DEUTSCHES INSTITUT FÜR BAUTECHNIK

Establishment of the public law

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General construction inspected approval

(Translation from the german original version.
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Approval number:	Z-21.2-177
Applicant:	Mungo Befestigungstechnik AG Bornfeldstrasse 2 CH-4603 Olten
Object of approval:	MUNGO Nylon Frame Plug with corresponding special screws for the fixing of facings (façades, curtain walls)
Term of validity until:	30th June 2007

The above mentioned object of approval is herewith generally construction inspected approved. This general construction inspected approval does include thirteen (13) pages and five (5) enclosures.

This General construction inspected approval does substitute the general construction inspected approval dd. 23th March 2001. The object of approval had been approved on 28th June 1982 for the first time.

I. GENERAL REGULATIONS

1. This general construction inspected approval gives evidence of respectively the usability and the applicability of the object of approval accordingly to the national building regulations.

2. The general construction inspected approval does not substitute any ratification, consent and certificate which may be prescribed by law for the realization of building projects.

3. The general construction inspected approval is granted without prejudice to third party rights, in particular to private rights.

4. The manufacturer and the distributer of the object of approval have to put copies of the general construction inspected approval at the disposal of the user of the object of approval, without prejudice to further regulations of the „Special regulations“. They further have to point out to the user, that the general construction inspected approval has to be at the place of use. If required, copies of the general construction inspected approval have to be put at the disposal of the concerned authorities.

5. The general construction inspected approval may only be wholly reproduced. The consentment of the Institut für Bautechnik is necessary for any publication of the general construction inspected approval in an abbreviated form. Wording and drawings of pamphlets or brochures may not contradict the general construction inspected approval. All translations of the general construction inspected approval must include the following indication: „This translation from the german original version has not been certified by Deutsches Institut für Bautechnik.“

6. The general construction inspected approval is removably granted. The regulations of the general construction inspected approval may subsequently be completed or modified, especially in case of new engineering achievements.

II. SPECIAL REGULATIONS

1 Object of approval and field of application

1.1 Object of approval

The MUNGO Nylon Frame Plug (type MBR 8, MBR 10 and type MB 10) is composed of a plug made of polyamide and a corresponding special screw made of electrogalvanized or stainless steel. The plugs theethed expansion zone is cut with wings.
While screwing in the screw into the plug body the plug does expand.

See on enclosure 1 the figure of a built-in plug.

1.2 Field of application

The plug may only be used as a multiple fixing for the fixing of facings (façades, curtain walls). The façades have to be fixed such as a load transmission to a further neighbouring fixing point is possible in case of failure of one of the fixing points. A fixing point can either consist of one single or of several plugs.

The plug may be used for the fixing into concrete and into brick walls. Table 3.1, paragraph 3.1.1 shows the admissible plug types for the different fixing grounds.

The plug may also be used for the fixing of heat-insulation-compound systems which have been approved according to the general construction inspected approval if the application of these plug types is regulated in these approvals, too.

The plug with collar (head) may also be used for the fixing of supporting rails made of PVC or aluminium for the fixing of heat-insulation-compound systems which have been approved according to the general construction inspected approval if the application of these plug types is regulated in these approvals, too.

The plug of type MBR may also be used for the fixing of wire-wound-armature according to DIN 1053-1:1996-11, paragraph 8.4.3.1 e).

The screw made of stainless steel may also be used in the open air as well as at industrial atmosphere and near by the sea (General construction inspected approval No. Z-30.3-6 for “building parts and connecting parts made of stainless steels”, table 1, corrosion-resistance class (value) III).

The galvanized screw with a minimum layer of 5 μm may also be used in the open air as well as at industrial atmosphere and near by the sea if after a careful fixing of the fastener, the area of the screw head is protected against humidity in order to avoid any entering of humidity into to the plugs’ shank. There are several possibilities for doing that, such as for instance a suitable coat of painting on to the whole screw head as well as the intersection of the screw- and plugs’ shank or attaching of end caps made of plastic. The special screw has to be made of stainless steel.

2 Instructions for the building product

2.1 Characteristic features and composition

With its dimensions and raw material parameters the plug has to correspond to the indications herewith enclosed.

The raw material parameters, dimensions and tolerances of the plug which are not mentioned in this general construction inspected approval have to correspond to the indications deposed by Deutsches Institut für Bautechnik, by the certificating and the external surveillance place.

The general construction inspected approval No. Z-30.3-6 for “building parts and connecting parts made of stainless steels” is additionally valid for the screw made of stainless steel. According to this approval the manufacturer has to deliver the proof of conformity of the starting material of the screw made of stainless steel by the means of a certificate of conformity (ZÜ) and an inspection certificate 3.1.B according to DIN EN 10 204: 1995-08.

The raw material and the mechanical parameters of the starting material of the screw made of galvanized steel have to be proved by the means of a work inspection certificate (manufacturer inspection certificate) 2.3 according to DIN EN 10 204:1995-08.

The raw material and material parameters of the starting material of the plug have to be proved by the means of a work inspection certificate (manufacturer inspection certificate) 2.3 according to DIN EN 10 204:1995-08.

2.2 Packaging, keeping in stock and marking

2.2.1 Packaging, keeping in stock

The plug may only be supplied as a fixing unit.

The plug has to be kept in stock on normal climatic conditions. Before being used it may not be uncommonly dried or frozen.

