, insert porous dough in "Porcerax II" (commercial name from Rives srl - http://www.rivessrl.com/) connected to a specific compressed air duct to keep it clean during the molding process without having to use Removing any part of the mold. Place GAS discharges also on the rummer and not only in the final filling areas (discharge the air-gas as soon as possible).

3.6.6 Cavities selection (bush or more positions insert)

The moulding cavities selection, if mentioned in the specifications, must be made by means of mechanical devices, that can be operated and adjusted when the mold is mounted in the moulding machine.

A three-positions bush of the type as per fig. 13 must be used as a standard device.

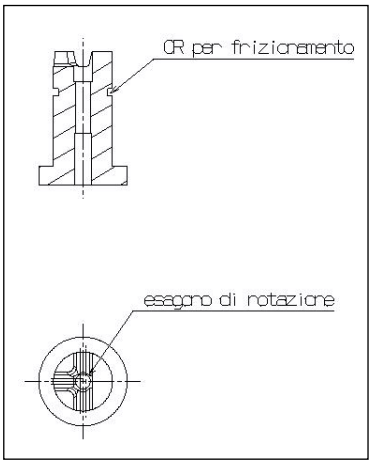


Fig. 13 – SWITCHING BUSH

Verify that feeding sections do not present chokes and do not create eccessive masses which could condition the run.

In case this bush intersects cooling passings, use the conic version with O-ring gaskets; so it is possible to avoid ball dowels in consideration of their friction.

In the family moulds always establish the ability to select the cavities prints.

In the case of more equal cavities, always give the possibility to select groups at least equal to half of the available cavities (for example, on 4 equal cavities give the possibility to select at least 2).

3.7 MOVEMENTS

During the execution of the mechanical movements, use, where possible, only the following types:

1. angled pins slides;
2. angled dipsticks;
3. horizontally pivoted dipsticks;
4. flexing dipsticks;
5. free dipsticks;
6. hydraulic movements.

NB: all the blocks / movement devices must be hardened at least 48 HRC. Depending on the criticality of the movement, if necessary, perform anti-seize grooves and DLC anti-wear coatings.

Avoid using what follows:

7. compressing and/or traction spring slides;

other solutions will be settled with the *Engineering Department*.

The mechanical realization of movements controlled by auxiliary devices shall meet the standards relevant to mechanical movements for the movable parts and the specific standards (i.e. electromechanic, pneumatic etc..) for the manovre device.

To avoid dents during the movement phase do not let appendixes protrude from the mold, (such as spring spare parts, pins, pipe unions) or protect projecting areas in a suitable way.

3.7.1 Angled pin slides

For "Angled pin slides" movement tipical section see fig. 14.

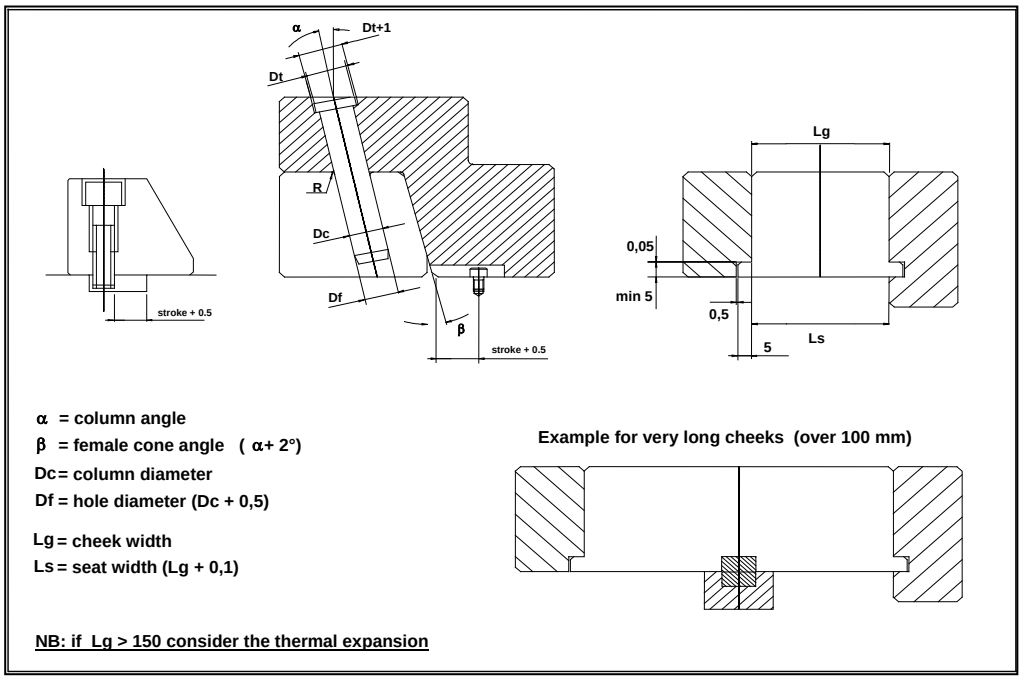
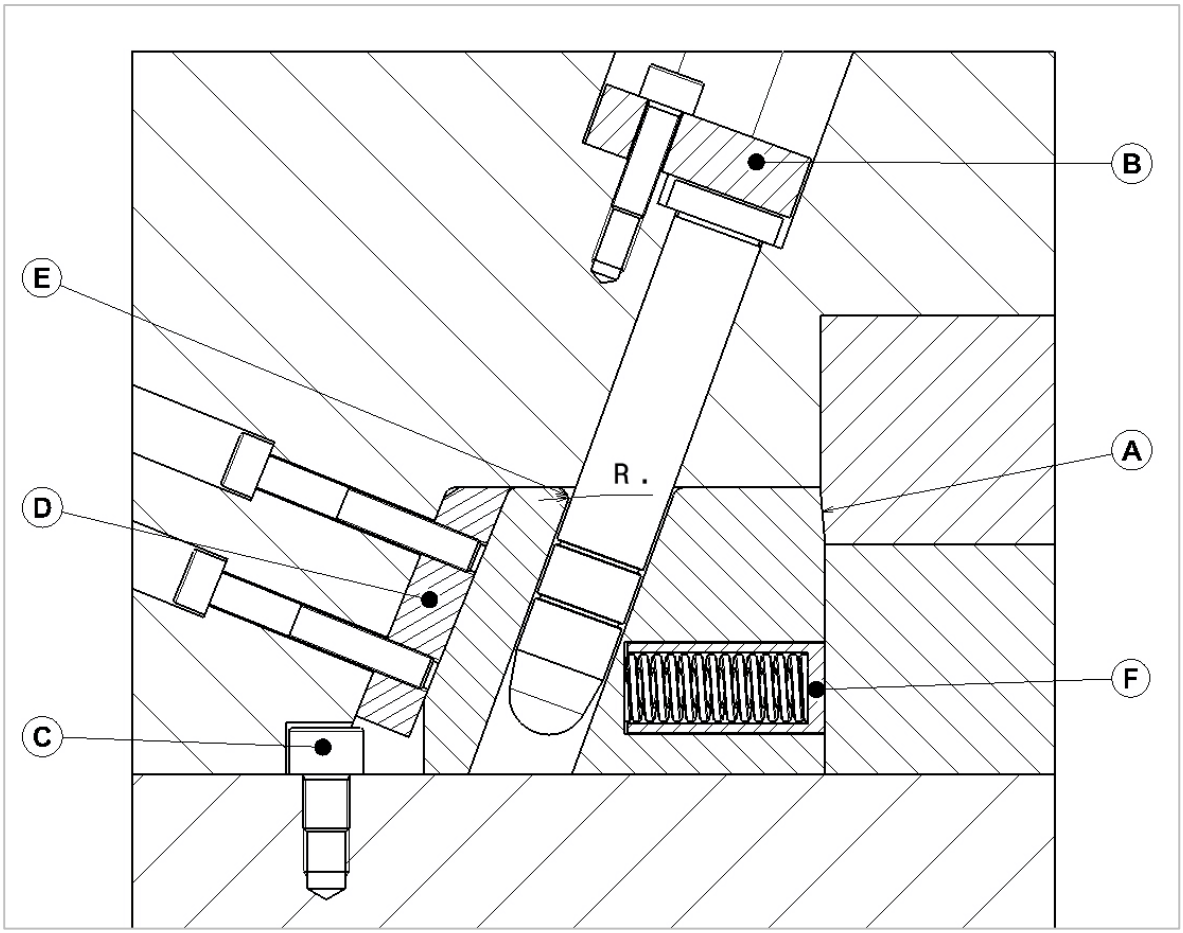


Fig. 14 - ANGLED PIN SLIDES MOVEMENT

Use the following criteria in the execution:

1. any coupling between the slides and the fixed part of the mold must always be done with appropriate tapering to prevent seizing at mold opening (**A**);
2. lock the angled pins backwards to prevent the spout (**B**);
3. for the size and shape of the pins, refer to Annex 28;
4. Always provide locking screws at the end of the slide (**C**);
5. in case of conical locking obtained directly in the plate, provide for the retrieval of tempered platelets (**D**);
6. do not discharge the plates in the conical locking area;
7. the hole in the slide must have a gap on the diameter of the pin of at least 1 mm, so that the closure is made from the inclined plane of the conical locking, if it is necessary to delay the opening of the slide, discharge more that hole;
8. chamfer the entrance of the holes (**E**);
9. adopt a 2-degree inclination for the conical locking to that of the pins;
10. to prevent the rebound of the slides, insert the retainers listed in Annex 15, for high production or small slides, try to insert appropriate springs (**C**);
11. if the slide exceeds 100 mm in length (in the direction perpendicular to the movement), provide a H7 tolerance center rail leaving an E8 tolerance (to compensate for thermal expansion) at the ends.



3.7.2 Angled slides

When possible, it is preferable to use the angled pin movement because it is more reliable.

Depending on the specification, use one of the following types of dipsticks:

- angled
- horizontally pivoted
- free (do not use for TOP molds)

Regardless of the type of dipsticks you choose, follow the following guidelines:

1. if possible, insert taper to allow, in closed mold, to cancel the gap necessary to sliding the dipsticks itself;
2. make sure that the dipsticks have a support along the opening direction near the closure area (see example in Figure 19).
3. execute anti-seize grooves on the parts subject to sliding

3.7.2.1 Angled dipsticks

"Angled dipstick" movement tipical construction is shown in fig. 15.

Use K110 steel hardened to 58 HRC for the construction of the sliding guide blocks in the plate.

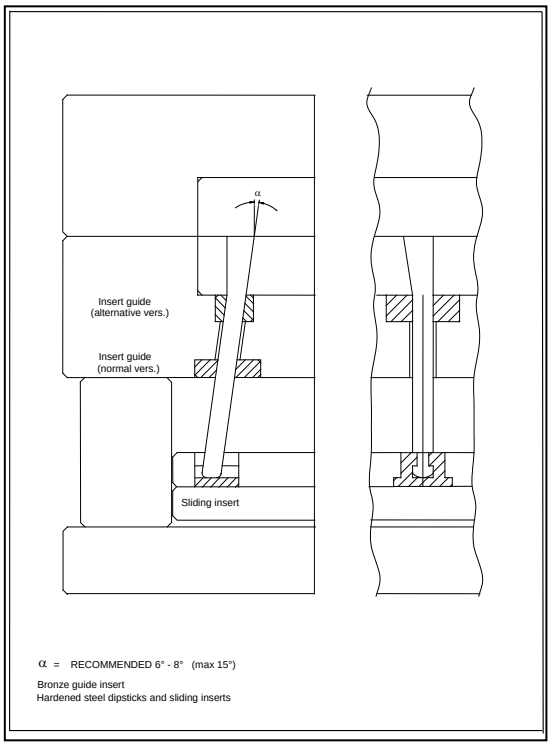


Fig. 15 – ANGLED DIPSTICKS MOVEMENT

3.7.2.2 Horizontally pivoted dipsticks

For "Horizontally pivoted dipstick" movement tipical section see fig. 16.

