WEPIA

Water Efficiency and Public Information for Action

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PROPOSED CHANGES IN JORDANIAN BUILDING CODES, SPECIFICATIONS AND STANDARDS FOR WATER CONSERVATION

February 2001.

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Water Efficiency and Public Information for Action (WEPIA)

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Specification and Standards Recommended for the Jordanian Construction Code

A. BACKGROUND/RATIONAL

One of the most effective water efficiency strategies is to examine Building Codes, Standards and Regulations as a method of conserving water. In Jordan the Construction Code is the law that governs all construction and is produced by the Ministry of Public Works & Housing. A Ministry of Water and Irrigation Technical Committee has promulgated a set of standards, which it is presenting here, to be considered for adoption by the Government of Jordan, Ministry of Public Works & Housing. These standards are recommended after much consideration of the Jordanian setting, international standards established by other countries, and the need to urgently develop a conservation code for water in Jordan.

There are three immediate standards that need to be changed in the code:

A. Flow Rates:

Table (1): Comparison between flow rate established as standards in 3 countries and recommendations of the MWI Technical Committee

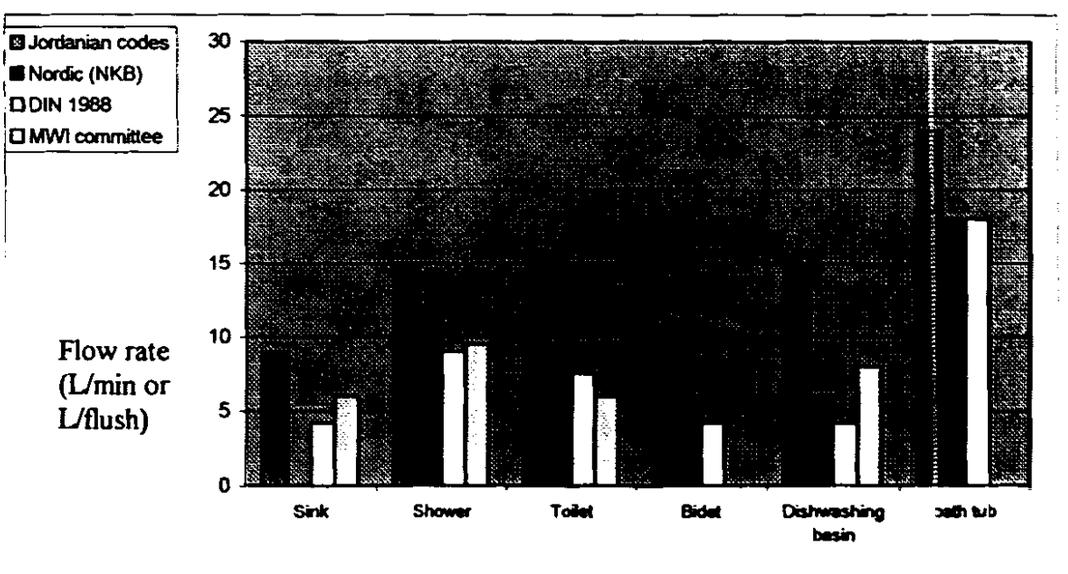
Fixtures	Existing Jordan. standard (L/Min)	Existing pressure standards in Jordan	Nordic (NKB) Flow rate (L/Min)	DIN 1988 Flow rate (L/Min)	MWI Technical Committee recommendations. Flow rate (L/Min)
Sink	9	0.2-1	---	4.2	6
Dishwashing basin	15	0.2-1	6	4.2	8
Bath tub	24	0.2-1	18	18	-----
Clothes washing basin	18	0.2-1	-----	-----	-----
Showers	15	0.2-1	12	9	8-9.5
Hand showers	9	0.2-1	-----	-----	-----
Bidet	9	0.2-1	6	4.2	-----
Toilet (tank)	12	Producing company instruction	6	7.5	6
Toilet (flush o meter)	-------	Depends on the type and pressure	-----	-----	-----
Urinal (tank)	6	Producing company instruction	-----	-----	-----
Urinal (flush o meter)	6	Producing company instruction	-----	-----	-----
Drinking basin	3	0.1-1	-----	-----	-----
Garden faucet (irrigation)	18	0.1-1	-----	-----	-----

The MWI Technical Committee recommended flow rates are based on the 0.3-3 bar prevailing pressures in most buildings in Jordan and are intended for both domestic and institutional buildings. The codes recommended are for all new construction. A phased program to replace inefficient fixtures is appended to this document for consideration as an adjunct to the law.

Recommendation:

- **Showerheads**: Showerheads in all new construction should use a maximum of (8-9.5) L/min.
- **Taps**: Low-flow domed pressure compensation aerators that deliver a maximum of 6 L/min. for washbasin and (8) L/min for kitchen sinks and out side faucets should be required for all new construction.
- **Toilet Flushers**: All toilet fixtures to be installed in new construction must comply with maximum (6) L/flush. Old fixtures must be replaced with trim that is either dual flush (3 liters for liquid waste and 6 liters per solid waste) or maximum 6 L/flush.

These recommended standards recognize that Jordanian current standards are based on British standards, however these have themselves undergone changes and are currently under review by the UK to conform to the European Community standards.



Fig(1): Shows the difference in flow rates between Jordanian, Nordic (NKB), DIN, MWI advisory committee

B. Cistern capacity:

The Technical Committee pointed out conflicting standards within Jordanian law when it comes to toilets, which need to be harmonized. The maximum flush capacity cistern is 7.5 liters based on JS 1132/1996. However Civil Architectural Standards Volume one, Part 1405/3 allows for 4.5 liters, 9 liters or 11 liters.

Irrigation and the Ministry of Public Works to prepare WSD legislation before recommending code changes.

Any product that is manufactured in Jordan or imported must be labeled with flow rates on the equipment itself. The WSDs manufacturers should also include information that specifies its performance at different pressures with and its efficiency and quality. Information on hot water standards and specifications should also be included. The two conflicting Jordanian standards were discussed at length. The Committees recommended that the 7.5 liters flush should be used as the maximum cistern capacity even though this type is no longer manufactured since there would be no conflict for using lower sizes. The consensus was that a goal of 6 liters /flush maximum will keep Jordan current to world standards Water Saving Devices have a great potential benefit for Jordan but should be put into the law but in a time phased manner. The committees suggested the WEPIA WSD Assessment recommendations for one, three and five years be reviewed by the Ministry of Water and while making the transition from a maximum of 7.5 liters/ flush.

The MWI Committee unanimously agreed that the Cistern Capacity should be set at 7.5 liters/flush maximum with a goal of 6 liters/flush and two flush systems

C. Water Saving Devices:

The Technical Committee made the following recommendations for improving the efficiency of water consumption in Jordan. The recommendations are based on phasing out of the Jordanian market inefficient sanitary fixtures and ensuring that all buildings will replace inefficient fixtures within a reasonable amount of time.