2.2.2 Marking

The manufacturer has to mark packaging, packing list and delivery note of the plug with the conformity mark (Ü-Zeichen) according to the regulations of conformity marks of the different countries. Furthermore, the works mark, the approval number and the plugs’ whole designation have to be declared on the packaging.

The marking may only take place if all requirements according to paragraph 2.3 are fulfilled.

The plugs marking happens accordingly to its type, the nominal drilling diameter which fits the plugs’ outside diameter in mm (plug dimension) and the plug length in mm, as for instance MBR 8/120.

The MB 10 plug with cylindrical collar can be identified by the letter marking “K” ex. MBK 10/100.

Each plug has to be marked with the works mark, the plugs type, the plug dimension and the plug length according to enclosure 2, by the type of the plug and by the plug dimension. The required minimum usable length has to be engraved, too.

The screws have to be marked according to enclosure 2.

The special screws have to be marked according to enclosure 2 in a way that the required thread reach can be verified.

2.3. Accordance proof

2.3.1 Generalities

The confirmation of the accordance of the plug with the regulations of the present general construction inspected approval has to take place for each manufacturer with an accordance certificate on the base of an own production control and regular third party control including a first test of the plug according to the controlling dimension of the following regulations.

The manufacturer of the plug has to engage a competent certificate office as well as a competent inspectorate for the granting of the accordance certificate and for the third party control including the corresponding product tests.
The certificate office has to deliver a copy for information of the granted accordance certificate to the Deutsche Institut für Bautechnik.
Furthermore the Deutsche Institut für Bautechnik needs to get a copy for information of the first test report.

2.3.2 Production control proper to the factory

Each work (factory) has to install and execute its own production control. An own production control means the permanent survey of the production by the manufacturer which does guarantee that the produced building items do correspond to the regulations of this general construction inspected approval.
The own production control has to include at least the hereafter mentioned measures.
Description and examination of the starting material and the component parts:

a.) Screw

- The proof of conformity and the inspection certificates required according to paragraph 2.1 have to be verified as to their integrity and exactitude to what the starting raw materials are concerned. The mechanical strength properties (steel grade) have to correspond to the table 1, enclosure 3.

- Dimensions and characteristic features of any vendor part have to be tested by the incoming inspection. They have furthermore to be proved by the means of an inspection certificate 3.1.B according to DIN EN 10 204:1995-08, even in case that the supplier should have issued certificates about raw material tests.

b.) Plug body

- The proof of conformity and the inspection certificates required according to paragraph 2.1 have to be verified as to their integrity and exactitude to what the starting raw materials are concerned.
- Twice a year the following qualities of the granulated polyamide have to be determined:
  - Density (Spritzling) according to ISO 1183
  - Volume flow rate (=Volumendurchfluss) (MVR) according to DIN EN ISO 1133 on measurement conditions according to DIN EN ISO 1874-2,
  - DSC- curve according to ISO 3146, method C, heating-up rate 20° C/min. on the second heating-up.

Control and tests which have to be executed during the production (plug body):

- Engineering data of the most important machine adjusting data

The injection process has to be inspected on each controlling step which is several times daily.

- Dimensional inspection of the tools' main dimensions (inside and outside diameter, total length, cut length and core box) on each fixing of the tool into the moulding press.
- Control of all dimensions on the drawing after each modification or new production a tool.

Proofs and tests of the achieved building product which have to be executed respectively at least on three samples each plug dimension and each 10'000 produced plugs or once each production week:

- Determination of the dimensions of all component parts.
- Determination of the thickness of the galvanizing layer respectively according to or by taking pattern from DIN EN ISO 4042 by the means of a measurement instrument of the layer thickness.
- Determination of the mechanical characteristic features of the screws' raw material (elasticity of elongation, apparent limit of elasticity and elongation at rupture).
- If there is no conditioning (moistening) after production of the plug made of ultramide B3S, the plugs may be supplied only five weeks after production.
- Verification of the correctly executed assembling.

The results of the own production control have to be recorded and evaluated. The records have to contain at least the following indications:
- Designation of the building product, of the raw material and of the component parts
- Kind of control or test
- Date of production and test of the building product and of the raw material or of the component parts
- Result of the control and tests and if applicable comparison with the requirements
- Signature of the responsible for the own production control.

The records have to be kept at least five years. They have to be put before the surveillance office engaged for the third party control. If so requested, they have to be put before the Deutsche Institut für Bautechnik and the responsible highest building authority, too.

If the test results are unsatisfactory the manufacturer has to immediately take the necessary measures in order to abolish the lack. The building products which do not correspond to the requirements have to be handled in order to avoid any confusion with the good product. After abolishment of the lack the test has to be immediately repeated - if technically possible and if required - for the support of the lack abolishment.

2.3.3 Third party control

In each manufacturing work the own production control has to be regularly - or at least twice a year - tested by a third party control.

Within the scope of the third party control a first test of the plugs has to be executed. Also, a random sampling for a spot check has to take place. The sampling and their tests is the duty of the competent surveillance office.