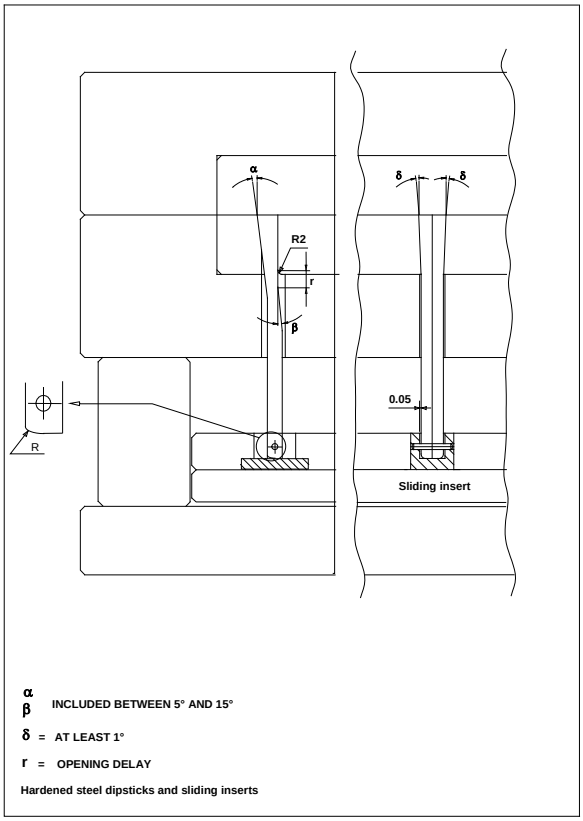


Fig. 16 – HORIZONTALLY PIVOTED DIPSTICKS MOVEMENT

3.7.2.3 Free dipsticks

For "Free dipsticks" movement tipical section see fig. 19

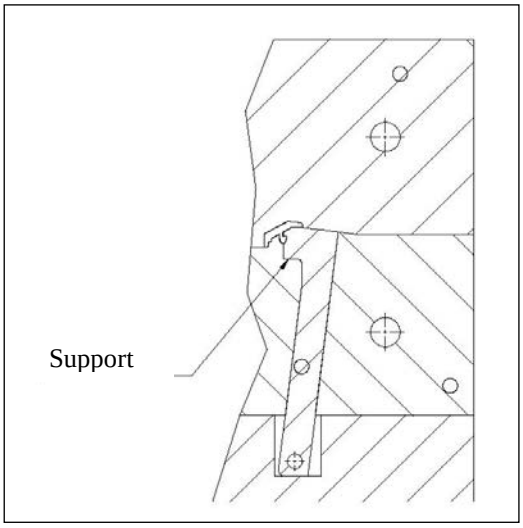
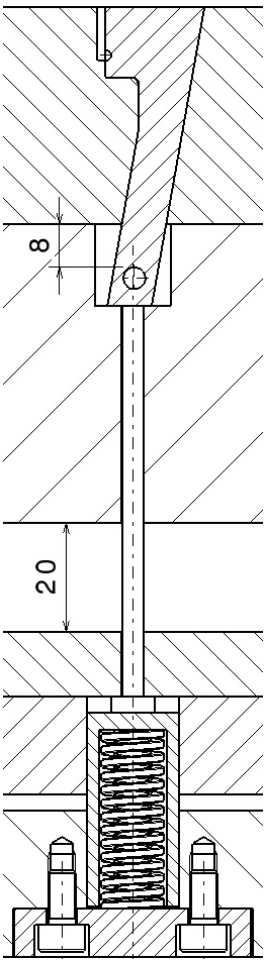


Fig. 19 – FREE DIPSTICK

The ideal use is the application for the movements in fixed. In this case the movement is guaranteed by a spring at mold opening. The return is given by the closure on the dipsticks.



In the case of applications for mobile movements, consider the following aspects:

1. insert an ejector that only moves the last millimeter of extraction run to ensure the fall of any incomplete piece;
2. the advancement of the dipsticks is obtained by means of the undercut of the semi-finished product which, during the extraction, drags with the dipstick, then assess whether the sub-frame size is adequate according to the geometry and the size of the dipstick; if it is inappropriate to insert an extractor which pushes the stick at the same time as the printed one;
3. after the extraction has taken place, the dipstick remains in the advanced position, if such position can compromise the fall of the semi-finished, ensure that the dipstik stroke is less than the extraction stroke;
4. if it is necessary either to push the dipstick with an extractor or to have the dipstick stroke lower than the extraction stroke, insert a spring acting on the extractor only during the extraction step limited to the required travel (see example in the figure below). In this case, make sure that the table plate return springs exceed those in the extractor.

3.7.3 Hydraulic movements

Characteristic elements of the system are:

A. hydraulic cylinders;
B. electrical/hydraulic connection;
C. movement control.

For national supplies use only the standard listed here below, while for foreign supplies it is necessary to respect the technical characteristics of the single elements after contacting the Engineering Department.

A. Hydraulic cylinders

1. Use VEGA oleodynamic cylinders (http://www.vegacylinder.com/)**.**
   The bore must be selected considering that it has a working pressure of 80 bar. To select the cylinder, engage Engineering Dept. or directly *VEGA*.
2. Protect the possible projections from mold profile with crankcase or stirrups;
3. Arrange the cylinders as much adherent as possible to the mold, in order to avoid impediments for actuating and stirrup.
4. Connect the cylinder rod to the element moved by floating joint or with self-made devices; a transversal actuation must be allowed in order to avoid the rod overload due to possible misalignment.

5. The cylinders must be fixed: only the rod must move.

B. Electrical / hydraulic connection

1 Carry out the hydraulic oil distribution by ø 10 rigid pipes (est. ø 10, int. ø 7 of 150 Bar – use tube bender); only exceptionally it is possible to use parts of flexible pipe (SAE R2AT 200 ATM with ERMETO connections).
2 Use model “LARGA” components for connections with gas thread (see adaptors, male/female reduction fittings, right / swinging terminal fittings, swinging / elbow etc.).
3 Pipes and fittings must not prevent the stirrup and the actuating; they have to be possibly included in the perimetral slots.
4 The mold disassembly must be easy: the rigid pipes must not be bent to disconnect the installation.
5 The moulding machine/mold connection takes place by Gas ISRM ½ automatic connection (male), an actuating group corresponds to every couple of connections (an actuating group is a cilinder assembly with common operation phases).
6 The rigid pipes must be connected with automatic connections by a header block in W. 1.0503 material, fixed with screw on the mold side opposite to the mould operator. The automatic connections must be turned frontally or downwards, with minimum axle base of 40 mm.
7 When there is more than one cilinder, the fills must be brancheds out by splitting blocks or through T connectors.
8 In case of impossibility of connection with pipes, it is allowed to connect the cylinder to the circuit with holes in the plate (after project approval) Cylinders, gaskets, OR, ecc. see VEGA catalogue).
9 Provide a watertight enclosure for outdoors (type 44 CE IP56 - GEWISS Series) for electrical connections: it must be arranged on the mold upper side or on the operator side. Input the microswitch cables, output a 4P+T plug (codes GW76204 + GW76102) by connecting the micro that gives consent to extraction to the PIN 1-2 and the micro that gives the consent to injection/closure to the pins 3 -4.
Inside the enclosure the connections must be carried out through suitable insulated terminal blocks.

C. Movement control

1. Every movement must be controlled with micro-switches with mechanical limit switches.
2. Have to be used microswitches TELEMECANIQUE cod. TEZCMD21 complete with contactor and cable cod. TEZCMC21L1.
3. You have to directly control the movable element; if it’s not practicable, opt for rods or cams.
4. The rods and cams must be fixed to the movable element in a defined position (e.g. broaching).
5. If spaces are limited it is allowed to control the movement rod.
6. It’s not allowed to use magnetic and capacitive sensors or sensors that require power supply or specific control device for their functioning.
7. The microswitch must be visible in order to verify the running without disassembling the mold.

8. The microswitch placing must consider the links of stirrup, lifting and actuating; they must be protected from knocks if positioned outside the mold.
9. The microswitches cables must be arranged in an orderly manner, providing for slots and containing plates (avoid blowing wires).

3.8 EXTRACTION DEVICE

For the dimensioning of extraction device, making reference to Annex 13 we have the following:

I	upper ejector plate thickness
L	lower ejector plate thickness
P	guide pins diameter (use max 250 mm pitch for every couple)
Q	quantities and types of ejector plate fastening screws
1 mm	distance between plates and supports
2,9 mm	distance between ejector plates and clamping plate

For processing tolerances, permitted and recommended backlashes, vents dimensions and guide sections, make reference to annex 2.

3.8.1 Choice of extraction points

To locate punches, ejector sleeves or extraction inserts adopt the following criteria:

1. the thrust must act in areas with a substantial thickness, under pins, beads, riported pieces;
2. the thrust must be balanced;
3. the piece must fall even if it is unsufficient;
4. the stroke must be able to completely disengage the piece;
5. in case of hollow pieces, provide for air passages to avoid the sucker effect;

3.8.2 Stroke feets

Between the mold clamping plate and the lower ejector plate, mount 48-50 HRC stroke feets in W. 1.2343.
For dimensions, make reference to fig. 20.

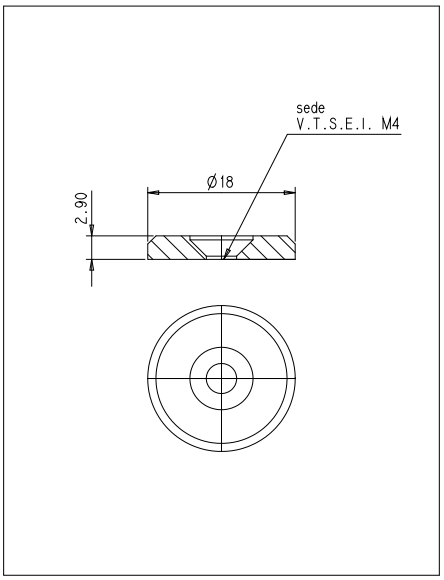


FIG. 20 – PLATE STROKE FEETS

Provide for 1 foot next to every push back pin, and 4 feet in the zone of plate coupling to the moulding machine (AGS); in case of considerable distance, provide for other feet to assure the planarity stroke of the plate.

3.8.3 Push back pins

In the push back pin stroke area provide for the assembly (flush-mounted or prominent) of hobbed inserts 48-50 HRC, made by W. 1.2343.

For inserts standard dimensions, make reference to fig. 21.

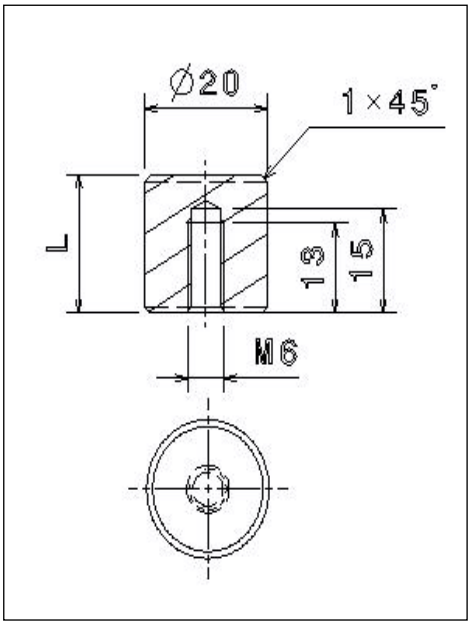


FIG. 21 – PUSH BACK PINS STROKE INSERTS

3.8.4 Moulding machine coupling

Standard device for mold coupling to moulding machine ejector pin.
For foreign supplies only execute seats, as indicated in fig. 22.

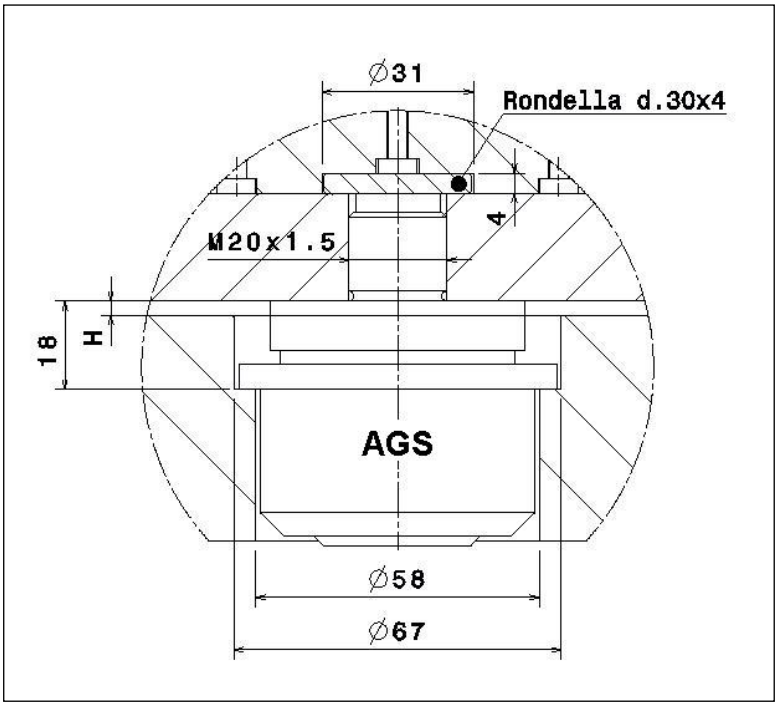


Fig. 22 – AGS DEVICE STROKE AND SEAT

The device is available on the market. Use exclusively the “standard” model, with M20x1.5 fixing thread.

Respect the dimensions mentioned in the annex, for a correct stroke and a consequent limit stop release.

The execution, which provides for more than one coupler point at the moulding machine, must be agreed and verified with the *Engineering Department,* referring to the moulding machine on which the mould must be mounted.

In case are used the moulding machine screws, arrange the plate with M20 threads in conformity with the axle bases shown in Annex 1.