B. WATER CONSERVATION PHASED IMPLEMENTATION PLAN

Within one year:

1. National water efficiency standards should be established and included in all of the laws relating to water use, customs and taxes, building codes, and plumbing codes.
2. An oversight committee should be established to test suppliers' compliance with national standards.
3. Licenses for new buildings should only be granted to plans that include the new national standards.
4. WSDs should be distributed and installed with water meters for all new water subscribers.
5. The Ministry of Water and Irrigation and the Customs Department should work jointly to clarify the application process for a WSD exemption to vendors of WSDs.
6. The aforementioned national water efficiency standards should be used by the Customs Department to grant full exemption for WSDs.
7. Incentives for the importation of WSDs should be created by applying a higher sales tax on inefficient plumbing fixtures and a lower or no tax on water efficient fixtures.
8. Proposed MWI incentive programs (such as the invoice prorating and monetary rewards program) should be implemented.

9. An MWI committee should review incentive programs for retrofitting old buildings with WSDs in the United States and elsewhere to determine their feasibility in Jordan.

Within three years:

1. All plumbing fixtures should be labeled with flow rates.
2. All locally manufactured plumbing fixtures should comply with national standards.
3. Suppliers should be required to guarantee performance standards for a set period of time. This would help to alleviate the problem of selling inappropriate or faulty plumbing fixtures.
4. There should be monitoring of the effectiveness of all plumbing fixtures, mandatory preventative maintenance, and immediate consequences for consumers who do not comply with water laws and regulations.
5. A separate utilities court with a judge and lawyers who are trained in water law should be established (analogous to a traffic court) so that illegal users would have to face immediate consequences for their infractions.
6. Locally appropriate incentive programs for retrofitting old buildings with water efficient fixtures should be implemented.

Within five years:

All buildings in the large water consumer category should be retrofitted with WSDs. In July 2000 the Water Efficiency and Public Information for Action (WEPIA) a USAID funded initiative working in collaboration with the Ministry of Water and Irrigation (MWI) produced a report "Assessment of the Supply and Demand of Water Saving Devices Amongst Large Consumers in Jordan". Researchers were able to make accurate estimates of the potential savings from the retrofitting of public and private buildings if these standards were to be adopted. Some examples are provided below.

Benefits of Changing the Code:

Using data from field surveys on large water consumers, the recommended standards were compared with the existing Jordanian codes for these same consumers. The results show that the use of WSDs and the reduction of flow rates is an effective conservation tool, as well as an economic benefit to the country and the individual user. The following table illustrates the potential savings in water and money that can be achieved using the MWI Technical Committee recommended code versus the Jordanian existing conditions.

Table (2): Benefit of using MWI advisory committee recommended code.

Site	% of water saved (sink)	% of water saved (shower)	% of water saved (toilet)	% Average water savings	Quarterly water bill	Potential Savings on quarterly bill
Slaughter house	52	66	70	63	48,579	30,442
MPWH	67	no	54	61	2,601	1,587
MWI	90	no	0	45	2,479	1,116
King Hussain M.C.	70	72	50	64	1,500,000	958,333
M.Awqaf	53	no	no	53	300	159

MPH: Ministry of Public Work and Housing
MWI: Ministry of Water and Irrigation
M. Awqaf: Ministry of Awqaf

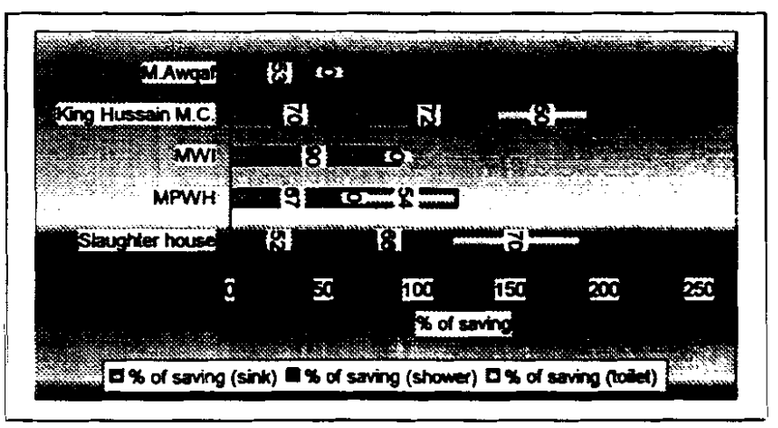


Fig (2): % of saving in water of different fixtures

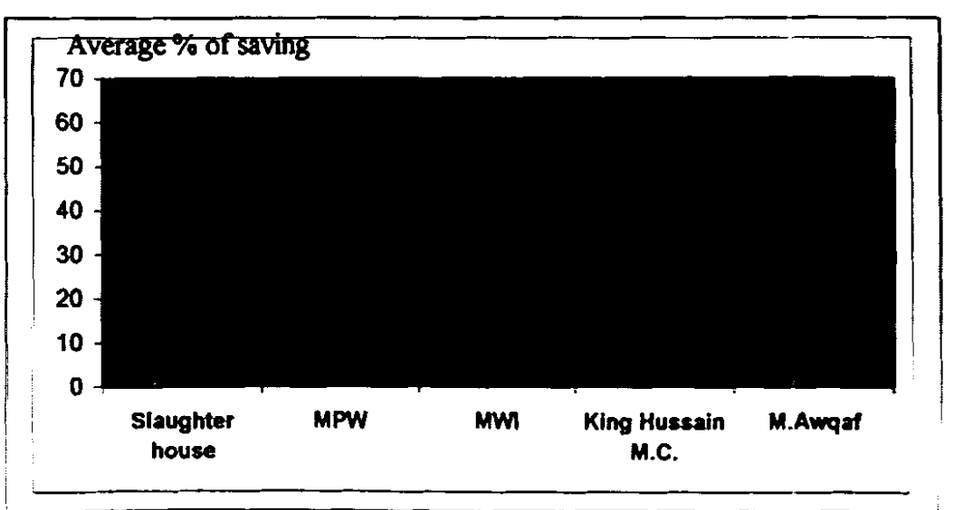


Fig (3): Average % of water saved

C. CONCLUSIONS:

1. Where possible Jordan should use maximum not minimum or ranges WSDS flow rates and reduce minimum flow rates for the network.