The third party control has to be executed as follows at least on three samples of each plug dimension:
- Determination of the dimensions of all component parts.
- Determination of the mechanical parameters of the plugs' raw material such as apparent limit of elasticity, elasticity of elongation and elongation at rupture. The steel grades have to correspond to the table 1, enclosure 3.
- Determination of the thickness of the galvanizing layer respectively according to or by taking pattern from DIN EN ISO 4042 by the means of a measurement instrument of the layer thickness.
- Verification of the volume flow rate and the DSC measurements as well as the records of the machine data conditions. If it does result from it a possibly inexpert handling (working), micropolariscopical tests in the scope of the third party control have to be executed.
- Verification of the fixed imprints (markings)

The results of the certificating and of the third party control have to be kept at least five years. If so requested, they have to be put before the Deutsche Institut für Bautechnik and the responsible highest building authority by the respectively certificate office or by the surveillance office.

3 Regulations for the draft and for the dimensioning

3.1 Draft

3.1.1 Generalities

The fixings have to be planed by an engineer. Testable calculations and constructional drawings have to be executed by considering the loads to fix, part dimension and tolerances. The screws' length has to be chosed so that the screws' point does penetrate the plug body by 5 mm.

The following table 3.1 shows the admissible fixing ground for each plug type.

Table 3.1 Fixing ground and admissible plug types

	Fixing ground [1]		**admissible plug types**
1	normal concrete B15 according to DIN 1045 [2]		MBR 8, MBR 10
2	solid brick according to DIN 105 [2]	Mz	MBR 8, MBR 10
3	sand-lime full bricks according to DIN 106 [2]	KS	MBR 8, MBR 10
4	sand-lime perforated bricks according to DIN 106	KSL	MB 10
5	vertically perforated bricks according to DIN 105	Hlz	MB 10
6	hollow block made of breeze concrete according to DIN 18 151	Hbl	MB 10
7	full bricks and full blocks made of breeze concrete according to DIN 18 152	V/Vbl	MB 10
8	brick made of concrete acc. DIN 18 153 full blocks / full bricks	Vbn/Vn	MBR 8, MBR 10
	hollow blocks	Hbn	MB 10
9	granulated slag brick according to DIN 398		MB 10

1) For brickwork walls the mortar compression resistance has to correspond at least to the requirements of the normal mortar of the mortar group II, for dünnbett- or light mortar according to DIN 1053-:1996-11, enclosure A.3.

2) See paragraph 3.1.2 for the fixing of wire-wound-armature.

3.1.2 Fixing of wire-wound-armature

For the fixing of the plug dimensions MBR 8 and MBR 10 into normal concrete, full brick and sand-lime full brick it has been proved – while observing the minimum grade class – that the fixing according to DIN 1053-1:1996-11, paragraph 8.4.3.1 e) takes a minimum load of 1 kN per wire-wound-armature and every 1,0 mm penetration.

3.1.3 Fixing of heat-insulation-compound systems

The proof of stability for the heat-insulation-compound systems including the load sectioning is not subject of this general construction inspected approval.

3.2 Dimensioning

3.2.1 Generalities

The fixings have to be dimensioned by an engineer. The proof of the direct local force introduction into the fixing ground is given.

The transmission of the loads to be fixed in the building item has to be proved.

A bending load of the plug may only be neglected if the following conditions are respected:

- The building element which has to be fixed must be made of metal. It has to be tightly fixed to the fixing ground, without any intermediate layer.
- With its whole dimension the connecting part has to sit close to the plug.
- The through hole in the fixing element may not exceed the values on list 3, enclosure 3.

Additional loads which may result - in the plug, in the building element to be fixed or in the building ground to which the plug is fixed - from changed conditions (temperature changes as for instance) have to be considered.

The construction which has to be fixed should allow a dislocation of the anchoring entry in case of a faulty drilled hole.

Plaster, gravel layers, curtain walls or levelling/equalizing layers are not considered as load-bearing and have therefore to be neglected for the determination of the setting depth.

If there are flatness defects of the fixing ground a possible lever arm enlargement has to be considered for the application of a force.

3.2.2 Fire protection

The plug may be used for the fixing of facings without any restriction since corresponding trials have furnished the proof that the expansion zone of the plug body remains satisfactorily (at least during 90 minutes) resistant to fire in the fixing ground.

Fixing of heat-insulation-compound systems: please see indications given in the respective general construction inspected approvals.

3.2.3 Admissible loads (Pull-out values)

3.2.3.1 Generalities

The admissible loads apply to the kinds of loading centrical tension, cross loading and oblique tension on each angle. A permanently working tension load (as for instance as a result of the dead load) is only admissible as oblique tension. The oblique tension load has to form at least an angle of 10° with the plugs' axis.

3.2.3.2 Admissible loads (values according to the respective table)

3.2.3.2.1 Fixing into concrete and full brick work walls

The admissible loads of the plug type MBR for fixings into concrete are indicated on table 4, enclosure 4, and for fixings into full bricks and sand-lime full blocks on table 6, enclosure 5. The admissible load values are only valid for the indicated grade classes of the respective fixing ground. The setting depth values according to table 3, enclosure 3 may not fall short of.

If the test of the fixing ground shows that it is question of respectively unpunched full bricks or sand-lime full blocks, the admissible load (pull-out value) according to table 6, enclosure 5 for the plug type MBR 8 may be increased to 0,5 kN and for the plug type MBR 10 it may be increased to 0,8 kN.

In case that the grade class of the fixing ground is lower than the value indicated on table 6, enclosure 5, please consider paragraph 3.2.3.3:

the admissible pull-out value of the plug type MBR has to be determined by the means of trials on the building, according to paragraph 4.4.