3.8.5 Guide device

The guide columns, as indicated in Annex 2, must always slide inside steel bushes. Use W. 2.0975 bronze bushings only if required in the specific specifications. For bushings and Columns it is preferable to choose between the GW codes listed in Annexes 21 and 22.

3.8.6 Extraction control

The mold must be equipped with a control device to check the plate return.

The mechanical construction of the control device is described in the annex 29.

3.8.7 Anti-recoil device

Mount suitable anti-recoil springs onto the plate push back pins to allow the end switch constant reading and to avoid plate longitudinal oscillations in the mold opening and closing phases.

Use max deflections of load to obtain a long duration (L <30% Initial length), making reference to the technical data and to the standard dimensions available on the market.

In particular cases, nitrogen cushoning cylinders are available on the market however; this application must be verified with Engineering Department.

If there is no space to use springs, use polyamide frictional puller as a brake (normally available on the market).

3.8.8 Ejection zone protection

The plate sliding space must be protected from the fortuitous entrance of foreign matters (e.g.: feedheads).

The protection must be made by supports or galvanized iron sheet cover, fixed to the plates by TCEI screws.

3.9 CONDITIONING AND HEAT INSULATION

The design of mold temperature conditioning circuits must take into consideration many factors:

1. piece configuration;
2. kind of material (that needs of cooling or thermostation);
3. kind of steel (thermal exchange factor);
4. physical possibility of making the necessary holes inside the cavity.

3.9.1 Exchange area

The optimum condition to guarantee a homogeneous conditioning provides for a cooling circuit exchange area equal to the moulding piece surface at least. This for each of the mold two halves.

3.9.2 Holes dimension

The standard size of the holes is 6 and 8mm compatible with the shape of the piece. Smaller holes are allowed if there is no other way to cool areas that are critical from the geometry of the cavity.
Holes greater than 8mm are to be evaluated with ENGINEERING DEP. and with appropriate computational tools to ensure a good effectiveness in terms of heat exchange. Similar circuits (such as similar parts of the cavity and having equivalent flow rates) can be connected to the plate in order to reduce the number of connections to be made during the setup.

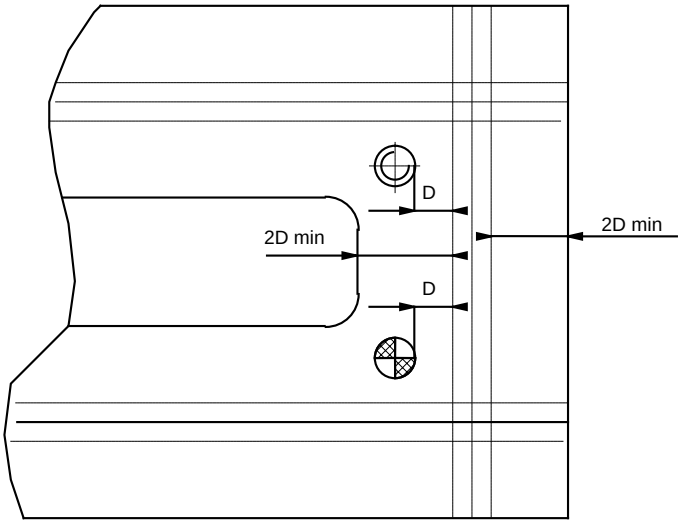
3.9.3 Execution technique

The minimum distance between the conditioning circuit holes and the moulding surfaces or insert outside rims must be at least twice the hole diameter (this distance can be reduced to 1,5 D in case of operating difficulties).

The holes must be drilled using CNC machines with suitable tools, use the most suitable techniques to ensure a precise hole position along the entire length (hole starting point precision ± 0.2 mm; maximum deviation from the theoretical axis of the hole 0.5 mm).

In case of passings near extraction holes, screw seats, pins ... use a distance equal to the hole diameter at least.

We show the following figure as an example:

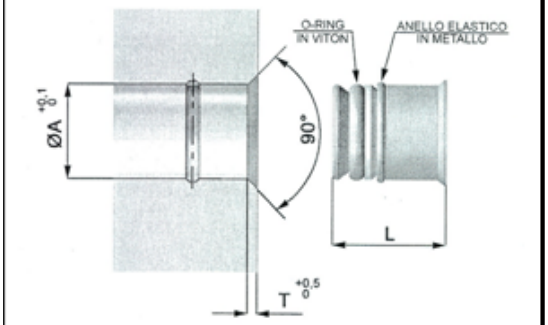


3.9.4 Plugs

To fit the holes, observe the following specifications:

- if the plug is contained in a seat, prefer the use of removable Balzi plugs ((http://www.ermannobalzi.com/), it is obligatory execute the seat of the elastic sealing ring as required in the catalog (see figure 24).

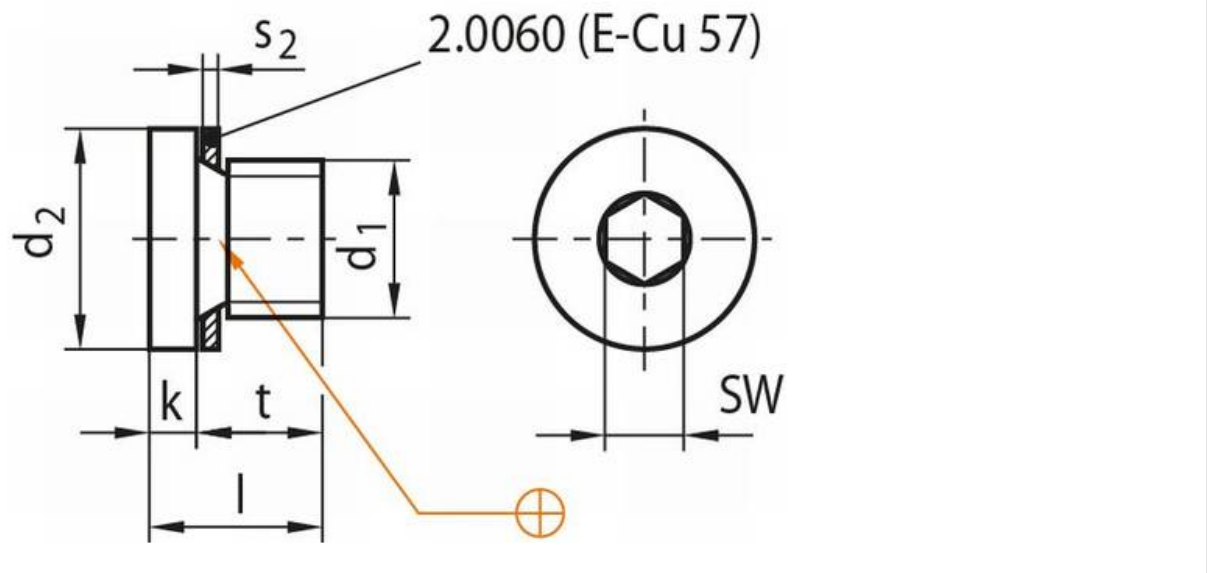
BALZI PLUGS



COD.	d.A	T	L
TR-6F	6	0,5	6
TR-8F	8	1	8
TR-10F	10	1	12
TR-11F	11	1	12
TR-12F	12	1	12
TR-14F	14	1	12
TR-15F	15	1,2	12,5
TR-16F	16	1,2	12,5
TR-18F	18	1,2	12,5
TR-20F	20	1,2	12,5
TR-25F	25	1,2	12,5

Fig. 24 – BALZI PLUGS

- if the plug is not conteined in the seat by a insert or plate (f.e. slides, mold base plates, etc.), use the grain with copper washer as in the following figure ((https://www.hasco.com/hasco/it/).



numero d'ordine	d1 [mm]	d2 [mm]	l [mm]	t [mm]	s2 [mm]	k [mm]	s [mm]	numero mate...
Z 941 /R1/8	G1/8A	14	11	8	1	3	5	75396
Z 941 /R1/4	G1/4A	18	15	12	1,5	3	6	75388

- If the dimensions only allow the use of plugs of less than 6mm diameter, use grains with a flat tip with hexagon socket - A2-70 stainless steel (AISI 304) ISO 4026 with seals fittings (do not use copper or aluminum plug in cold riveted Because they bring to the cracking of the dowels).

3.9.5 Different techniques

If you choose to adopt wells exchange use Balzi coolers (http://www.ermannobalzi.com/):

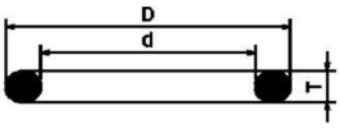
- central source wells (verify input and output sections);
- spiral wells;

these two techniques guarantee the exchange working surface, unlike the central blade wells.

In any case, apply only stainless steel for exchangers, In the case of very complex circuits, apply the steel inserts distributors in W.nr-1.2083.

3.9.6 Seals

To assure the conditioning circuits seal use O-rings english set (norms BS 1806, BS 4518, SAE AS-568).
For standard use (from –20 °C to +110 °C) choose the material NBR 70 (ISO 1629). For heavy duty, high temperatures, choose fluorinated elastomer material (f.e. Viton®) FPM 75 Sh A (ISO 1629).
The surfaces wrinkledness of static seal must be less or equal to Ra 1, the seats constructive tolerance is of ± 0.05 mm.



D= O-ring external diameter
d= O-ring internal diameter
T= O-ring cross section

With the O-rings it's possible to do axial and radial seals of dynamic and static type. We have the dynamic seal when the 2 elements that must assure the seal have the relative motion. The seal is static when the 2 elements have not the relative motion.

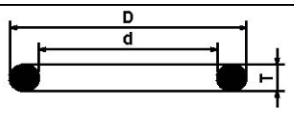
AXIAL STATIC SEAL

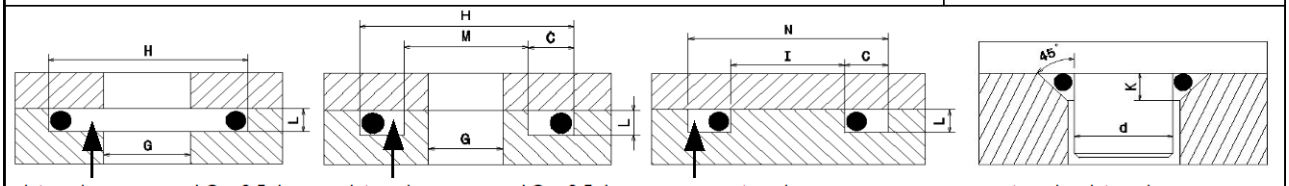
Usable to do the axial seal in division planes between inserts, the table of the seats dimensioning is shown in the annex 9.

STATIC AXIAL SEAL TABLE – ENGLISH SET O-RING

Or material : NBR 70 (ISO 1629, running temperature –20 °C/+110 °C)

Seal surfaces wrinkledness Ra<1, seats tolerance ± 0,05

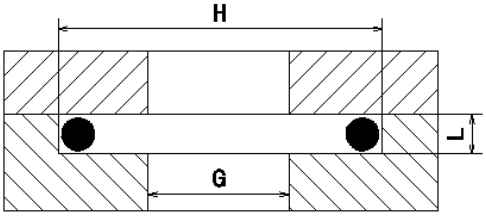




internal pressure and G > 0,5 d | Internal pressure and G < 0,5 d | external pressure | external or internal pressure

Reference			OR dimension			Cavity dimensions (mm)							
English	BS 1806 BS 4518	SAE AS-568	T	d	D	L	C	H	M	I	N	K	G max
OR 2007	004	2-4	1,78	1,8	5,3	1,3	2,5	5,1	-	2,0	7,0	2,4	1,2
OR 2010	005	2-5	1,78	2,6	6,1	1,3	2,5	5,9	-	2,8	7,8	2,4	1,7

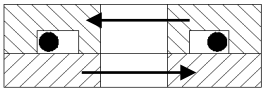
In case of internal pressure to prefer the use of relevant configuration with G>0,5d, because the seat allows a better finish, reduce the water stagnation and improve the seat corrosion strength.



Adopt the configuration “internal pressure and G < 0,5d” when the H diameter is too big respect to the G hole and it’s not a good think to leave inside the mould an empty area equal to the H mm. and the H diameter (e.g. when the G hole is 10 mm and the H diameter is 150 mm).

In certain cases, previous *Engineering* agreement, is possible to do the G diameter like the internal diameter of “d” gasket. In order to assure enough duration of the seal, the seat must be made with a corrosion strength steel (e.g. W. Nr. 1.2083).