2. Change Water Cistern Specifications to 7.5 l/flush and establish a goal of 6l/flush

3. Adapt DIN and Nordic Standards to Jordanian conditions.

4. Require use of WSD through legislation including labeling with flow rates

5 Make special code designations for large consumers.

6. Create incentives for consumers (large and small) and local manufacturers to use best technologies.

Appendix 1

Appendix

Existing Conditions

Jordan has thirteen laws that govern its water use. None encourage the use of Water Saving Devices. Jordanian Building Codes mandate minimum flow rates that do not encourage conservation. The network depends on flows for a velocity to maintain a satisfactory volume and pressure. The rationale is that this minimizes sounds and erosion in the system. The waste stream depends on a concentration that meets the systems performance capacity. Additionally there are Public Health concerns if the concentration becomes too high.

There is a widely accepted though erroneous belief in Jordan that any reduction in flow rates from water efficiency will effect the network 's sustainability and user satisfaction. There is also a lack of knowledge as to the extent that leakage and pilferage affects the network. Information about the true effect of WSDs are little understood which leads to resistance to make changes in the minimum rates no matter how compelling the argument that Jordan can have water efficiency and maintain the network.

Methodology

In August and September 2000, government organizations that have the responsibility for promulgating new water use codes, standards and regulations in buildings were contacted by the Water Efficiency and Public information for Action (WEPIA) program working in collaboration with the MWI to support the research and consider the drafting of a new set of codes for Jordan that reflected the urgent need to conserve water. From that research they identified the process by which changes are to be made and focused on three major areas of concern: Flow rates, toilet cistern capacity and WSD legislation. WEPIA and partners then developed several scenarios or issues comparing the present situation in Jordan with standards in other countries. The three categories were then presented to the MWI appointed Specifications and Standards Committee for independent comments, review and recommendations in a series of meetings from the end of September to the middle of November 2, 000.

Water Saving Devices (WSDs)

The report evaluated the policy and regulatory issues affecting the use of WSDs in Jordan. At the beginning of the study, WEPIA convened three focus groups of fifty chief engineers from the Hospital, Hotel and Industrial sectors that independently came to the same conclusions. They all recommended strongly that WEPIA first examine what Jordanian policies that are barriers to wiser water use. WEPIA followed their advice and concluded that without policy and regulatory changes compliance the report's recommendations would be uneven and savings less than optimal.

As a follow up to the study, WEPIA and the MWI consultants began to examine policies, regulations, standards and specifications, as well as incentives to encourage rapid retrofitting by large and small consumers. In September, 2000 the MWI

established a committee to take advantage of the opportunity to support the Ministry of Public Works and Housing which was coincidentally charged with the responsibility of revising the Jordanian Codes and Standards and for the first time was targeting codes for maintenance of plumbing systems inside of buildings.

The MWI created a Policy and Regulations Committee made up of representatives from the Royal Scientific Society, Jordan Engineers Association, Jordan Construction Contractors, Institute of Standards and Metrology, MWI, and Jordan University of Science and Technology. Advisory group (Codes and Standards Technical Advisory Committee) made up of users from large consumers such as five star hotels, hospitals, WSD suppliers, manufacturers and engineering design consultants augment the MWI committee. Both committees worked in tandem to recommend changes

The groups looked at Jordanian minimum flow rates as presently promulgated that reflected a set of standards, which appear to discourage conservation. The groups focused on flow rates in faucets, sinks and showers for large consumers. They also examined conflicting Jordanian standards as they relate to toilet cistern volume. And lastly the committees looked at realistic uses of WSDs in Jordan and how new laws could be implemented to encourage their use.

Table(3): MWI Policy and Regulations Committee

Organization	Name
Royal Scientific Society	Eng.Hassan Okour Eng. Falak Sarraf
Jordan Engineers Association	Eng. Moh'd Abu-Afifa
Jordan Construction Contractors Association	Mr. Faisal Al-Masri
Institute of Standards and Metrology	Eng. Nidal Haddadin
Ministry of Water and Irrigation	Eng. Saleh Malkawi
Ministry of Public Works and Housing	Eng.Khalid Abu-Jamous Eng. Rawan Huniti
JUST	Dr. Wa'il Abu-Al-Sha'r

Table (4): Technical Advisory Committee

Organization	Name
Amman Mariott Hotel	Eng. Fahd Shahrouri
Jordan Ceramics Company	Mr. Yazid Odeh
Irshidat Company	Mr. Ersan Al-Dal'a
Al-Rawnaq Company	Mr. Hani Hussein
Jordan University Hospital	Eng. Azzam Al-Shalabi Mr. Eng. Kamel AL-Daour
Intercontinental Hotel	Mr. Kim Kurdi
Amra Forum Hotel	Eng. Rafiq Salah
Royal Scientific Society	Dr. Naseem Haddad Mr. Ali Ajlouni
USAID	Ms. Setta Tutundjian

The MWI Technical and Advisory committee reviewed the documents and prepared studies of the potential savings in water and money to be obtained from changing the codes. They also researched international standards such as the German DIN, Nordic, British and US laws as models to examine in relation to the three categories. MWI, MPW & H, RSS and JISM were excellent sources of information and support to the committees.

Both committees met separately to review each of the categories and to comment on the studies. The MWI I Advisory group findings and recommendations were then presented to the MWI Technical Group for comment. Both groups then reviewed the findings again after researching their own agency's view of their recommendations. Representatives of the Ministry of Public Works and Housing (MPW&H) who have the final responsibility for making recommendations for legislative change were asked to review each of the recommended changes as well as the advisory committees' recommendations. Both groups met with the MPW&H representatives in a meeting of the committee as a whole to develop final recommendations on November 15, 2000.

They recommended additional discussion of the design issues especially as they relate to the effect of water efficiency and WSDs on the network. To that end the MWI Committee made a final review on November 29, 2000. The committee agreed to "vote" on each case after hearing additional testimony from members. Their final recommendations are here respectfully submitted to the Ministry of Public Works and Housing for adoption.

The Ministry of Public Works and Housing will implement flow rates and cistern capacity recommendations as new minimums for building licensees. They will also draft legislation on the use of WSDs in the future which if passed will allow future committees to develop codes, standards and specifications for WSD use in Jordan.

The Jordan Institute of Standards and Metrology has examined the appropriateness of international standards recommended by the committee e.g. DIN 246 and other recommendations that fall in their purview. MWI and MPWH have reviewed the WEPIA Assessment Study recommendations for implementation of laws and policies especially as they relate to WSDs for one, three and five years.

International Standards for Internal Building, Water Use

Jordan has looked to Europe and particularly to the British, German and Nordic standards for guidance. British standards were used in the past for establishing minimum flow rates. For example British standard: (BS 7358: 1990 *and BS 6700*: 1997) for Close Coupled Suites With Flush Capacity of 7.5 L. has been the standard for Jordan. Large consumers such as five star hotels use standards set by their international associations.