3.2.3.2.2 Fixing into brick work walls made of perforated bricks

The admissible pull-out value of the plug type MB 10 for the fixing into brick work walls made of hollow bricks according to the admissible types of brick of table 3.1, paragraph 3.1.1, have to be determined on principle by the means of trials on the building according to paragraph 4.4, all considering the respective drilling method. The admissible load is only valid for the chosed drilling method.
For the fixing of the plug type MB 10 into brick work walls made of hollow bricks the minimum setting depth indicated according to table 3, enclosure 3, has to be observed. This setting depth may only be higher in case that the impact of the increased setting depth on the admissible load has been tested by the means of trials on the building according to paragraph 4.4 and all observing the respective tolerances. The indications according to paragraph 3.2.4 have to be observed for fixings into butt joints.

3.2.3.3 Admissible load determined with trials on the building
For fixings into brick work walls made of:
bricks according to DIN 105,
sand-lime bricks to DIN 106,
granulated slag bricks to DIN 398,
hollow blocks made of aerated (breeze) concrete to DIN 18 151,
full bricks and full blocks made of aerated (breeze) concrete to DIN 18 152 and
bricks made of concrete to DIN 18 153
the admissible load of the admissible plug type according to table 3.1, paragraph 3.1.1 may also be determined, irrespectively of the grade class of the fixing ground, by the means of trials on the building according to paragraph 4.4.
The determined admissible load does apply to the kinds of loads axial, tension and shear load under every angle (restrictions see paragraph 3.2.3.1).
The admissible loads for the following kinds of bricks may not exceed the values mentioned hereafter:

Plug dimension	8 mm	10 mm
Bricks to DIN 398, 18 151, 18 152 or 18 153	0,25 kN	0,5 kN
Bricks to DIN 106	0,25 kN	0,6 kN
Bricks to DIN 105	0,25 kN	0,6 kN

These maximum values do also apply to the plug type MB 10.
For the fixing into butt joints see indications according to paragraph 3.2.4.

3.2.4 Fixing into masonry or brickwork
For the anchoring into masonry or brickwork the plug may not be set into butt joints. The distance of the plugs to the mortar butt joints has to be at least 3 cm.
If the location/distance of the plugs to the butt joints cannot be indicated (as for instance because of an existing wall plaster or a heat insulation system) or in case that the masonry cannot be determined the admissible load has to be halved if the transmission of the loads to at least two neighbouring fixing points is not possible.

3.2.5 Mounting parameters, plug distances and part dimensions
The mounting parameters and the necessary axial and edge distances as well as the minimum part dimensions are indicated on enclosures 3 to 5. As for the definition of the dimensions please see enclosures 2 and 4.

3.2.6 Bending load

3.2.7 The admissible bending moments of the plug - in dependence on the tension force - are indicated on table 5 of enclosure 4. The calculated fixing point is situated once the nominal diameter of the screw behind the surface of the fixing ground.

For facings with changeable bending loads (as for instance as a result of temperature changes) the alternating stress amplitude 50 N/mm2 around the mean value referring to the core diameter of the screw may not be exceeded.
If there is a bending load the deflection of the screws has to be considered.

3.2.7 Displacement behaviour

On a fixing ground made of concrete and different kinds of masonry the following displacements towards the load can arise if there are loads according to the admissible pull-out values

oblique tension: up to 0,2 mm
cross loading up to 0,5 mm

If permanently stressed according to the admissible pull-out values additional displacements of the same dimension may happen/arise.

4. Regulations for the execution

4.1 Generalities

The plugs may only be used as a fixing unit which is supplied in series (pre-assembled or of the same packaging unit).
The screw belonging to the plug has to be at least 5 mm longer than the plug itself. For the special screw this is valid as from the inserted marking (see on enclosure 2). The mounting of the plug to be fixed has to be executed accordingly to the drawings according to paragraph 3.1.1 and according to the mounting instructions of the applicant. Before fixing the plug the building material, the consistency and if necessary the mortar group have to be determined according to the building papers or by testing of the consistency of the building material.

4.2 Preparation of the drilling hole

In case of reinforced concrete walls the location of the drilled hole has to fit the reforcement in order to avoid any damage of the reinforcement.
The drilled hole has to be executed rightangled to the surface of the fixing ground and depending on the drilling machine with respectively hard metal drill bits or hard metal percussion drills.
Drilled holes into masonry or brick work walls made of perforated/hollow bricks (Hlz, KSL, Hbl) may only be produced with rotary drilling machines (without percussion or hammer action). This regulation may only be neglected in case that the impact on the plugs' pull-out value on masonry made of hollow bricks while drilling with percussion or hammer action has been determined/tested by the means of trials on the building according to paragraph 4.4.
The drills' nominal diameter and the cutter diameter have to correspond to the indications on table 3, enclosure 3.
The hard metal hammer drill bit has to correspond to the indications of the notice of the Institut für Bautechnik über die „Kennwerte, Anforderungen und Prüfungen von Mauerbohrern mit Schneidkörpern aus Hartmetall, die zur Herstellung der Bohrlöcher von Dübelverankerungen verwendet werden“ (Translation: Characteristical values, requirements and control testing of hammer drill bits with carbide tips (hard metal hammer drill bits), which are used for drilling holes as a combined fixing with anchore plugs) (Edition of January 2002).
The hard metal percussion drill has to correspond to the diameter tolerances according to ISO 5468.