When the OR has to make the seal between the plugs:

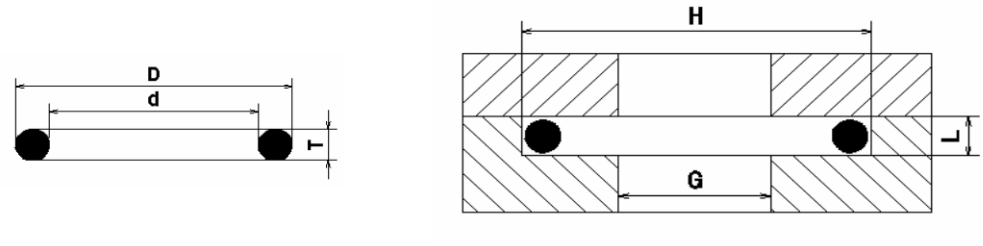


1. that, when mounting, they must slide over the other along the sealing plane;
2. which also suffer from external compression (f.e. air bubbles in punches and / or matrices);
3. one of which has a small supporting surface (f.e. pins with welded head);

Prefer to use the configuration called "internal pressure and G <0.5d" (with internal collar) even when G is greater than 0.5d. Reach sharp edges that could damage the seal during assembly.

The following table is an extract of annex 9 and shows the O-rings to use for the most common seals for the holes of moulds conditioning circuit.

USING OF STATIC AXIAL SEAL O-RING IN THE MOST COMMON CONDITIONING HOLES
(seal between insert-insert or plate-insert)



Conditioning circuit hole diameter	O-RING with T=1,78 to use for construction moulds				O-RING to restore the wore out ORING seals with T=1,78 maintenance moulds			
G (mm)	Codice OR	T	H	L	Codice OR	T	H	L
0 ÷ 4	OR 2021	1,78	8,6	1,3	OR 3021	2,62	10,3	2,1
4 ÷ 5	OR 2031	1,78	11	1,3	OR 3030	2,62	12,6	2,1
5 ÷ 6	OR 2037	1,78	12,6	1,3	OR 3037	2,62	14,2	2,1
6 ÷ 8	OR 2043	1,78	14,2	1,3	OR 3043	2,62	15,8	2,1
8 ÷ 10	OR 2056	1,78	17,4	1,3	OR 3056	2,62	19	2,1
10 ÷ 12	OR 2062	1,78	19	1,3	OR 3062	2,62	20,4	2,1

For a better seal dimensioning and for not reported holes make reference to the annex 9 from which this table is extracted.

Fig. 25 –RING TABLE FOR CONDITIONING HOLES

Example of seal dimensioning between plate and insert for the conditioning circuit.

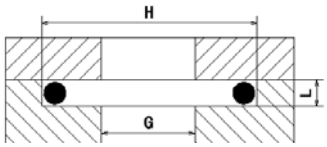
G conditioning hole diameter = 8 mm.
The pressure is inside the O-ring.

Supposing to use an O-ring with T = 1,78 mm. (in the future will be possible to insert an O-ring with T= 2,62 easily restoring the seat).

To look up in the table the O-ring that has the Gmax greater or equal to 8 mm.
Found the O-ring 2043 and 114, we choose to use the O-ring 114 (generally we choose the biggest O-ring)

O-ring internal diameter d = 11,1 mm.
O-ring external diameter D = 14,7 mm.

Check the configuration to adopt: “internal pressure and G> 0,5 d” indeed 8 > 0,5*11,1 = 5,55



Internal Pressure and G > 0,5d

Seat diameter	OR114	H = 14,5 mm
Seat depth	OR114	L = 1,3 mm

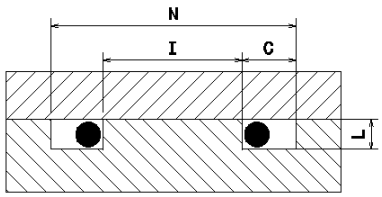
Supposing that the mould configuration not allows to use the seat diameter H=14,5 because intersects an ejector hole. After checking the impossibility to solve the problem in a different way (e.g.: move the conditioning hole, change diameter, move an ejector, ecc) proceed in the following way.

It’s possible to reduce the H quote of the value log (D/3), H=14,5 can be reduced till 13,8 mm., if the reduction it’s not enough to choose in the table an O-ring that has an internal diameter d greater or equal to 8 mm.

OR 108	internal diameter d=8,7 mm	and seat diameter H=12,1 mm.
OR 2037	internal diameter d=9,3 mm	and seat diameter H=12,6 mm.

If both solve the problem choose the one with the greater internal diameter (OR114), when G>Gmax it’s not possible reduce the external seat diameter H) and it’s necessary to make the housing with a corrosion strength steel. If none of the OR solves the problem there is no solution by acting on ORs and their seats.

In case of tightness with “external pressure” for d < I (O-ring subject to traction) the variance of I from d can reach the maximum of the upper value between log (d/3) and 3% d.



External pressure

For applications that not expect a circular seat let’s the gasket support perimeter equal to the support circumference of the relevant circular seat, marked in the table or calculated in the above-stated methods (the support circumference for internal pressures is the external one, for the external pressures is the internal one, in the same manner to determine which is the support perimeter of the seat of any form).
To draw the not support outline to do a seat of C width and L depth adjacent the support outline in the pressure side (inside the O-ring for internal pressure, external the O-ring for external pressure).

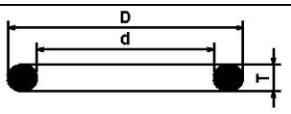
RADIAL STATIC SEAL

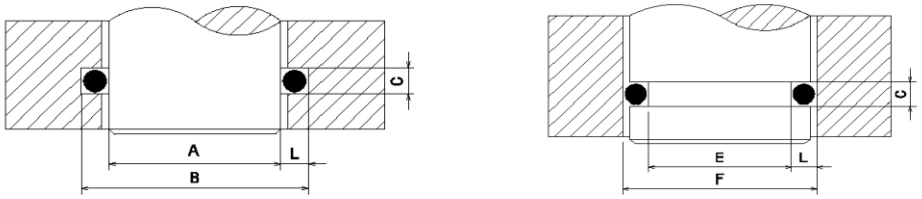
Usable to do the seal between cylinders, the table for the seats dimensioning is shown in the annex 10.

STATIC RADIAL SEAL TABLE – ENGLISH SET O-RING

Or material : NBR 70 (ISO 1629, running temperature –20 °C/+110 °C)

Seal surfaces wrinkledness Ra<1, seats tolerance ± 0,05





Reference			OR dimension (mm)			Cavity dimensions (mm)					
English	BS 1806 BS 4518	SAE AS-568	T	d	D	L	C	A	B	F	E
OR 2007	004	2-4	1,78	1,8	5,3	1,3	2,5	2	4,6	5	2,4
OR 2010	005	2-5	1,78	2,6	6,1	1,3	2,5	2,5	5,1	6	3,4
OR 2012	006	2-6	1,78	2,9	6,5	1,3	2,5	3	5,6	6	3,4

In the table shown in the annex 10 the diameters A and F have been obteined by rounding to a whole number the measure d and D of the gasket, the most suitable measure to adopt for A and F should be d and D respectively. It's possible to have the seal on shafts or holes that have not whole measures (very frequent event with moulds) moving away from the gasket diameter (d when the seat is made in the hole and D when is made in the shaft) till a maximum of log (D/3), in this cases it needs to calculate the new value of A, B, F, E to realize the gasket compression at value L, e.g.:

a) gasket seat made in the hole;

∅ shaft on which to do the static seal Z= 26,3 mm.
cross section gasket that we want to use T=1,78 mm.

In the table choose the gasket with d nearer to Z, It's the OR 2106 that has d=26,7 and D=30,3

The maximum usable variance is log (30,3/3)= 1 mm

L = 1,3 mm
C = 2,5 mm
A = Z = **26,3 mm**
B = A+2*L = 26,3 + 2*1,3 = **28,9 mm**

b) gasket seat made on the shaft;
∅ shaft on which to do the static seal Z= 33,8 mm.
cross section gasket to use T=1,78 mm.

In the table choose the gasket with D nearer to Z, it's the OR 2118 that has D=33,4

The maximum usable variance is log (33,4/3)= 1 mm, when d<E (O-ring submitted to traction) the variance can reach till the most high value between log(D/3) and 3% of D.

L = 1,3 mm
C = 2,5 mm
F = Z = **33,8 mm**
E = F-2*L = 33,8 - 2*1,3 = **31,2 mm**

Prefer the use of the configuration with gasket seat made on the shaft because is more easy to do and assembly.
Round off all the corners that can damage the gasket during the assembling.

If is not possible to dimension the seat for the hole/shaft during checking (difference between gasket diameter and shaft seat greater than the suggested value) it needs to create a diameter variance both on the hole than on the shaft to reach the diameters of d for A and D for F.

For applications that not expect a circular seat let's the gasket external circumference equal to the seat external circumference, the cavity section not change (depth L and width C).

DYNAMIC RADIAL AND AXIAL TIGHTNESS

Must be designed with Gewiss personal assistance or following the indications contained in the relevant Specifications.

3.9.7 Connections in plate

In the cooling circuit design, take into consideration:

1. the availability connections to the moulding machine (generally 10 circuits);
2. the necessity to divide the different section and high lenght circuits;
3. the possibility of a rapid fitting out.

If high temperatures or strong differences between the two halves of the mold are expected, divide the insert circuits from the plates circuits.

In this case the 2 plates can be maintained at a similar temperature, to avoid problems on the coupling, while the two inserts can be subjected to the necessary temperature for the best moulding.

3.9.8 Outside connections

The pipe union standard seat is shown in fig. 26.

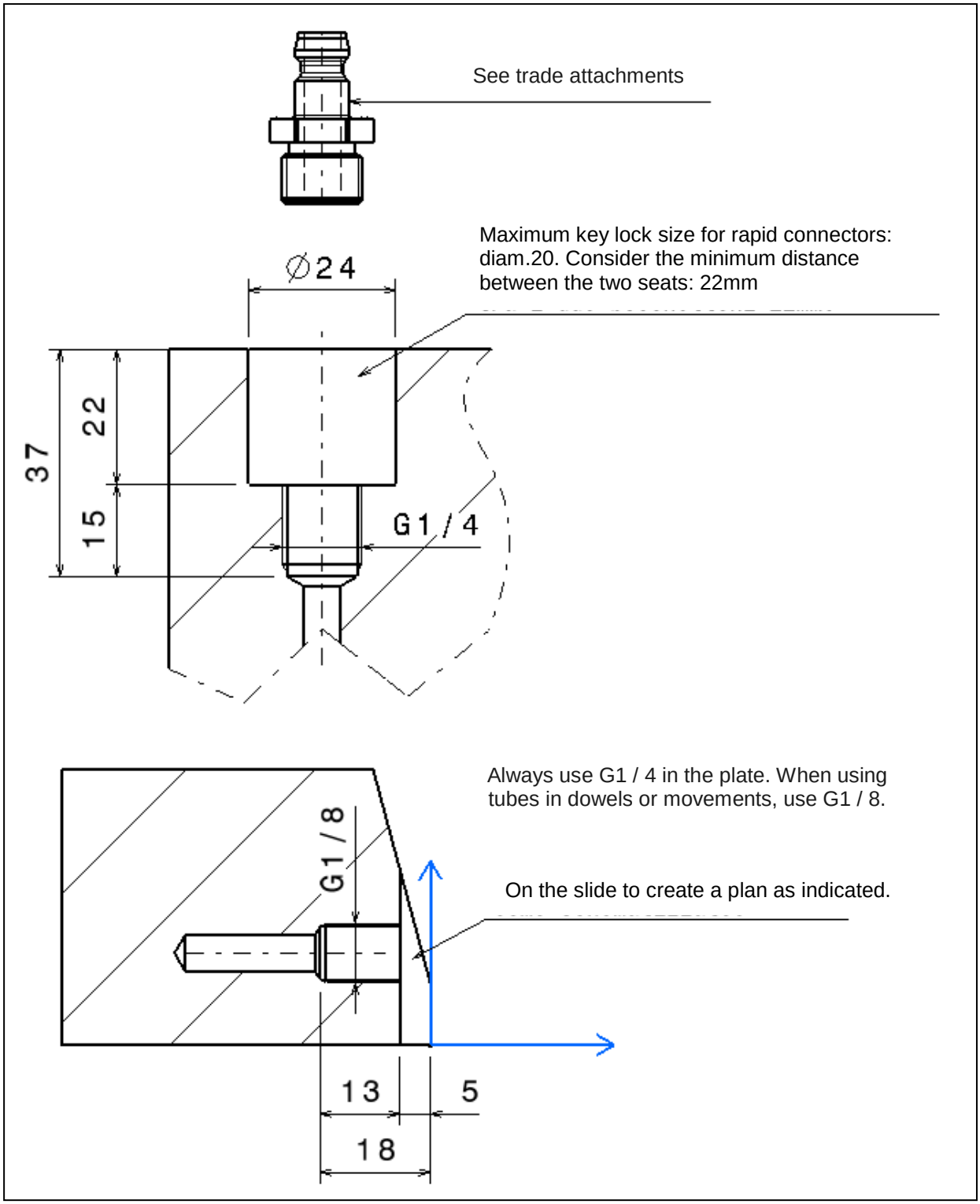


FIG. 26 – CONDITIONING CIRCUIT CONNECTION

Every seat must be numbered according to the following criteria:

- E or U (Entry or Exit))
- progressive number (e.g.: E1M
- identification)

Respect the fluid flow direction, in case of wells, when indicating E or U.