The committees agreed that the DIN EN 246 Specification (European Standard) which aims to establish the dimensional, hydraulic and acoustic properties that allow flow rate regulators mounted on sanitary tap ware should be adapted to the Jordanian situation. DIN 246 cites the test methods whereby these properties may be verified. The example below is taken from DIN246 for aerators.

Flow rate regulators are devices which are fitted on the head of a fixture to regulate the flow rate, and WEPIA recommends aerators (or flow rate regulator with air intake, if the aeration of water is ensured). DIN EN 246 classifies flow rate regulators according to their nominal flow rate at a dynamic pressure of 0.3 MPa (3 bar), the flow will be regular and compacted and visually shall exhibit regular and adequate aeration over a length of 150 mm. The flow of water shall remain full and aerated in a pressure range between (0.5 – 5) bar.

Figure (5): DIN Flow rate classification

	Flow rate in L/min		
Class	Nominal value	Tolerance	Regulated
A	15	(13.5-15)	4.2
S	20	(18-20)	5.2
B	25	(23-25)	6.0
C	30	(27-30)	7.5
D	38	(35-38	8.4

This DIN classification for aerators can be adapted to Jordan but with modification to meet existing conditions in Jordan such the variations in water pressure. The WEPIA recommended flow rates are preferable to those under DIN 246 and can be amended by JISM for inclusion in the Jordanian Building Codes.

While the US water standards embodied in the Energy Act of 1994 were reviewed, for the purposes of this document only European codes were considered. One valuable component of the Energy Act, which Jordan would do well to emulate, is the labeling requirements, which require manufacturers to put flow rates, and the volume of toilet cisterns on fixtures and WSDs. Adoption of a standard 6 liter tank volume will considerably assist consumers to make wiser choices.

Appendix 2

التوصيات التي يجب القيام بها لتغير بعض بنود كودات البناء الوطنية (كودة تزويد المباني بالمياة)

ان من أهم استراتيجيات الادارة والكفاءة المائية هو وجود كودات ومواصفات وقوانين لدعم مثل هذه التوجيهات. وتعتبر كودات البناء التي يتم اصدارها من وزارة الأشغال العامة بمثابة القانون في الأردن.

وفي سياق هذا البحث، تم مناقشة مجموعة من المواصفات مع لجنة كونتها وزارة المياه والري ليتم تبنيها من قبل وزارة الأشغال والحكومة الأردنية. وقد تمت التوصية آخذه بعين الاعتبار الوضع المائي الحالي للأردن اعتمادا على المواصفات العالمية القائمة في بلادها، حيث يوصى ايضا بعمل كودة للادارة والكفاءة المائية لتكمل عمل كودة تزويد المابني بالمياة.

ثلاثة مواصفات داخل الكودة موصى بتغييرها مباشرة:

١. معدلات التدفق:

قامت اللجنة الفنية من وزارة المياه والري بتوصيه حول معدلات التدفق على ضغط (٠.٣ – ٣) بار بحيث يتماشى مع معدلات الضغوط للابنية داخل الأردن، ويشمل المباني السكنية والتجارية والصناعية وغيرها وأيضا جميع المنشأت حديثة البناء. ويجب أن تحتوي الوثيقة على برنامج مرحلي لتغيير الأدوات الصحية ذات الكفاءة المائية المنخفضة لأخذها بعين الاعتبار كملحق للقانون.

توصيـــــات:

الدوشـــات: في جميع المنشآت حديثة البناء يجب أن لا تتجاوز قيمة معدل التدفق ما بين (٨ – ٩.٥) لتر/دقيقة كقيمة قصوى .

الحنفيـــات: استخدام الحنفيات ذات الهوّايات مقببة الرأس بقيمة قصوى لمعدل التدفق مقدارها ٦ لتر/دقيقة، أما بالنسبة لحنفيات أحواض الجلي داخل المطبخ فتكون القيمة القصوى ٨ لتر/دقيقة وأيضا تكون هذه القيمة لحنفيات خارج المنزل (الحدائق).

تدفق التواليتـات: يجب أن تكون سعة خزان الطرد للتواليتات في المباني الحديثة ٦ لتر/الدفقة الواحدة على أقصى حد. أما المباني القديمة فتبدل عدة النياجرا الى عدة حديثة ثنائية التدفق بحيث

تكون ٣ لتر/دقة للمخلفات السائلة و ٦ لتر/دقة للمخلفات الصلبة أو تكون العدة الحديثة على أقصى حد ٦ لتر/دقة.

أن المواصفات الاردنية الحالية قائمة على المواصفات البريطانية التي يتم الآن تعديلها للتماشي مع المواصفات الأوروبية والتي تم مرجعتها خلال تحضير هذا التقرير.

٢. <u>صنـــدوق الطـــرد:</u>

قامت اللجنة الفنية الموكلة من وزارة المياه والري بمراجعة المواصفه والكوده الأردنية الخاصة بصناديق الطرد لتكون موحدة بدون اختلافات بحيث أن القيمة القصوى لصناديق الطرد٧,٥ لتر/دقة كما ورد في المواصفة الأردنية JS 1132/1996 بينما القيمة الواردة في الكودة والمواصفات المعمارية والمدنية تختلف حسب القيم التالية لسعة صندوق الطرد (٤,٥ و ٩ و١١) لتر/دقة
الأختلافات الرئيسة المدرجة سابقا تمت مناقشتها باسهاب مع اللجنة الفنية. ووضعت اللجنة توصيتها باتخاذ ٧,٥ لتر/الدقة الواحدة كحد أعلى لحجم خزان الطرد مع العلم بأن هذا الحجم لم يعد يصنّع داخل الأردن. وبملاحظة أن هذه القيمة هي الحد الأقصى فلن تكن هناك مشاكل في استخدامها أو استخدام أحجام أصغر منها. ولكن استخدام ٦ لتر/الدقة الواحدة يجعل الأردن يتماشى مع المواصفات العالمية لأجهزة ترشيد استهلاك المياه وحتى تصبح فعّالة في أرض الواقع. و يجب أن تدخل بالقانون على مراحل كما هو موصى به في دراسة التقييم التي تمت في مشروع الكفاءة المائية والتوعية.و من مخرجات الدراسة التي تمت مع اللجنة الفنية وضع علامات على القطع الصحية المصنعة داخل الأردن مبينة معدل التدفق. وكذلك على مصانع أجهزة ترشيد استهلاك المياه أن تقدم مرفقات شرح لمواصفة ونوعية وكفاءة الأجهزة تحت درجات الضغط و الحرارة المختلفة.
لقد وافقت اللجنة الفنية الموكلة من وزارة المياه والري على استخدام ٧,٥ لتر/دقة كأقصى حجم لصندوق الطرد بهدف الوصول الى ٦ لتر/دقة.