The drilled hole depth has to exceed the usable length by at least 10 mm. The thickness of the building element has to be thicker than the drilled hole depth, at least 2 cm more for masonry and at least 3 to 4 cm more for concrete in order to avoid any popping (transpiercing).
The drilling dust has to be removed from the drilled hole.
In case of drilling errors a new drilled hole has to be realized with a distance of at least 1 x the depth of the faulty drilling. However, a maximal distance of 5 x outer plug diameter is sufficient.

4.3 Setting of the plug

Any tolerance of the fixing ground have to be compensated in a manner that no excessive stress occurs as a consequence of the multiple fixing while the plug is being mounted. The compensation has to be realized in order to allow the transmission of the forces of pressure.
Even if underfillings are necessary for the compensation of parameter inaccuracies of the fixing ground the usable length of the plug has to be respected and the reach of the screw has to be assured.
While screwing in the screw the temperature of the fixing ground may not be below 0°C.
The fixing of the plug into the drilled hole can be realized by a careful beating with the hand hammer. The screw has to be screwed in right to the border of the plug, so that the coned end of the screw does penetrate the plug.
The plug is correctly fixed if after the completed screwing-in of the screw neither a turning of the plug occurs nor a further slight turning of the screw is possible.
The plug may be mounted/used only once.

4.4 Trials on the building

4.4.1 Generalities

For the fixing of facings (façades, curtain walls) according to paragraph 1.2
the admissible load (pull-out value) of the admissible plug dimensions according to table 3.1, paragraph 3.1.1 into masonry or brick work walls according to paragraph 3.2.3.3 may determined with trials on the building.
For this, at least 15 extraction trials with centrical tension load have to be executed on the building.
The execution and the evaluation of the trials as well as the making up of the test evaluation and the fixing of the admissible loads (pull-out values) have to be realized by inspection offices or under control of the responsible of the building supervisor.
The number and the situation of the plugs being tested have to be adapted to the respective conditions. For undefined or vast façades for instance they have to be increased so that a justifiable statement can be made regarding the admissible loads of the plugs (pull-out values) for the present fixing ground.
The trials have also to consider the unfavorable conditions of the execution in practice.

4.4.2 Mounting

The plug being tested has to be mounted according to paragraph 4.2 and 4.3 and regarding its axial distance, the distance to respectively cross and horizontal joints or to the part border the plugs have to be distributed as it is provided for the fixing of the building element to be fixed. The plug may also be mounted into the horizontal joints.
Depending on the drilling machine hard metal hammer drills according to the indications on the notice of the Institut für Bautechnik (see paragraph 4.2) or respectively hard metal percussion drills according to ISO 5468 whose the width across corners of the hard metal cutter is situated in the area of the upper admissible tolerances.

4.4.3 Execution of the trials

The pull-out tester must allow a continuing, slow load increase with calibrated force indicator. The tension load has to work vertically towards the surface of the fixing ground and it has to be transmitted over a joint further to the plug screw.
The reaction forces have to be transmitted - with a distance of at least 15 cm to the plug - into the fixing ground. The test load has to be permanently increased in order that the maximum load can be reached after about one minute. The tension load is red off on the first load stop and simultaneous distance increase (F1) and the maximum load (F2).

4.4.4 Test report

The test report must contain all indications allowing an opinion of the plugs' load capacity. It is part of the building papers.
The following information are at least required:
- building, owner (of the building in construction),
- date and place of the trials, temperature,
- firm which is responsible for the mounting of the plugs,
- masonry (type of stone, consistency (solidity), stone dimensions, mortar group),
- apparent evaluation of the masonry (full jointing, joint thickness, uniformity (evenness),
- designation of the construction to be fixed,
- plug type,
- location of the plugs regarding stone, respectively cross joint (gap at the joint) or horizontal (bed) joint,
- Width across corners (edge width) of the hard metal cutter of the drills, measured value prior to and after the drilling,
- test device,
- test results with indication of the measured values F1 and F2,
- test respectively executed or supervised by .....,
- signature.

4.4.5 Evaluation of the test results

The admissible load (pull-out value) results from the measured values F1 respectively F2 to:
zul F1 = o,23 F1
zul F2 = 0,14 F2
The minor value is desicive for zul F.

For respectively F1 or F2 the average value of the five minor measured values have to be considered.

The maximum load values indicated according to paragraph 3.2.3.3 for the different kinds of bricks may not be exceeded.