The progressive number shows the correspondence between E and U clearly.

The identification is necessary to clear up the area covered by the circuit; using the following codes:

1. M Males inserts
2. T integral cavities
3. A rings
4. F carried bases
5. P plates
6. G slides
7. C core pins

Use, possibly, only the lateral sides of the plates for connection seats.

In particular cases, use also the upper area, always avoiding the lower area to guarantee the easiness connection.

Take into consideration the clamping boxes and tie bars presence, making reference to annexes 12 and 13, for relevant axle bases and dimensions.

The design table with plan views must report the pins drawing for a prompt check.

If an air blow in the plate is used, name the entrance by "AIR" and use the same dimensions for the connection seat.

In injection plate avoid using the air blow throught the sprue bush with insulated runner; use air valves available on the market, like in movable part.

For particular cases, make reference to annex 3 for the choice of O-rings.

3.9.9 Circuit Testing

The conditioning circuits must be clean from chippings and / or drilling fluids.

The conditioning circuits should be tested by putting them under pressure with a water pump up to 20 bar. The circuit is left under pressure for 2 minutes without any leakage.
Caution: do not use compressed air for safety reasons.

When the mold has been finished, it must be completed and delivered together with the project, the table in Annex 34 where the measured flow rates of each circuit must be entered.

3.9.10 Cavities temperature measurement

Arrange always the mold for the temperature measurement on injection and ejector insert, as per fig. 27:

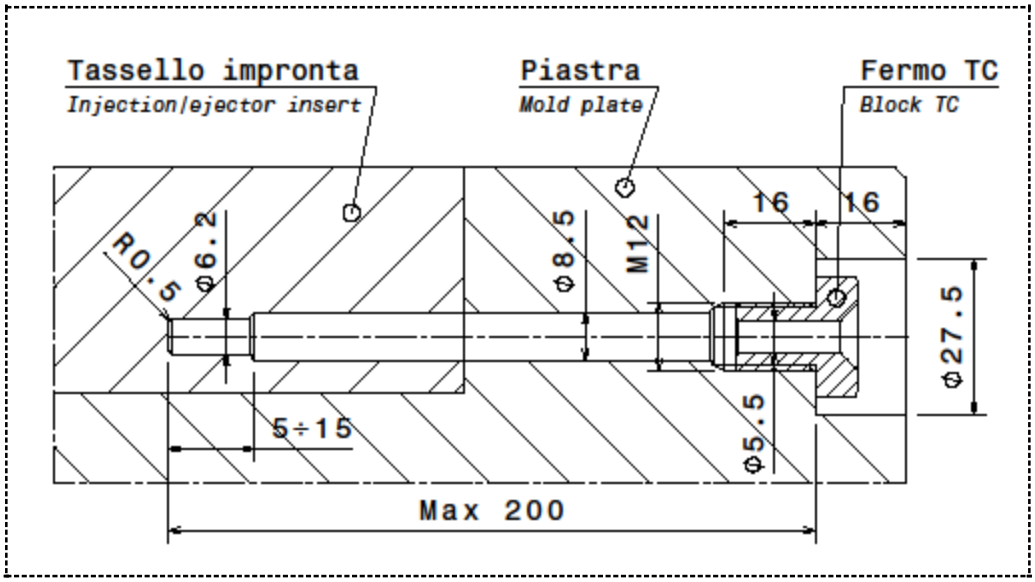


Fig. 27 – SEAT FOR TEMPERATURE MEASUREMENT THERMOCOUPLE

To realize the TC stop only if it is request the supply of the thermocouple togheter the mold.

3.10 HIGH TEMPERATURE MOLDING

In the specifications it will be indicated whether the mold must be predisposed for molding at high temperature (> 100 ° C), in this case the possibilities are two:

- Thermoregulation with resistances
- Temperature control with water / oil

However, the mold must be made for use with both solutions (obviously not at the same time) and must comply with the following specifications:

1. The dowels with conditioning circuit must be made of stainless steel (Mirrax-Corrax or equivalent). If these dowels have special geometries at risk of breakdown, evaluate with the ENGINEERING DEPT. the most suitable steel.
2. Moldbase plates (injection and extraction) must be made of stainless steel (Ramax, Royalloy or equivalent).
3. Use table guide bushings and bronze injection plate bushings
4. Apply insulating plates on the contact surfaces with the press and around the two main plates (injection and extraction).
5. In the case of family mould and angled pins movements, Make a slide for each cavity so that it does not have any sliding problems caused by thermal expansion.
6. Insert a thermocouple on the injection dowel and one on the extraction dowel as close to the printer areas as possible. For the thermocouple seat refer to § 4.9.10

NB: the use of the two systems simultaneously, resistance thermoregulation and water / oil thermoregulation is prohibited for safety reasons!

3.10.1 Thermoregulation with electric resistances

3.10.1.1 Resistances

Insert cartridge resistors provided by MDR (http://www.mdrmarca.it/, including high-temperature protection cable and sheath, in moldbase plates evenly and in a sufficient amount to bring the mold volume to the required temperature. To do this, engage the resistor supplier to assist with the design of the mold.
The resistance housing diameter should be through and have a maximum gap of 0.05mm (f.e. Ø resistance = 12mm → Ø hole housing = 12.1mm max).

3.10.1.2 Electric connections

For the wiring of the resistors and of the relative thermocouple refer to Annex 6. Connect the thermocouples inserted into the dowels in two free areas of the socket, for controlling the actual cavity temperature.

Bring all the electric cables on the upper part of the mold creating recessed ducts, in the moldbase and convey them all into a socket 24 poles Gewiss GW Connect (fruit GW76107 code with custody GW76404 or GW76326 code) thermally insulated from the mould.

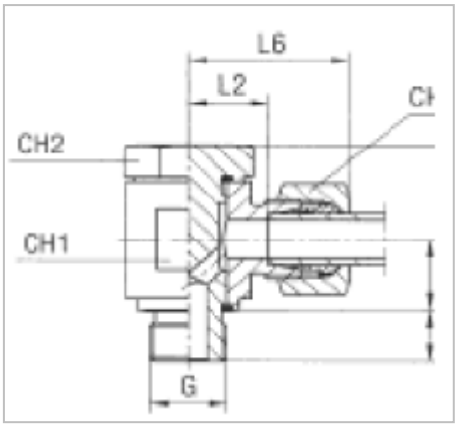
Do not completely cover the cable ducts to avoid excessive overheating, however, they must be contained in some points with platelets to prevent them from escaping from their housings.

Perform the "grounded" as specified in annex 6A.

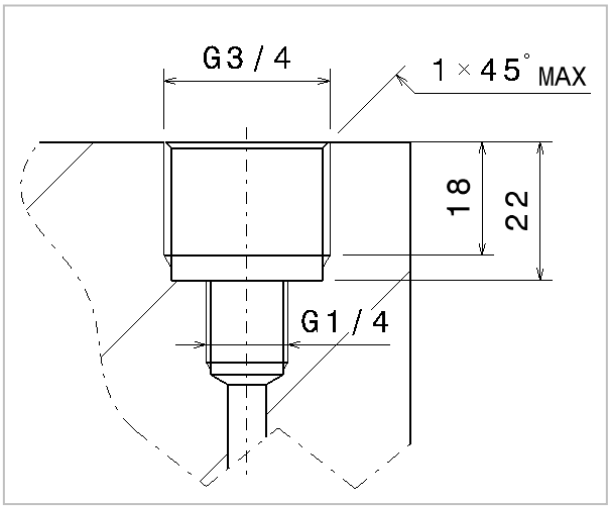
3.10.2 Thermoregolation with water/oil

Measures to observed:

1. Use OR in Viton gaskets with good care of seat finishing.
2. Where size permits, to plug the dowels and plates conditioning circuits, use grain with copper washer (see chapter 4.9.4).
3. Limit the number of circuits to two (one in fixed part and one in part mobile). If necessary, make connections on the outside of the mold without making them protrude from the same. For external connections, use fittings DIN 2353 stainless steel, ogives and stainless steel tube, possibly with G1/4 fixing. Below is a figure as an example.



4. Realize seats for inlet / outlet connections as in the following figure.



3.11 ELECTRICAL CONNECTIONS

The electrical circuits design, the materials choice and the executive solutions must take into consideration the final use and, particularly:

1. the nearness with water circuits,
2. the stresses onto the mold;
3. the connection easiness.

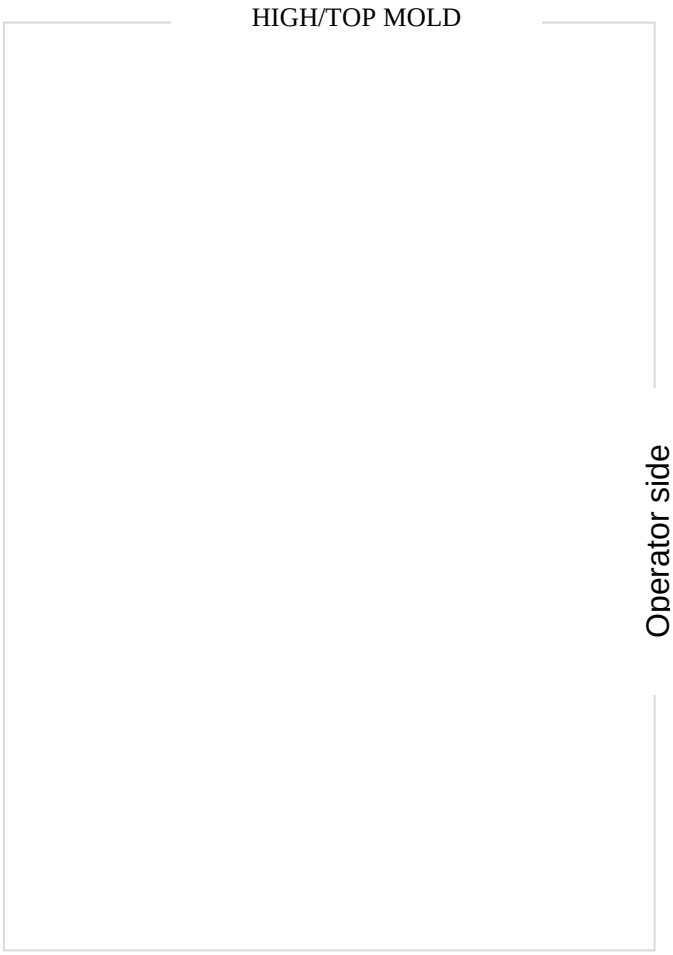
Therefore, select waterproof and thermal high resistance materials.

Use all possible solutions to avoid fortuitous contacts with live parts, and, in any case, realize the workmanlike system, positioning the molds on the mold upper side.

For hot channels and insulated channels resistances choose the wiring shown in annex 6. Insert always thermocouples of insulated type.

When there are many nozzles on the mold give a logical order to the numerical sequence with regard to the mold positioning in the molding machine: looking at the fixed side of the mold,

number it as the first nozzle on the high mold, operator side, then proceed clockwise. The following diagram shows the example of a 16-cavities mold.



Always use heating parts complete with relevant thermocouple

In case of power supply higher than 24V, arrange the grounding through 24-pole multi-pin connector of supplied elements and of the mold as indicated in the annex 6A “Moulds equipotential link”.

3.12 PNEUMATIC CONNECTIONS

The pneumatic circuits outside connections must be made by automatic couplings for PA12 D.8 pipe, fixed by 1/8 gas thread.

3.13 OIL-PRESSURE CONNECTIONS

The oil-pressure circuits outside connections must be made by GEWISS automatic standard couplings reducing to a minimun the quantity of E and U (see point 4.7.5 B).

3.14 MOULDING SURFACES FINISH DEGREE

The manufacture drawing shows the moulding surfaces finish degree.
Such finish degree is settled on the basis of the "normalized finishes table" as follows in annex 35 or, in particular cases, on the basis of commercial finishes, whose code and Supplier's name must be indicated (e.g. photogravure, RA silk finish).

3.15 DIMENSIONING AND TOLERANCES

With regard to plates and screws dimensioning, make reference to Annex 13.

With regard to coupling components, ejector pins and relevant seats dimensioning, make reference to Annex 2.

For the execution tolerances of the all mold components and relative seats in the mold holder apply the dimensional tolerances for mechanical couplings SHAFT/HOLE ISO R.286 h4/H4, for this purpose it is compulsory squaring by grinding all the faces of the inserts after the heat treatment and respecting the tolerance in the nominal design dimensions, parallelism and orthogonality of the planes (tolerance of roundness for the revolving cylinders).

In the case of mechanical coupling of components subject to relative movement, adjust the clearance appropriately to avoid seizure and the presence of burrs, always check after the first sampling for signs of movements to adjust the coupling appropriate in case it is too narrow.