٣. <u>أجهـــزة ترشيـــد استهـــلاك الميـــاه:</u>

وضعت اللجنة الفنية توصيات لرفع كفاءة استخدام المياه في الأردن، وكانت هذه التوصيات مبنية على استثناء تلك الأدوات الصحية ذات الكفاءة المنخفضة والتأكد من استبدال الأجهزة الصحية غير المناسبة خلال فترة زمنية محددة. لذلك على وزارة المياه والري وبالتعاون مع وزارة الأشغال العامة، وضع تشريعات قبل تغيير الكودات.

توصيات مشروع الكفاءة المائية والتوعية WEPIA للتشريعات والمواصفات وكودات الإنشاءات

<u>خلال السنة الاولى</u>:

١. ان يتم تشريع مواصفات الكفاءة المائية الوطنية وتضمنيها في كل القوانين التي لها علاقة باستهلاك المياه مثل الضرائب والجمارك وكذلك في كودات السباكة وكودات البناء.

٢. ان يتم تأسيس لجنة لمراقبة الموردين ومعرفة مدى التزامهتم بالمواصفات الوطنية.

٣. أن يكون ترخيص البنايات الجديدة مطابق للخطط التي تقوم على أساس المواصفات الوطنية الحديثة.

٤. ان يتم توزيع أجهزة ترشيد إستهلاك المياه WSDs مجانا من سلطة المياه الأردنية ويجب أن توضع أيضا مع عدادات المياه لكل المشتركين الجدد.

٥. ان تعمل وزارة المياه والري بالتعاون مع دائرة الجمارك على اعفاء أجهزة ترشيد استهلاك المياه من الجمارك وتوضيح كيفية عمل هذه الأجهزة.

٦. ان تخول مواصفات الكفاءة المائية دائرة الجمارك على الإعفاء التام لأجهزة ترشيد الإستهلاك.

٧. ان تستخدم دائرة الجمارك مواصفات الكفاءة المائية آنفة الذكر لمنح أجهزة الترشيد اعفاءا كليا.

٨. ان يتم وضع ضريبة المبيعات على أدوات السباكة غير المطابقة للمواصفات وخفض أو إعفاء أدوات السباكة ذات الكفاءة المائية العالية وذلك لإعطاء حوافز لاستيراد أجهزة ترشيد الإستهلاك.

٩. أن تقوم وزارة المياه والري بتطبيق برامج تشجيعية مثل إعادة التعرفة المالية للفواتير حسب كمية الإستخدام.

١٠. أن تعد وزارة المياه والري برامج تحفيزية لإصلاح البنايات القديمة باستخدام أجهزة الترشيد المطبقة في الولايات المتحدة الأمريكية وتبين مدى امكانية الاستفادة منها في الأردن.

<u>خلال ثلاث سنوات</u>:

١. أن تحتوي كل أدوات السباكة على علامة تبين مقدار التدفق أو حجم الخزان.

٢. أن تتلائم كل صناعات مواد السباكة المحلية مع المواصفات الوطنية.

٣. أن يطلب من الموردين تأكيد فعالية المواصفات لفترة زمنية معينة وذلك لتجنب بيع أدوات السباكة غيرالمناسبة أو الخاطئة.

٤. أن يكون هنالك متابعة لفعالية كل أدوات السباكة وعمل برنامج صيانة وقائية الزامية لها. وكذلك عواقب فورية للمستهلكين غير الراضخين للتعليمات والقوانين.

٥. أن يكون هناك محاكم ذات صفه خاصة وكذلك قضاة و محاميين مدربين على قوانين المياه حتى يواجه المستهلكين غير القانونيين عواقب تصرفاتهم مباشرة.

٦. أن يكون هناك برامج محلية تشجيعية مناسبة لإعادة تأهيل البنايات القديمة بأجهزة مائية فعالة.

<u>خلال خمس سنوات:</u>

١. أن يتم وضع أجهزة ترشيد الإستهلاك في جميع مباني كبار مستهلكي المياه.

<u>ملاحظة:</u>

تستطيع قراءة بعض الارقام و المقرنات في النسخة الانجليزية.

Appendix 3

UDC 621.646.4 : 620.1 DEUTSCHE NORM January 199C

Sanitary taps

General specifications for flow rate regulators
English version of DIN EN 246

DIN EN 246

Sanitärarmaturen; allgemeine Anforderungen für Strahlregler

Supersedes DIN 3214 Part 12, March 1984 edition.

European Standard EN 246 has the status of a DIN Standard.

A comma is used as the decimal marker.

Dimensions in mm

National foreword

This standard has been prepared by CEN/TC 34. The responsible German body involved in the preparation of this standard was the *Normenausschuß Armaturen* (Valves Standards Committee).

This standard has been included in the body of Codes of practice for water issued by the *DVGW Deutscher Verein des Gas- und Wasserfaches e.V.* (German Association of Gas and Water Engineers). Since this standard does not cover flow rate class Z, which will continue to be of relevance in Germany, this class has been dealt with in a separate standard, DIN 3214 Part 14.

The DIN Standards corresponding to the International/European Standards referred to in clause 3 of the EN are as follows:

EN 200	DIN EN 200
EN 248	DIN EN 248
ISO 49	DIN 2950
ISO 228/1	DIN ISO 228 Part 1
ISO 2768	DIN 7168 Part 1
ISO 3822/1	DIN 52 218 Part 1
ISO 3822/4	DIN 52 218 Part 4

Standards referred to

(and not included in **References**)

DIN 2950	Malleable cast iron fittings
DIN 7168	General tolerances for linear and angular dimensions and geometrical tolerances (not to be used for new designs)
DIN 52 218 Part 1	Testing of acoustics in buildings; laboratory measurement of noise emitted by appliances and equipment used in water supply systems; method of measurement
DIN 52 218 Part 4	Testing of acoustics in buildings; laboratory measurement of noise emitted by appliances and equipment used in water supply systems; mounting and operating conditions for special appliances
DIN EN 200	Sanitary taps; general technical specifications for single taps and mixer taps (nominal size ½), PN 10, with a minimum flow pressure of 0,05 MPa (0,5 bar)
DIN EN 248	Sanitary taps; general technical specifications for electrodeposited nickel-chromium coatings

Previous edition

DIN 3214 Part 12: 03.84.

International Patent Classification

E 03 C 1/08
G 05 D 7

Continued overleaf.
EN comprises 10 pages.

Editor's note

*This standard reproduces the official text of the English version of EN 246 as issued by CEN. In its preparation for publication as DIN EN 246 (English version), certain points have been noted which we consider to be in need of correction. These have been marked *). The suggested amendments are given below and will be forwarded to the responsible CEN Secretariat for its consideration.*

In presentation, orthography, punctuation and hyphenation, the aim has been to implement the PNE Rules consistently. Obvious errors (e.g. redundancies and omissions) have been rectified without further reference.