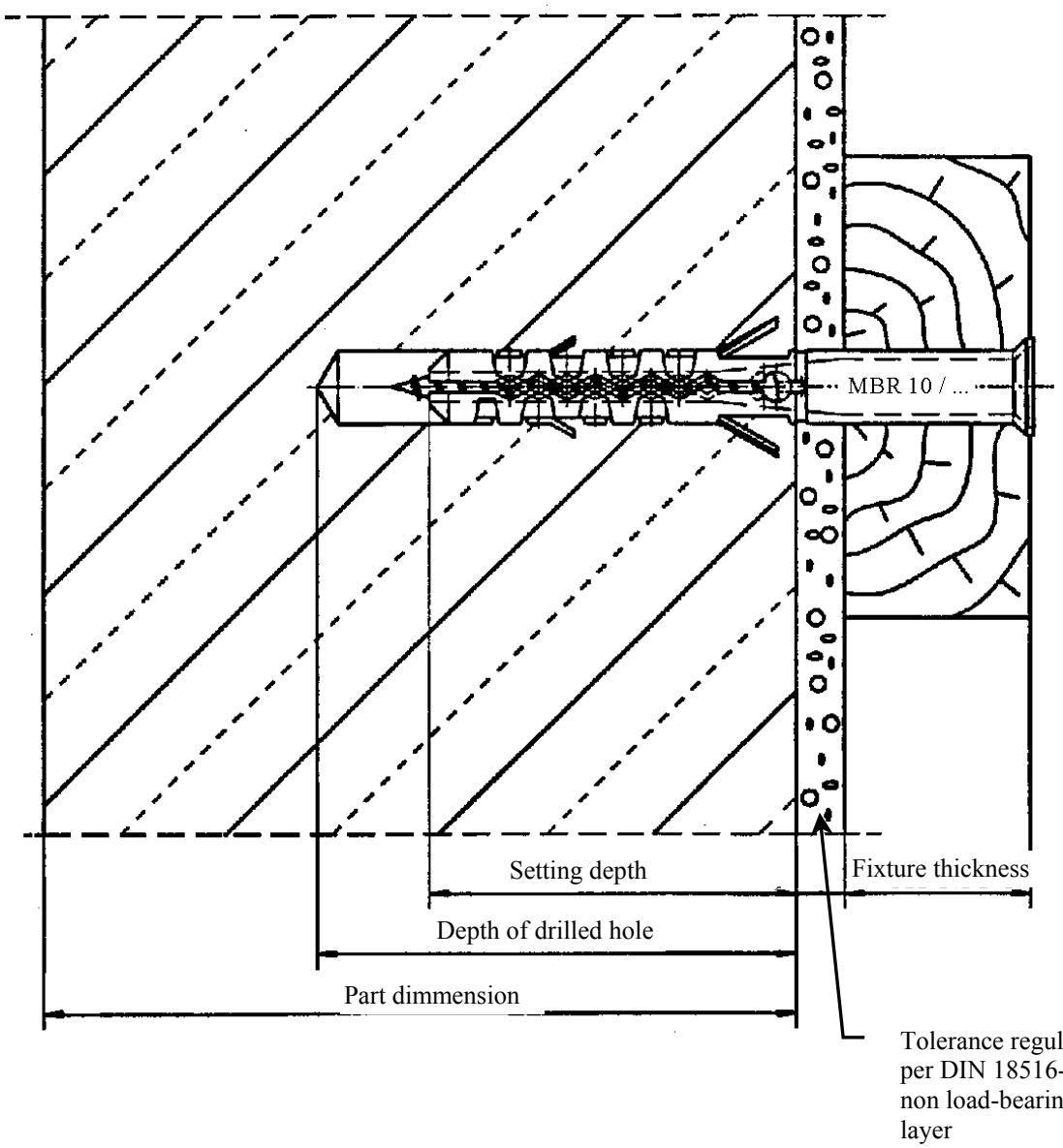
If the plug is stressed in perforated brick stones or hollow brick stones special proofs are required.

4.5 Control of the execution

While the fixings are being realized the contractor responsible for the mounting of the plugs or the director of works commissioned by him or a competent representative of the director of works has to be present on the site. He has to assure the execution of the jobs in the prescribed form.

While the fixings are being executed the proofs of the fixing ground (respectively consistency of the concrete or the type and the consistency of the masonry) and the mounting of the plugs in the prescribed form have to be recorded by the director of works or by his representative. The records have to remain on the site during the construction and if required they have to be presented to the responsible of the construction supervision. These records as well as the delivery notes have to be kept by the building contractor during at least five years after achievement of the construction.

Mounting condition of the plug



Application into concrete and various kinds of masonry ar

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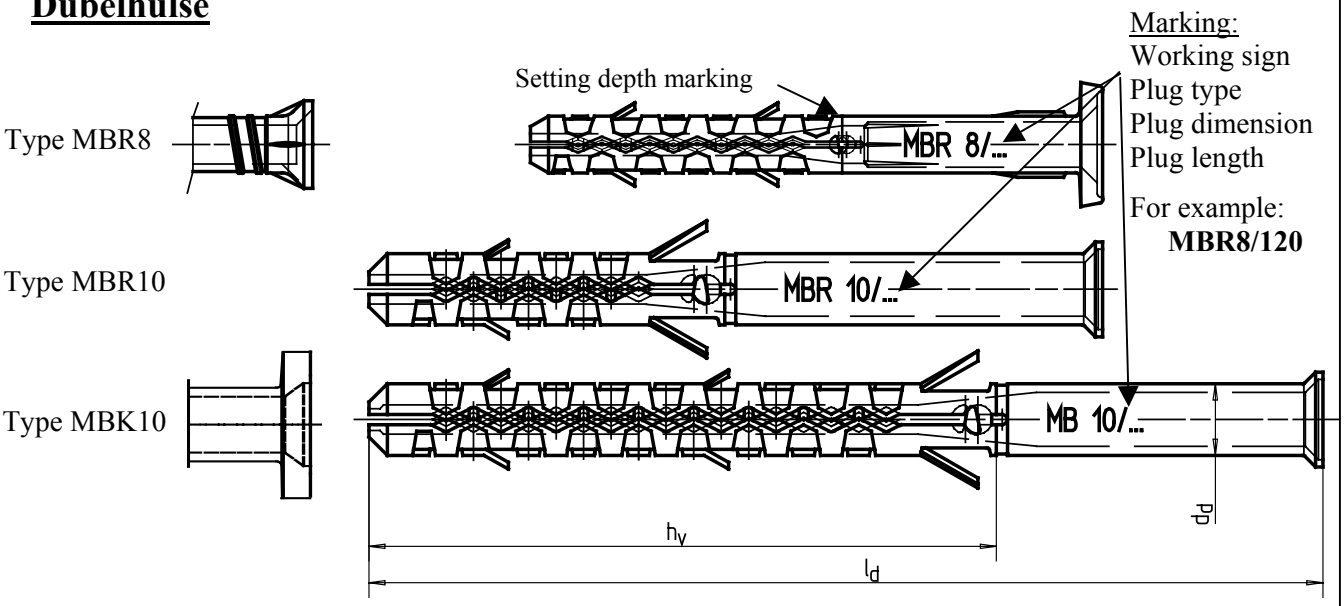
mungo – Nylon Frame Plug