The dimensions have been analyzed with the intention of:

- realizing correct couplings and flows;
- making the further maintenance activities easier;

taking into consideration the dimensional changes to whom commercially available materials are subjected, the real necessities for precision and the current operative modes.

Moreover, when dimensioning we must take into consideration the following indications:

1. The frontal closure should only take place on the hardened planes of the dowels protruding from the plate of 0.1-0.2 mm; If the cavity is obtained from "full", make a plan of sufficient width (min 30 mm) around the print cavity.
   Verify, by calculation, minting possible phenomenon due to a wrong relation between the moulding machine nominal closing force and the area on which it acts (that is the closing area).
2. for bending, traction, torsion stressed parts structural calculations, use the safety charges for floating stresses tipical of used metal materials; in case of critical applications make use of a system of calculation with finished elements.

The mold must faithfully respect the project and the relative tolerances, any modifications of the same implemented in the assembly and / or development phase must be applied to the project.

The mold manufacturer must be equipped with suitable measuring instruments such as CMM and / or digital altimeters certified as measuring instruments in order to guarantee compliance with the required tolerances.

3.16 MATERIALS AND HEAT TREATMENTS

The Annex 31 contains a table with the essential references of standard materials for the molds construction.

The following parameters have been valued for the steels charachterization:

1. chemical composition certificate
2. annealed grain structure (micrography x 500)
3. supplying state hardness
4. hardnesses and structures obtainable by CCR and TTT diagrams
5. steel inclusion properties in conformity with ASTM E 45 D method (or in alternative A method)
6. belonging Werkstoff number
7. tensile strenght
8. yield strenght
9. Charpy strenght KCV method in J/cm²
10. thermal conductivity at 20-200-400° C
11. coefficient of linear expansion from 20 to 200 ° C
12. saline smoke corrosion strenght (GEWISS test only for stainless steels)
13. tempering hardness/strenght/temperature diagrams
14. advised thermal cycles also on the basis of further treatments (PVD, Nitridings, etc.)

Further considerations:

a) In case of heat treatments (H.T. and S.T.T.) and TIG/Laser welding in the cavity, use exclusively materials and methodologies mentioned by relevant steel supplier, use qualified firms that carry out a vacuum heat treatments.
b) In order to trace the original supply, in case of possible problems "post-processing", mention in the bill of materials the freight bill references or the casting number.
c) In case of big dimensions cavities obtained directly by mold holder plate in steel blocks (pre-treated or to be treated), make always a specific ultrasounds analysis to identify possible internal faults.
d) The guarantee of the steel compatibility of other trademarks, different from the steels mentioned in the table, is at the mold Supplier's charge who will have to specify all the above-mentioned characteristics.
e) The materials and the treatments effected by other new Suppliers have to be verified by suitable tests (Charpy tests).

Heat treatments greatly affect the performance of steels, a poorly performed treatment greatly worsens the life of the component, taking particular care of heat treatments, choosing suitable suppliers.

It is obligatory the stress relieving by heat treatment at the end of all the processes on all the dies of the mold.

It is obligatory to report the hardness verified with the Rokcwell hardness tester and the tempering temperature applied during the heat treatment on the drawing cartoche of the 2D drawing of the single component!

The mold manufacturer must be equipped with a Rockwell hardness tester and must check the hardness of all the inserts

3.17 PROJECT

The design of the mold must be made entirely with CAD 3D, different ways are possible only if indicated in the specific specifications.

The project consists of:
A) 3D CAD Files
B) CAD Files 2D
C) Bill Off Materials of the mold
D) Photo of the two half parts of the mold (in JPEG format)
E) Nozzle numbering scheme, in the case of hot-runners devices (see chapter 4.10)

3D CAD files

Files must be provided in native format and using one of the following 3D formats listed in order of preference:

1. CatProduct/CatPart version CATIA 5R14 or lower
2. STEP (check with Engeneering Dep. conversion settings for proper import into CATIA).

Are requested :

1. Semi-finish product mathematics obtained by subtracting the inserts (male or female)
2. Global project
3. Components
4. Especially complex electrodes, complete with support or easily repositionable.

Each position must be represented by a file.

N.B. : The hot chamber injection systems are part of the project even though purchased, the approved suppliers provide their 3D CAD systems so they should be included in the global project.

2D CAD File

Starting from 3D solids, are to be realised all the needed 2D technical drawings for the construction of individual components. 2D CAD files can be of a simplified type, that is, with a minimum representation but in any case with indications of tolerances.

The files must be submitted in one of the following formats, listed in order of preference:

1.- CatDrawing version CATIA 5R26 or lower
2.- DXF version AUTOCAD 2006 or lower
3.- DWG version AUTOCAD 2006 or lower

General rules of 2D drawing

1. must comply with the relevant ISO standards;
2. the global project must state the location of each component (including normalized);
3. the drawings must not exceed the UNI AO standard size; in case of global mold, the A1 x 3 lengthened size (841 x 1783) is accepted;
4. each drawing must represents only one component; only in case of drawings of the extraction group is allowed more than one set (f.e.: spacers, clamping plates and supports);
5. if a component differs from another only for the symmetry or for a small detail is required a dedicated drawing; are not allowed indications such as 1 piece right and 1 piece left with the differences highlighted;
6. In the case of all components that can be made with traditional machines such as ejectors; spinets; simple diameters (all those components for which 3D is superfluous); draw all the dimensions necessary for the construction.
7. if a normalized component is subjected to working it must be represented by a relevant drawing (for example extractor with particular working on head);
8. the drawing scale must correspond to the plotter format;
9. all the drawings must contain the drawing GEWISS table duly filled (see Annex 7) or a neutral one (without logo) conteining all the indications of a drawing GEWISS table, that is available in DXF format;
10. the sheets will be progressively numbered starting from number 1. It is important that the hardness test after the heat treatment and the temperature of the steel to be exposed is found on the cartouche, which is to be taken from the certificate issued by the heat treatment supplier.
11. The hardness check after the heat treatment must be written on the drawing cartoche; the tempering temperature to which the steel was subjected which must be detected by the certificate issued by the person performing the heat treatment;
12. In case of hot runners systems the 2D drawings of the Supplier must be available in electronic format (DXF, DWG, PDF, JPG, TIF).

Drawing table

The following information must be filled in (see Annex 7):

A) Relevant to the mold element;

1. Position (with reference to the global drawing);
2. Quantity (number of pieces to manufacture);

3. Denomination (with reference to the table and to the component);
4. Material;
5. Dimensions;
6. Heat treatment;
7. Tempering temperature
8. Hardness required (after treatment).
9. Hardness detected (after treatment).

B) Relevant to the component to mould:

1. Product name;
2. Manufacture name;
3. Material (of the manufacture);
4. Shrinkage (used);

C) Relevant to the mold:

1. Mold number (first information "drawing n°");
2. Manufacture code (second information "drawing n°.");
3. Seats number (total);
4. Designer;
5. Project date;
6. Table progressive n°;
7. Table total n°;
8. Scale/s.

In case of molds which produce simultaneously or separately more than one component, each component relevant to a single part must be identified by a name which mentions the relevant part (e.g.: in an mold bottom+case, the extraction insert relevant to the case will name "case extraction insert").

GEWISS Logo

Logo is available on request in the following formats:

- 2D CAD format (DXF) and 3D CAD (STEP)

Respect the dimensions ratio in case of enlargements or reductions.

3D and 2D files denomination:

The name of the file should be composed of the following linked information:

1. mold code (f.e.: **20PI0001**)
2. character **"-POS**" (character "-" of the keyboard)
3. position of the component, it's a progressive number from 1 to ..(e.g. **4**)
4. character "-" (character "-" of the keyboard)
5. description in capital letters of the particular defined in the data base (**MATRIX**)
6. file type extension (e.g.: **stp**)

E.g.: file name **20PI0001-POS4-MATRIX.stp**

In the mold data base are automatically defined the names of the file (see Annex 8)

Bill Of Materials of MOLD

The list of the mold components must be inserted in the Annex 8. In this file there are some pull-down menu from which to choose the standard descriptions, the file names are obtained automatically. Material and hardness must be specified for the construction components, and the supplier must be specified for the purchase components. The file contains examples and instructions for use. If the mold is equipped with hot chamber all components must be reported individually in the data base and identified with the supplier code (e.g.:nozzle TPN10212 Thermocouple GH789…).

Delivery of the project

The project must be delivered only in electronic format through one of the following supports:

- CDR;
- DVD
- when the project dimensions are less than 10MB it's possible to send it by e-mail to the Gewiss Engineering Department (industrialization@gewiss.com), using WINZIP for the compression;
- other secure online sharing systems (f.e. workspace gewiss, we-transfer, dropbox, etc).

In case of first supply or changes in the cad system in use, Engineering Department works together with the supplier from the mould setting phase to verify the readability of 3D and 2D files in order to get their full use from Gewiss.

3.18 NORMALIZED COMPONENTS

3.18.1 Normalised components from the market

Screws

Use screws with class of minimum resistance 12.9, according to ISO 4762 – 8992.
Use screws indicated in Annex 26; Different screws can be used if specified in the specific specifications.

For the dimensioning of the keeping screws of the dowels take account of the maximum effort in extraction and opening phase (maximum pression in the cavity).
Supposing an effort equal to 1/5 of the force of closing available:

$$\text{Extraction effort} = \frac{\text{Available effort}}{\text{----------}}$$

5

Moulding machine 200 ton
N° of inserts 4

Extraction effort = 2000 KN / 5 = 400 KN
Effort on insert = 400 KN / 4 = 100 KN

We work out the resistant minimal section necessary for every insert (for the screws with resistance class 12.9 $RP_{0,2}$ = 1000 N/mm²).

- Resistant section = 100 kn x 1,3 (coefficient of security) / 1000 N/mm² = 130 mm²

Screws resistant section [mm²]									
M 4	**M 5**	**M 6**	**M 8**	**M 10**	**M 12**	**M 14**	**M 16**	**M 20**	**M 24**
8,78	**14,2**	**20,1**	**36,6**	**58**	**84,3**	**105**	**157**	**245**	**353**

The seal can be guaranteed by :
4 screws M8 (4x36,6 = 146,4 mm²)
7 screws M6 (7x20,1 = 140,7 mm²)

If there is a risk of breaking appropriately reduce the tension inside to obtain a long-life.

For the screws dimensioning of the extraction plates and the clamping plates/supports make reference to the indications **Q** and **R** in the Annexe 13, these indications can be modified in particular cases after verification of the section.

Guide pins

Use Columns indicated in Annex 21; You can use different columns if required by the specific specifications. It is highlighted the replacement of two diameter columns with columns to a diameter.

Guide bushes

Use guide bushes indicaed in Annex 22; You can use different bushes if required by the specific specifications. The choice of the use of the steel bushes is highlighted. Use Bronze bushes W.NR.2.0975 for cases with fretting problems.

Compression springs

Use the rectangular light springs indicated in Annex 23; You can use springs of a different type if required by the specific specifications. The size of the spring must be sufficient to ensure that the maximum compression is equal to or less than 1/3 of its length.

Hot runners

1. The currently approved GEWISS suppliers are:
   a. MOLD MASTERS (HTTPS://WWW.MILACRON.COM/PRODUCTS/HOT-RUNNER-SYSTEMS/)
   b. THERMOPLAY (HTTP://WWW.THERMOPLAY.IT/IT/HOME)
   c. HUSKY (HTTP://WWW.HUSKY.CO/)
2. All the injection unit (distribution chamber, nozzles, resistors, thermocouples, etc.) must be supplied by the same manufacturer and must be made of stainless steel.
3. Give priority to systems with screwed nozzles and / or the ability to remove the entire system without disassembling it.
4. In case of nozzles with valve gate, give priority to the use of hydraulic ones. However, engage *ENGINEERING DEPT.* and/or the supplier for choosing the most appropriate nozzle.
5. Use resistors for nozzles and distribution chambers with a voltage of 220 Volt.
6. Use only thermocouples of type "non-ground" (isolate) for temperature control.
7. The part of the injector bush in contact with the injector of the press must be flat (without spherical seat) and have a hardness of at least 50HRC.
8. Mount a plate of insulating material of the thickness of 5 mm between the injection plate and the press plane with compression resistance min. Of about 590N / mm square.
9. The 24-pole multipole connector (male part) must be mounted on the top of the injection plate parallel to the pressed planes and must have ground connection between the mold and the terminal block.
10. Between the multipole connector and the upper surface of the injection plate mount an aluminum spacer, with the following dimensions in mm: 140x45x40 (length x width x height)
11. In case of direct injection into the piece, always provide a sufficiently cooled bushing to restore the injection zone by replacing.
12. The coupling diameter between the dowel and the nozzle tip must be finished by grinding.
13. In the mold design phase, the supplier must arrange a meeting with the hot runner provider and a Gewiss technician to evaluate and share the appropriate technical solutions.
14. Use the ORing in VITON.