Suggested amendments

1 *For the sake of clarity, clause 1 should read as follows:*

'The aim of this standard is to specify dimensions as well as hydraulic and acoustic properties for flow rate regulators intended to be used with sanitary taps, and the methods to be used to verify such properties.'

2 *For the sake of consistency, the term 'visible' should be replaced by 'significant' throughout (cf. EN 248).*

3 *To make the sense complete, in subclause 6.1, 2nd paragraph, 'affecting' should be substituted for 'involving'.*

4 *To make the sense complete, in figures 6 and 9 and in table 5, 'width across flats' (which is the common technical term) is to be substituted for 'Flat part' and 'Side faces', respectively.*

5 *The English text in subclause 8.3.1 does not reflect the German text which is not a requirement but translates that the aeration is to be checked for the minimum flow rates specified in table 6 as a function of the regulator class.*

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 246

June 1989

621.646.4 : 620.1

Descriptors: Sanitary taps, flow rate regulators, dimensions, hydraulic properties, acoustic properties, tests.

English version

Sanitary tapware

General specifications for flow rate regulators

Robinetterie sanitaire; spécifications générales des régulateurs de jets

Sanitärarmaturen; allgemeine Anforderungen für Strahlregler

This European Standard was approved by CEN on 1988-06-20.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Ref. No. EN 246 : 1989 E

Brief history

This European Standard has been prepared by Technical Committee CEN/TC 34 'Sanitary tapware; dimensions, quality'.

The member bodies of CEN/TC 34 initially intended to specify certain requirements for flow rate regulators in EN 200, which covers single and mixer taps, but given the fact that the flow rate regulators could be mounted on other types of tapware (e.g. thermostatic mixing taps), they finally decided to specify requirements for flow rate regulators in a separate standard.

In accordance with the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard:

Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

Contents

1 Scope

This European Standard aims to establish:

- the dimensional, hydraulic and acoustic properties to which flow rate regulators intended to be mounted on sanitary tapware shall correspond;
- the test methods whereby these properties may be verified. *)

2 Field of application

This standard applies to flow rate regulators intended to be mounted on tapware fitted on sanitary appliances in toilets and washrooms and kitchens (single taps, mixer taps, thermostatic mixer taps).

3 References

ISO 49 : 1983	Malleable cast iron fittings threaded to ISO 7/1
ISO 228-1 : 1982	Pipe threads where pressure-tight joints are not made on the threads; designation, dimensions and tolerances
ISO 2768-1 : 1989	General tolerances; tolerances for linear and angular dimensions without individual tolerance indications
ISO 2768-2 : 1989	General tolerances; geometrical tolerances for features without individual tolerance indications
ISO 3822-1 : 1983	Acoustics; laboratory tests on noise emission from appliances and equipment used in water supply installations; method of measurement
ISO 3822-4 : 1985	Acoustics; laboratory tests on noise emission from appliances and equipment in water supply installations; mounting and operating conditions for special appliances
EN 200	Sanitary tapware; general technical specifications for single taps and mixer taps (nominal size ½), PN 10; minimum flow pressure of 0,05 MPa (0,5 bar)
EN 248	Sanitary taps; general technical specifications for electrodeposited nickel-chromium coatings

4 Definitions

Flow rate regulators are devices which are fitted on the diverter head of a tap to enable its flow rate to be regulated. A distinction is made between:

- flow interruptors (or flow rate regulators) without air intake, if operation is possible without aeration of the water;
- aerators (or flow rate regulators) with air intake, if aeration of the water is ensured;
- swivel flow rate regulators if the aerator or interruptor has a swivel joint.

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5 Designation

A flow rate regulator is designated by:

- its name;
- its dimension;
- its flow rate class;
- reference to this standard.

Example of designation

Flow interruptor (or flow rate regulator) without air intake, with internal thread:

M 22 × 1 – A – EN 246

6 Materials

6.1 Chemical and hygienic behaviour

Materials in contact with water intended for human consumption shall present no danger to health up to a temperature of 90 °C. They shall not cause any deterioration to the water, either with regard to quality, appearance, smell or taste.

Under normal conditions of use, the materials shall not be subject to any deterioration involving *) the operation of the regulator; materials which do not have adequate corrosion resistance shall be protected against corrosion.

6.2 Condition of visible *) surfaces

Visible surfaces shall comply with the requirements of EN 248.

6.3 Quality of the coating

The coating shall comply with the requirements of EN 248.

7 Dimensions

NOTE: For the values without tolerance indication, the ISO 2768 tolerances are applicable.

7.1 Regulators with internal thread

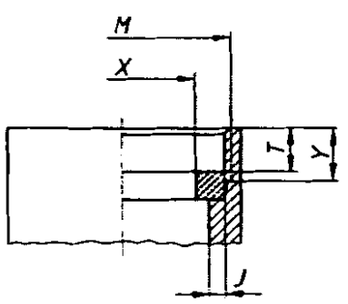


Figure 1: Regulator with internal thread

Table 1: Regulators with internal thread

Symbol	Values (mm)
M	M 22 × 1 – 6H
X	14 to 17
T	3,5 to 4,3
Y	Min. 4,5
J	Min. 1,5

7.2 Regulators with external thread

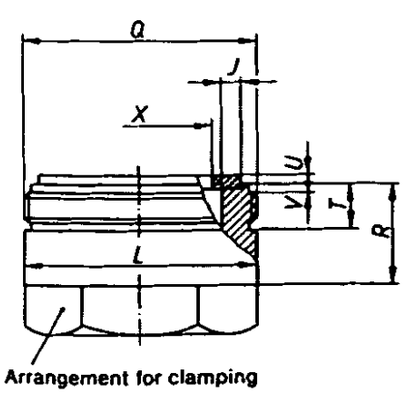


Figure 2: Regulator with external thread

Table 2: Regulators with external thread

Symbol	Values (mm)	
Q	M 24 × 1 – 6g	M 28 × 1 – 6g
X	14 to 17	15 to 19
T	4,5 ± 0,1	7 ± 0,1
R	Min. 9	Min. 14
U	$1\ ^{+0,5}_{0}$	$1\ ^{+0,5}_{0}$
L	$24\ ^{+0}_{-0,1}$	$28\ ^{+0}_{-0,1}$
V	0,8	0,8
J	Min. 2	Min. 2,5

3 Swivel flow rate regulators

The swivel joint/diverter head and swivel joint/regulator connections shall meet the requirements of tables 1 and 2.