mounting condition

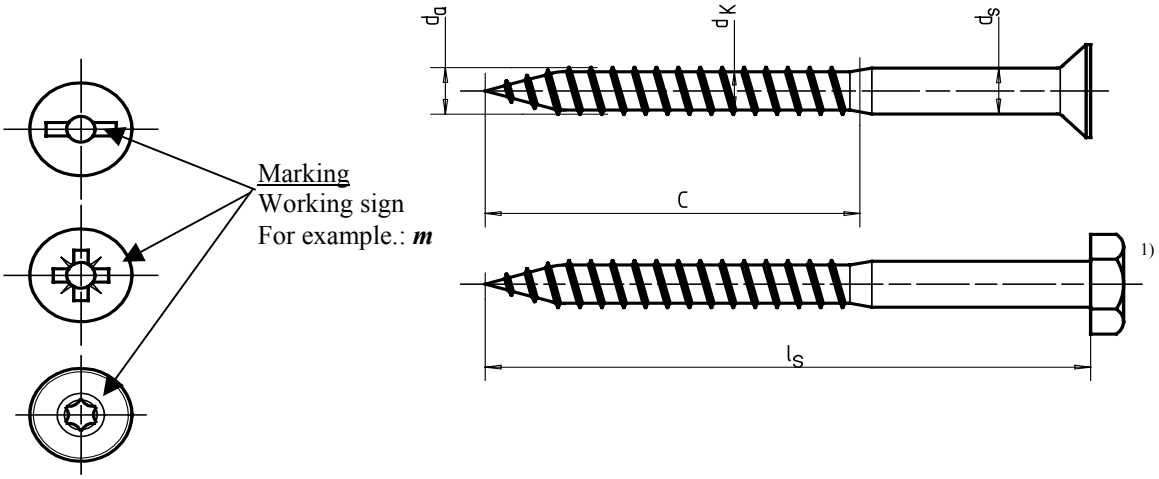
Enclosure: 1
To the General construction
Inspected approval
No. approval. Z-21.2-177
dd: June 5th 2002

Dübelhülse



Special Screws: Screwhead with various tool holding fixtures

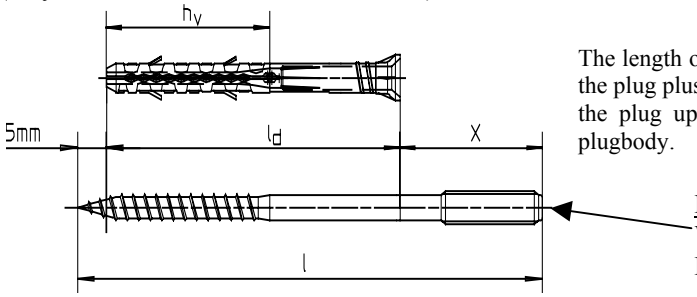
Tool holding fixtures:



1) Hexagon screws made of stainless steel. If the connecting part is metal, the schrow may be used in galvanized exwcution as well.

Application Requirements for Shoulder Screws

(only schoulder screws in stainless steel)



The length of the shoulder screw is 5 mm longer than the length l_d of the plug plus the length x. The schoulderscrews have to be screwde in the plug up to the marking allowing the screw point to pass the plugbody.

See also Encolsure 3

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Table 1: Materials

Part	Description	Material	
1	Plug Body	Polyamide PA6, Ultramide ®B3S, Colour: orange	
2	Special Screw	steel, galvanized ≥5µm as per DIN EN ISO 4042 f_{yk} = 480 N/mm^2; f_{uk} = 600 N/mm^2	Stainless steel 1.4401 or 1.4571 f_{yk} = 450 N/mm^2; f_{uk} = 700 N/mm^2

Table 2: Dimensions

Plug type 1)	**Plug body**		**Special Screw** 2) 3)			
	d_d [mm]	**h_v [mm]**	**d_a [mm]**	**d_k [mm]**	**d_s [mm]**	**C [mm]**
MBR 8	8	50	5.5	4.2	5.2	30
MBR 10	10	50	7	5.8	6.6 (6.9)[4)]	50 / 75
MB 10	10	90	7	5.8	6.6 (6.9)[4)]	50 / 75

1) The plug type of the plugs does additionally include the plug bodys' length l_d
Ex. for l_d = 140 mm: Plug MBR 10/140

2 The screw length l_s is 5 mm longer than the plug bodys' length l_d, allowing the screw to pass through the respective plug body. For shoulder screws (Stockschrauben) see enclosure 2.