Ejectors

Use the ejectors indicated in Annexes 16-17-18-19-20; Special or different types of ejectors may be used if specified by the specific specifications.

NB: The seats of the ejectors in the insert must execute by wire-cut erosion (EDM) with a roughness not exceeding to Ra 0.8 µm

OR gaskets

See section 4.9.5 of this document.

3.18.2 Dater and material recycling

You can see the typical application of interchangeable inserts for introduction of daters/materials recycling at fig. 28.

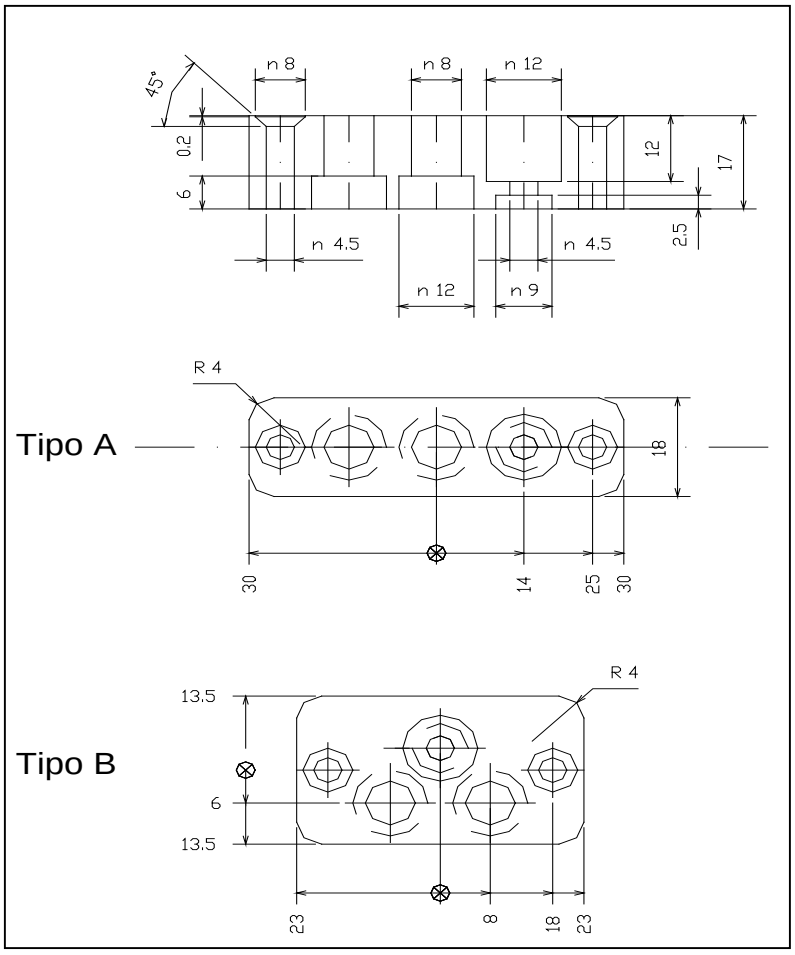


Fig. 28 – INTERCHANGEABLE INSERT FOR DATERS/MATERIALS RECYCLING

3.18.3 Written inserts

The written inserts must be executed as far as possible with a drop in the plastic so that it is possible to affix a label on the molded piece if necessary.
Adopt a system so that the inserts can be replaced without removing the mold from the press.
Adopt a system so that the insert can not be inserted incorrectly.

<u>Always buil at least two complete set of neutral insert without writing.</u>

4. NORMALIZATION FOR HIGH PRODUCTIVITY MOLD

Let's summarize below some general indications, to be added to standard standardization, for the production of "high-volume" molds.

The peculiarities of these molds are the high performance required both in terms of mold quality and mold performance, the following must be observed:

1. Moldbase entirely made of stainless steel, high precision of the insert seats and centerings.
2. Sizing of the mold for the minimum flexion.
3. Stainless steel cavities (if there are no specific contraindications).
4. Stainless steel auxiliary dowels.
5. Breakdowns high cavities to: optimize exhaust gas, easily replace areas at risk of rupture, of favoring grinding machining of the closures.
6. Insert hardened platelets under the slides.
7. Interchangeable dowels for injection points.
8. Ejectors coated with DLC.
9. Application of anti-wear coatings on the movements and centering systems
10. Adequate conditioning circuits: if necessary, use the conformate circuits (SLS technology).
11. Stainless steel screws.
12. Fix conditioning circuit connections, define serial connections avoiding external jumper.
13. Provide spare parts kit for critical or wear parts.
14. Carefully evaluate the choice of steels using in the case of steels obtained from powder metallurgy.
15. The work performed must be verified by properly trained personnel with certified CMM contact measuring machine-digital altimeters, in the case of closures along uneven surfaces is obligatory a dimensional verification with CMM or Optical Scan 3D machine.

5. NORMALIZATION HIGH PRECISION MOLD

Let's summarize below some general indications, to be added to standard standardization, for the production of "high precision" molds. Unless otherwise specified, standard normalization applies.

1. Mold holder entirely in stainless steel, high precision of the slots and of the columns
2. High precision in the execution of the moldbase.
3. Breakdowns high cavities to favoring grinding machining of the closures.
4. If necessary, reposition inserts to achieve and adjust the important closures
5. Take special care of the choice of steels.
6. Ejectors coated in DLC

7. The work performed must be verified by properly trained personnel with certified CMM contact measuring machine-digital altimeters, in the case of closures along uneven surfaces is compulsy a dimensional verification with CMM or Optical Scan 3D machine.

6. NORMALIZATION AESTHETIC PRODUCT MOLD

Let's summarize below some general indications, to be added to standard standardization, for making molds with "high aesthetic artifact".

1. Sizing of the mold for the minimum bending.
2. High precision in the execution of the moldbase.
3. Breakdowns high cavities to: optimize exhaust gas, easily replace areas at risk of rupture, of favoring grinding machining of the closures.
4. Use suitable systems to evacuate the gas.
5. If CAE analysis highlights critical joints in the esthetic zone, predicting the vacuum molding to limit visibility.
6. Care of the finishes of the aesthetic parts indicated on the design of the product.
7. Take special care of the choice of steels.
8. The work performed must be verified by properly trained personnel with certified CMM contact measuring machine-digital altimeters, in the case of closures along uneven surfaces is compulsy a dimensional verification with CMM Optical Scan 3D machine.

7. NORMALIZATION FOR OPTICAL MOLD

Let's summarize below some general indications, to be added to standard standardization, for the production of "optics" molds.

1. Use only stainless steel: the TYRAX or STAVAX or MIRRAX (UDDEHOLM) or M333 (BOHLER)
2. High precision in the execution of the moldbase that must be made of stainless steel RAMAX (1.2083 / 1.2085).
3. The sliding parts (extractors, sliders, etc.) should not be lubricated but coated with antifriction treatment, typically run at low temperature DLC.
4. For multi-cavities molds, place the cavities in such a way as to prevent the material from falling from the injection bush into the molded part.

7.1 CAVITIES INSERT

The cavities dowels must be made using steels suitable for the optical polishing and must have a good corrosion resistance. In the specific specification, the steel to be used will be indicated.

The breakdown of the various inserts must be made taking into account the following priorities:

1. optical finishing
2. conditioning
3. conversions

Create a fixing that prevents the involuntary disassembly of the optical parts during the mold maintenance phase.

All conversion inserts/half-mould regarding the optical parts must be provided attached to the inside of appropriate closed boxes. The optical surfaces must be protected by suitable and sturdy polyethylene covers (included in the supply) fixed to the inserts / half-mould by means of screws.

Optical surfaces must be measured with a contact measuring machine CMM or optical scan 3D machine before polishing to certify the correspondence with the project, take over the difference between the theoretical profile and the one made by measuring many points of said surfaces must be measured (indicatively a grid of points with distance between the points maximum 2 mm), lens mold surface tolerance $\binom{+0.030}{-0.000}$ .The report on this dimensional check must be provided with the project of the mold.

7.2 FINISHING OPTICAL INSERTS

In case of the lens, It's possibile that the equpment specification require the polishing of the optical surfaces using the CNC Diamond Turning technology on the previously coated Nickel Layers.

The inserts should not be protected with any product and should be handled with care to wear disposable latex gloves. It should not be touched with the bare hands with the optic polishing area.

For any cleaning use undenatured ethanol and dry with compressed air.

7.3 TEMPETATURE CONTROL

Limit to the minimum the number of connections and place them on the lower part of the mold.

Use only OR in Viton.

Insert a thermocouple on the injection dowel and one on the extraction dowel as close to the printer cavity as possible. For the thermocouple seat refer to § 4.9.10

Mount insulating plates in both fixed and mobile part.

For details not refer to § 4.9

8. NORMALIZATION FOR ECONOMIC MOLD

Summarized below are some general guidelines for the realization of the mold type "economic".

1. Minimize the dimensions of the tool, assuring anyway the mechanical resistance during the transformation processes.
2. For very small manufactures, of medium/high quality, the moulding insert has to be hardened and its dimensions have to allow the lining up without inserts holder plates.
3. Split up as much as possible the moulding inserts.
4. Do not build in the quick clutch fittings for the conditioning if the maximum overall dimensions fall within the space for the lining up. Anyway use only the two vertical walls.
5. Where possible because of the mold dimensions, limit the lining up of the mold and the extraction unit (for ex. only in two points).
6. In the inclined pins movements use spheric dowels to avoid the cheek rebound
7. Use only compression springs for the return of the extraction without any controlling device (microswitch).
8. Use the centering inserts only when necessary according to the typology of the semi-finished product.
9. Do not line up the supports by making the execution easy (for ex. round taps).
10. As far as possible use a standard purchase mold holder, it is possible not to insert the springs for the ejection device return; AGS device stroke; fixed side ejection device return; microcontroller ejection device position (in any case, always check if there are any constraints or difficulties in adopting these simplifications based on the press fleet available to the subcontractor production).
11. Simplify the project by dimensioning everything on the drawing.
12. It is possible not to embed the mold tags in the plates and spacers.

9. NORMALIZATION FOR SUPER ECONOMIC MOLD

Summarized below are some general guidelines for the implementation of type "super economic" mold. Unless otherwise specified, standard normalization applies.

- Generally consist of mold inserts to be inserted into an existing standard moldbase.

10. NORMALIZATION OF PILOT MOLD

Let's summarize below some general guidelines for the implementation of a "pilot" type mold.

- It must be designed considering the production of a limited number of pieces.
- It is possible to get the imprints from full on prehardened steels.
- Automatic molding is not binding.

11. NORMALIZATION OF SPECIAL MOLD

These are special molds not covered by this specification with "ad hoc" indications given on the specific specifications.

12. BABY PRESS MOLD

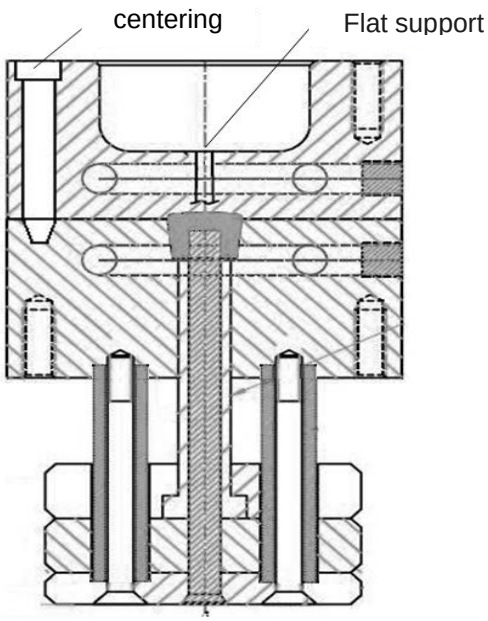
The peculiarities of these molds are the very small dimensions and the absence of a moldbase because it is made in the press planes.

In the specific specifications, the "Stamping Center" with the word "Baby" will be indicated.

This type of mold can be constructed according to standard or economic logic as a function of the expected saturation.

Measures to be observed

1. Insert a hardened and precise guide to the extraction table, if necessary, provided hardened guide spacers;
2. In case where there are ejector sleeve to be supported or a precise dimension to be kept in the extractors (for example, when defining the length of the piece), provide the bottom plate mold by dimensioning the screws so that the push It does not create excessive deformations (do not rely on the press space extraction support because it is not constant between press and press);
3. Insert a conical centering system. Do not insert cylindrical centerers to avoid closing problems as the pressed planes are never perfectly parallel. Make sure that the positioning of the centering system is not entrusted to the friction force;
4. the support part of the nozzle must be flat;



5. Give priority to the use of steels with good corrosion resistance except for specific specifications;
6. For standard "baby" molds, apply the same criteria as other molds. Do not overlook material quality and treatments, precision extraction system and centering;
7. For complex shapes break down areas at risk of breakages or foresee possible repair;
8. For economical molds it is possible to agree simplified solutions;
9. For the particularity of these molds are asked to specify in phase of the offer not indicated settings in specific terms (parting line, movements, closures, etc.);
10. Engrave the mold code directly on the extraction and injection dowels, side press operator.