There are two types of swivel flow rate regulators:

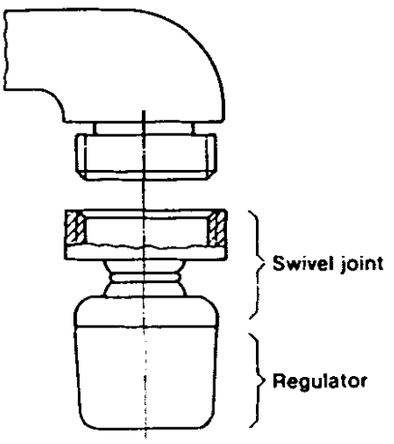


Figure 3: Regulator with swivel joint (type 1)

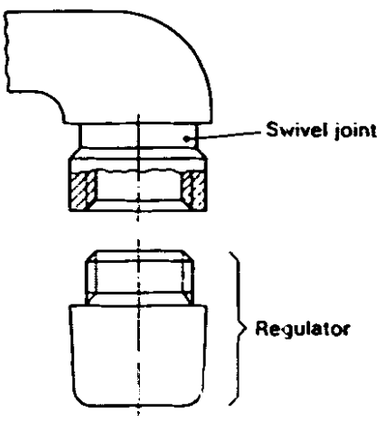


Figure 4: Swivel joint integral with diverter head (type 2)

Type 1: Swivel joint and flow rate regulator form a complete unit. The connection between swivel joint and diverter head shall meet the requirements of table 1 (internal thread) or table 2 (external thread).

Type 2: The swivel joint is independent of the flow rate regulator. In this case:

a) The flow rate regulator dimensions for the connection with swivel joint shall meet the requirements of table 1 (internal thread) or of table 2 (external thread).

b) The swivel joint dimensions for the connection with flow rate regulator shall meet the requirements of table 10 (for flow rate regulators with M 22 × 1 internal thread), or table 11 (for flow rate regulators with M 24 × 1 or M 28 × 1 external thread) of EN 200 (cf. Annex A).

8 Hydraulic properties

8.1 Flow rate

8.1.1 Requirements

Flow rate regulators are classed according to their nominal flow rate at a dynamic pressure of 0,3 MPa (3 bar), with the following tolerances:

Table 3: Flow rate of flow rate regulators

Class	Flow rate, in l/s	
	Nominal value	Tolerance
A	0,25	$0{,}225 \leq Q \leq 0{,}25$
S	0,33	$0{,}30 \leq Q \leq 0{,}33$
B	0,42	$0{,}38 \leq Q \leq 0{,}42$
C	0,50	$0{,}45 \leq Q \leq 0{,}50$
D	0,63	$0{,}58 \leq Q \leq 0{,}63$

The manufacturer is responsible for selecting the class.

NOTE: Flow rate regulators with flow rates lying outside these classes do not comply with this standard and cannot therefore be classified.

8.1.2 Test method

8.1.2.1 Assembly

Flow rate regulators shall be connected in accordance with the assembly specified for acoustic tests in ISO 3822-4, as shown in figure 5.

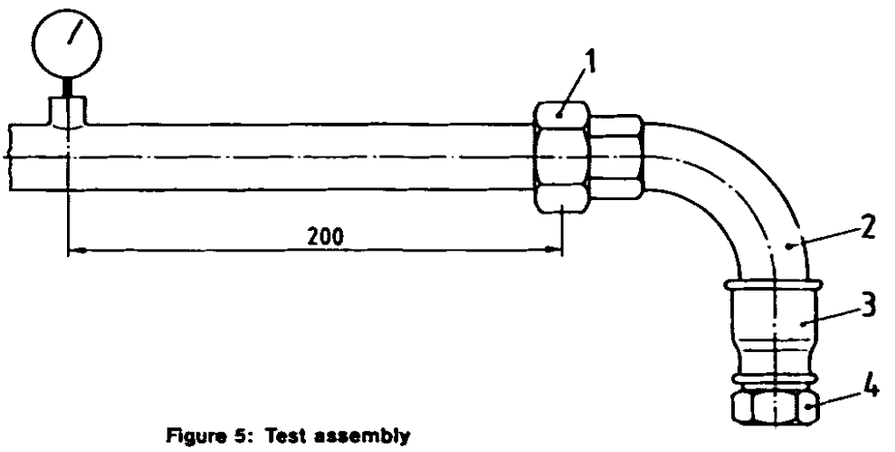


Figure 5: Test assembly

Key:

1 Galvanized union, taper seat 1, U 11, in accordance with ISO 49

2 Galvanized male long sweep bend 1, G 8, in accordance with ISO 49

3 Galvanized socket, 1 × ¾, M 2, in accordance with ISO 49

4 Copper-zinc adaptor in accordance with figures 6 and 7

These adaptors are of one of the following types:

a) Adaptor with external thread (A 3) for controlling M 22 flow rate regulators.

Table 4: Dimensions of A 3 adaptors

Designation	d_1	d_2	l_1	l_2	l_3
Adaptor ISO 3822 – A 3 – M 22 × 1	M 22 × 1	17	24	5	1,7

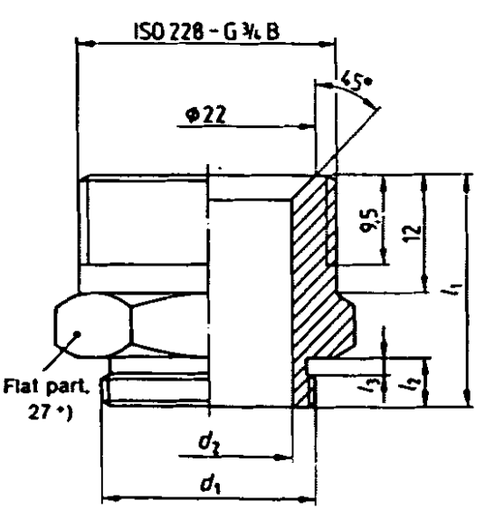


Figure 6: A 3 adaptor

) Adaptor with internal thread (A 4) for controlling M 24 and M 28 flow rate regulators.

Table 5: Dimensions of A 4 adaptors

Designation	d_1	d_2	d_3	l_1	l_2	l_3	Side faces*)
Adaptor ISO 3822 – A 4 M 24 × 1	M 24 × 1	24,5	17	25	8	1,7	27
Adaptor ISO 3822 – A 4 M 28 × 1	M 28 × 1	28,5	17	26	6	1,7	30

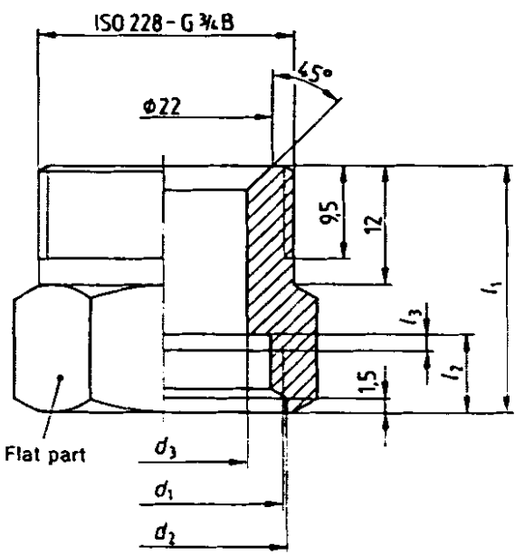


Figure 7: A 4 adaptor

8.1.2.2 **Test method**

– Fit the flow rate regulator on the adaptor 4 shown in figure 5.