3) With metal connecting parts the hexagonal screw may also be used in galvanized execution. See paragraph 1.2.

4) The value put in parantheses does refer to the galvanized screw.

Table 3: Application Data

Plug type				**MBR 8**	**MBR 10**	**MB 10**
Drill Dimension (nominal)			[mm]	8	10	10
Drill Dimension (cut)		≥	[mm]	8.45	10.45	10.45
Drill Depth	**t**	≥	[mm]	60	60	100
Setting Depth	**h_v**	≥	[mm]	50	50	90[3)]
Clearance hole in connecting part 1) 2)		≤	[mm]	8.5	10.5	10.5

1) See paragraph 3. 2.1

2) Not valid for shoulder screws (Stockschrauben)

3) See paragraph 3.2.3.2

See also enclosure 2

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Table 4: Admissible loads in concrete per plug for axial, tension and shear loads under every angle and respective plug distances and part dimensions.

(Restrictions for permanent axial loads see paragraph 3.2.3.1)

Plug dimension					**MBR 8**	**MBR 10**
admissible F	**for concrete ≥ B15**			[kN]	0.5	0.8
Single plug	Axial distance	a	≥	[mm]	100	100
	Edge distance	a_r	≥	[mm]	50	50
Plug pair	Axial distance	a_i	≥	[mm]	50	50
		a_g	≥		150	150
	Edge distance	a_r	≥	[mm]	50	50
Minimum part dimension		d	=	[mm]	100	100

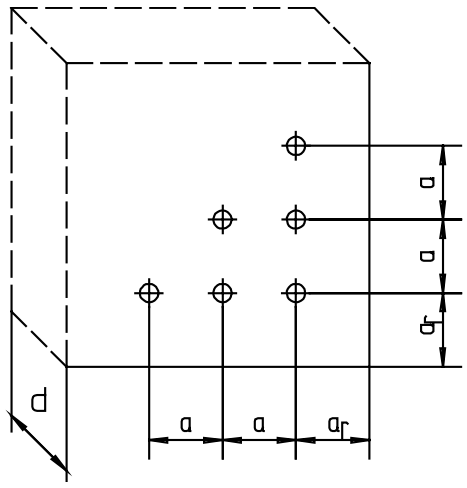
Table 5: Admissible bending moments depending on the existing centrical pulling force F_z

Plug dimension [1]			**admissible. M [Nm]**	
			Screw galvanized steel Zn	**Screw stainless steel**
MBR Ø8	F_z	= 0 kN	5.7	5.3
	zul. F_z	= 0.5 kN	5.4	5.0
MBR MB Ø10	F_z	= 0 kN	7.9	7.4
	zul. F_z	= 0.8 kN	7.3	6.8

[1] For loads between the two maximum values indicated in the table the respective admissible bending moments may linearly be interpolated.

Arrangement of the plugs

a) Single plug



b) plug pair

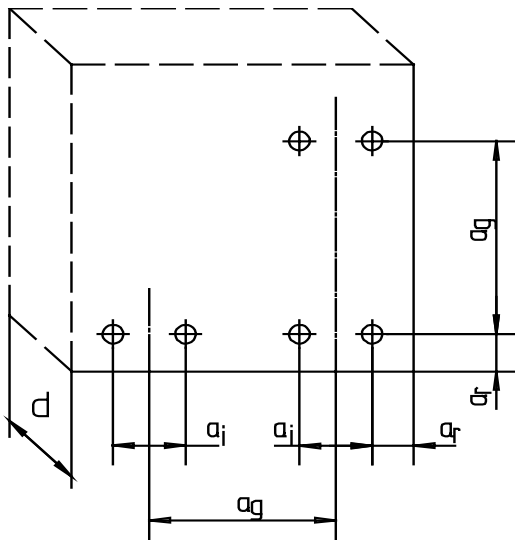


Table 6: Admissible loads per plug for single plugs in masonry for axial, tension and shear loads under every angle as well as respective plug distances and part dimensions. [1)]

(Restrictions for permanent axial loads see paragraph 3.2.3)

Plug dimension			**MBR 8**	**MBR 10**	**MB10**
Solid brick [1)]	≥ Mz 12	[kN]	0.4	0.6	-
Sand-lime full brick [1)]	≥ KS 12	[kN]	0.4	0.6	-
Sand-lime hollow brick	≥ KSL 6	[kN]	-	-	X [2)]
Vertically perforated brick	Hlz	[kN]	-	-	X [2)]
Hollow block of aerated concrete	≥ Hbl 2	[kN]	-	-	X [2)]
Full brick and full block of aerated concrete	≥ V 2	[kN]	-	-	X [2)]
Axial distance	a ≥	[mm]	100	100	100/250 [3)]
Edge distance with load As well as edge distance to Joints without mortar	a_r ≥	[mm]	100	100	100
Edge distance without load, if no overload approved	a_r ≥	[mm]	250	250	250
Minimum part dimension	d	[mm]	115	115	175

[1)] See paragraph 3.2.3.2

[2)] For the determination of the admissible loads see paragraph 3.2.3.3

[3)] For fixings into vertically perforated bricks, into sandstone (h > 11.3 cm, hole share >15%) and hollow blocks made of aerated concrete the axial distance must be of 25 cm.

The axial distance may be reduced to 10 cm if the admissible load can be lowered by 50% and the distance to other plugs remains 25 cm. These two maximum values may be linearly interpolated