Together the specific terms will be given the characteristics of the target press for mold sizing.

13. MOLD SAMPLING

This chapter gives instructions:

1. to prepare, execute and verify the mold sampling;
2. to verify the mold conditions at the end of the sampling.

These instructions must be carefully respected:

1. to obtain the mold approval;
2. to obtain the manufacture dimensional approval;
3. to guarantee the respect of the supply terms (to deliver the mold in optimum conditions).

13.1 NOTICE

GEWISS will send the necessary materials in sufficient quantities for the mold sampling and the production of the scheduled pieces.

The *Supplier* must prepare the moulding machine, the mold, the material and possible auxiliary molds for the moulding in optimum conditions, in order to verify the mold in the tipical conditions of production.

13.2 STARTING

Connect the conditioning circuits in order to verify possible losses.

The mold must do, at low speed, 50-100 relevant to: opening, possible auxiliary movements, extraction and closing.

At the end of that run, verify runnings, closings, etc…

Start moulding, enabling the mold to reach "thermal conditions".

Continue in this condition for 30-60 minutes according to the mold type.

In the following table you can find the indicative values relevant to mold temperature and molten, necessary for the optimum preparation of the moulding machine and the mold.

Indicative values of moulding process					
MATERIAL	**Aggressiveness class**	**Molten T °C**	**Molten T (p.injection) ° C**	**T mold (p. extraction) °C**	**Hygroscopic**
ABS	1	230 - 250	70° C	50° C	SI
PA + F.V.	2	270 - 280	70° C	50° C	SI
PA 6 – PA12	1	230 - 250	50° C	50° C	SI
PA 6.6	1	270 - 280	70° C	50° C	SI
PA 6.6 + C.M.	4	270 - 280	70° C	50° C	SI
PBT – PBT + F.V.	2	230 - 250	70° C	70° C	SI
PC	3	270 - 290	90° C (*)	60° C (*)	SI
PC + F.V.	4	270 - 290	90° C	60° C	SI
PE + F.V.	2	180 - 220	40° C	20° C	SI
POM	1	230 - 250	60° C	60° C	NO
PP	1	180 - 240	40° C	20° C	NO
PP+master autoest	3	180 - 240	40° C	20° C	NO
PPO	3	210 - 250	60° C	60° C	SI
PS	1	220 - 250	30° C	30° C	NO
PVC	3	170 - 180	40° C	30° C	NO
PA 6T/XT (Zytel HTN51)	4	320-330	140-150	140-150	SI
PPS (RYTON)	4	310-330	135-150	135-150	SI

(*) In case of the PC with satin finish, mold temperatures rise to 120-140 °C.

The temperatures have been measured during the regular production running.
The materials called “hygroscopic” need for dehumidification treatment before the moulding process.

13.3 EXECUTION AND CONTROL

The sampling must be made in the way and with the run specified in the mold specifications; on that document the number of the pieces to produce is also mentioned.

The pieces must meet the aesthetic and technical requirements of the relevant product class.

The Engineering Department will give the technical support, if requested by the *Supplier*, and will be present during the sampling, if it is considered necessary.

13.4 MOLD QUALITY CERTIFICATION AND CHECK AFTER PRODUCTION

The mold is self-certified by the Supplier by filling in and signing the GW537 form "Mold sampling"; this self-certification is valid providing:

1. the GW537 form corresponds in every part to the mold specifications;
2. the mold produces in conformity with the foreseen timing and modes:
3. the mold is accompanied by updated CAD project drawn up in the expected way;
4. the mold is designed and manufactured in conformity with the indications of these general specifications.

At the end of the sampling, the mold shall be checked by the Supplier, in order to find and remove possible problems.

The Engineering Department will give the approval to the mold only if the check results are positive.

Information about operative critical conditions, components to stock, assembly/disassembly of particular activities, equipping phase, production beginning or end must be mentioned in the "MOLD SAMPLING/PRE-PRODUCTION " form (GW537) for the mold data sheet updating of our SAP system.

13.5 DIMENSIONAL MEASUREMENTS

Pieces valid from an aesthetic point of view and obtained:

1. by mold in thermal production running;
2. in conformity with the foreseen timing and manners;
3. with the required material;

can be subjected to the dimensional measurement.

This measurement can be taken by:

- A. *The Technical Department* by the time specified in the relevant internal procedures;
- B. *The Supplier*, if any agreement on this matter has been taken being offered and / or orders.

Case A: The pieces, whose dimensions meet the required tolerances, will obtain the *dimensional approval* apart from possible modifications necessity occurred in the meantime or necessary to conform the manufacture to the other product components.

Case B: for each moulding cavity of the mold, it is necessary to measure all the dimensions on the drawings. These dimensions have to be written on a form with digital sequence by highlighting any non-conformity. The same digital sequence has to be written on the drawing. These documents has to be delivered with the components as per the specifications.

13.6 MOULD SETUP

This definition refers to all adjustment activities necessary to let the mold produce according to the timing and the manners specified in the mold specifications.

These activities are always at the *Supplier*'s charge, unless they come from the *Engineering Department's* specific requests.

If so, the *Engineering Department* will verify the possibility of respecting the scheduled runs and, if necessary, will modify the Mold Specifications.

We point out that the sampling valid for the self-certification and for the dimensional measurements is always and in any case the sampling obtained respecting the timing and the manners specified in the updated Specifications.

13.7 MOLD MODIFICATIONS

Mold modifications are all dimensional, functional and technological mold changes requested by GEWISS to conform the manufacture, with dimensional approval, to any kind of new order requirements.

These modifications will be quantified in percentage as regards the original order.
The *Supplier* must carry out the modifications within the execution time specified here below (starting from the delivery date of the notes):

% of modification cost on the mold order	Max. Execution Time	Notes
3 %	2 weeks	Cavity modification with or without steel surfacing
5 %	3 weeks	Cavity modification with or without steel surfacing
8 %	4 weeks	Cavity modification with steel surfacing and intervention on extraction
15 %	5 weeks	Cavity modification with steel surfacing and intervention on extraction
20 %	6 weeks	Inserts remaking with intervention on extraction and on water cooling circuit
30 %	8 weeks	Inserts remaking with intervention on extraction and on water cooling circuit

N.B.: Every time the mould wil be modified the relevant project will be updated and sent to Gewiss within the sampling date.

13.8 PREPRODUCTION AND MOLD DELIVERY

If the Supplier was available for the production of the pre-serie of the article, this will be defined and agreed with the *PURCHASE DEPT.* being offered.

GEWISS IS available for possible technical assistance during the pre-production.

The Supplier fills in copy of the GW537 form "Sampling mold" in state “Planned”, where he enters the moulding conditions used.

At the end of the pre-production, or in any case before the mold definitive delivery to GEWISS, the *Supplier* will make a total check of the mold, bringing back the outcome on the "CHECK MOLD WORKSHOP" tab (Annex 33) with any additional notes.

13.9 GW 537 FORM FILLING IN

The instructions written in the GW537 "Sampling mold" form are grouped, by analogy, in main sections. In this way the instructions can be defined and traced through the relevant numeration in the copy of the form given at the end of the paragraph:

1. Form data;
2. Semifinished products manufactured through the mold;
3. Raw materials used by the mold;
4. Summary data;
5. Sampling technical data;
6. Notes;
7. Samplings delivery;
8. Approval.

To fill in section 1 please follow the instructions given for section 1 in the specifications for the mold manufacturing GW543, except for:

- State It indicates the state of the sampling (not to be filled in)
- *Exec. Date*
- *Executor*

The semifinished products that the mold can produce are listed in section 2.

The row material used by the mold to produce the sampling is listed in section 3.

Section 4 automatically reproduces the master data of the mold.

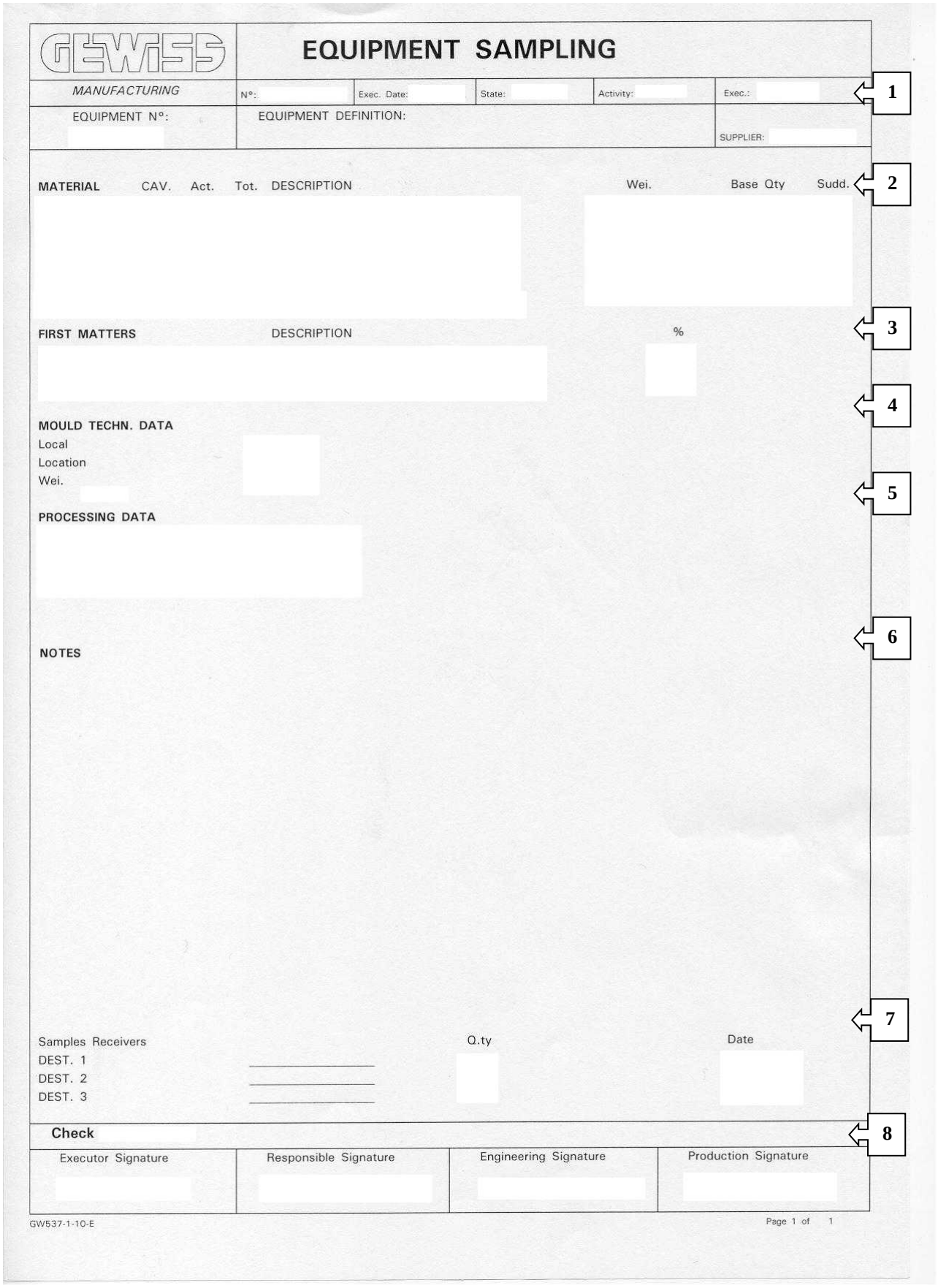
The data to be written in section 5 are those found on the press working at full capacity.

The observations are reported in section 6. They can be filled in whether by sampling applicant or sampling executor. In case of sampling with approval result “Yes, with reservation”, the applicant must fill in the observation field with caption “Open questions”: by specifying the actions to carry out to drop the reservation.

Section 7 concerning the delivery of samples.

Section 8 indicates the outcome of the sampling activity to which the mold is subject.

Le caselle della sezione 9 riportano le firme dell’esecutore e del responsabile.



GEWISS

EQUIPMENT SAMPLING

MANUFACTURING	N°:	Exec. Date:	State:	Activity:	Exec.:	1
EQUIPMENT N°:	EQUIPMENT DEFINITION:				SUPPLIER:	

MATERIAL	CAV.	Act.	Tot.	DESCRIPTION	Wei.	Base Qty	Sudd.	2

FIRST MATTERS	DESCRIPTION	%	3

4

MOULD TECHN. DATA
Local
Location
Wei.

5

PROCESSING DATA

6

NOTES

7

Samples Receivers		Q.ty	Date
DEST. 1			
DEST. 2			
DEST. 3			

Check				8
Executor Signature	Responsible Signature	Engineering Signature	Production Signature	

GW537-1-10-E

Page 1 of 1

N.B.: THE PRESENT FORM IS ATTACHED LIKE EXAMPLE