– Open the supply circuit and adjust to the required pressure.

– Measure the flow rate when a stable and continuous flow is established.

NOTE: The test may be carried out for various supply pressures. In this case, draw a flow rate/pressure graph and use it to calculate the value of the flow rate at 0,3 MPa (3 bar).

8.2 Evaluation of the shape of flow

8.2.1 Flow rate regulators without aeration

At the regulator outlet, the flow shall basically be along the axis of the regulator and shall flow continuously over a length of 150 mm at the nominal flow rate for each class; it shall be neither flattened nor constricted, nor scattered to such an extent that splashing results. It shall remain compact in the pressure range between 0,05 MPa (0,5 bar) and 0,5 MPa (5 bar).

8.2.2 Flow rate regulators with aeration

At a dynamic pressure of 0,3 MPa (3 bar), the flow shall be regular and compact and visually shall exhibit regular and adequate aeration over a length of 150 mm. It shall remain full and aerated in the pressure range between 0,05 MPa (0,5 bar) and 0,5 MPa (5 bar).

8.3 Aeration of flow

8.3.1 Specification

It shall be possible to verify the good aeration of the flow for a minimum flow rate established on the basis of the regulator class, as given in table 6.*)

Table 6: Minimum flow rate

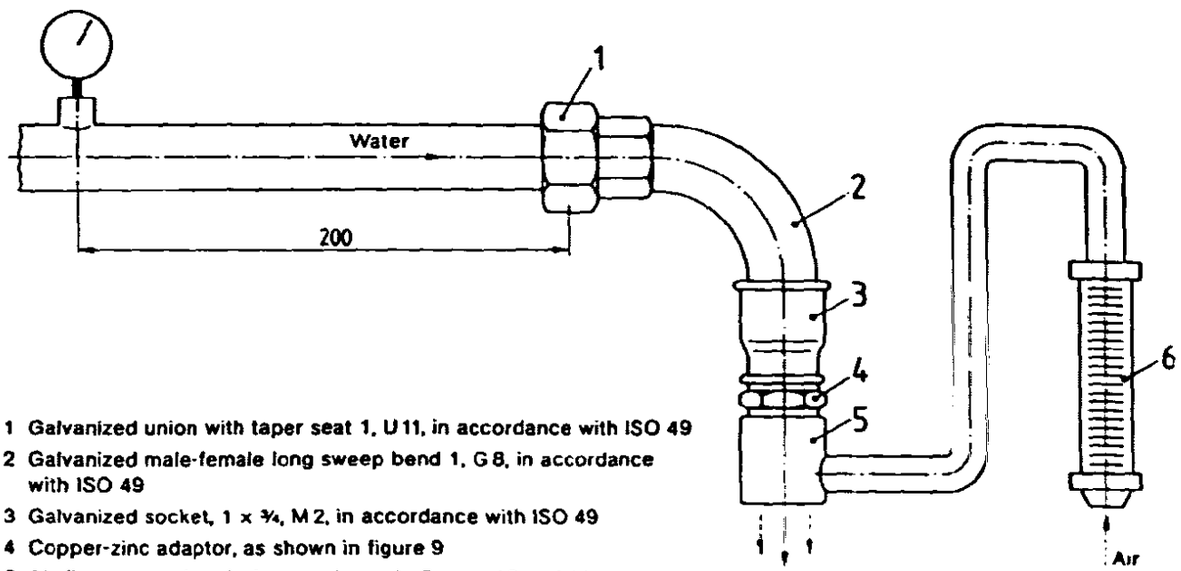
Regulator class	A	S	B	C	D
Flow rate, in l/s	0,07	0,087	0,10	0,125	0,14

For these minimum flow rates, the minimum air intake shall be $2{,}78 \times 10^{-3}$ l/s (≙ 10 l/h).

8.3.2 Test method for measuring air flow

8.3.2.1 Assembly

The test assembly shall be as shown in figure 8.



1 Galvanized union with taper seat 1, U 11, in accordance with ISO 49
2 Galvanized male-female long sweep bend 1, G 8, in accordance with ISO 49
3 Galvanized socket, 1 x ¾, M 2, in accordance with ISO 49
4 Copper-zinc adaptor, as shown in figure 9
5 Air-flow measuring device, as shown in figures 10 and 11
6 Flowmeter

Figure 8: Measurement of air flow

8.3.2.2 Procedure

- Fit the grille cage of the aerator into the air-flow measuring device (5).
- Open the water supply circuit and adjust the flow to the value corresponding to the class of aerator (table 6).
- Measure the air flow using the flowmeter (6), once a stable, continuous flow has been established.
- Verify that the requirements comply with subclause 8.3.1.

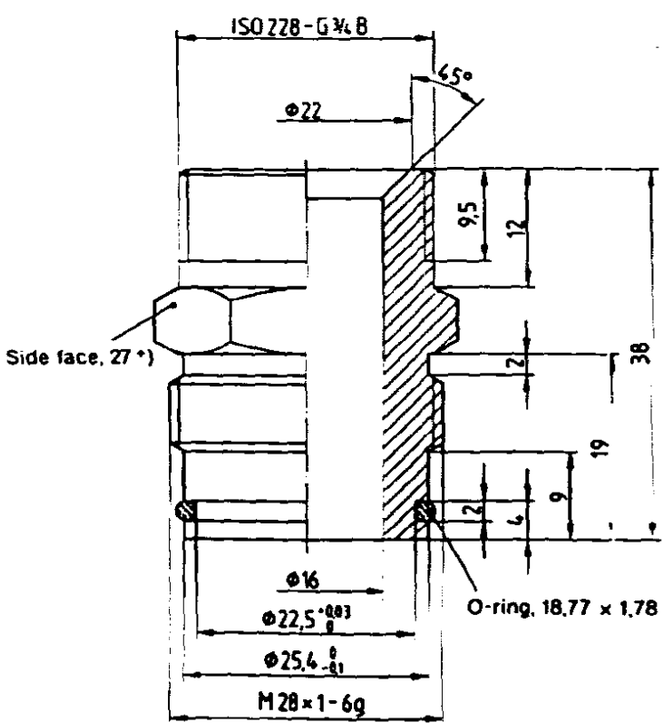


Figure 9: Adaptor for measuring air intake (cf. No. 4 in figure 8)

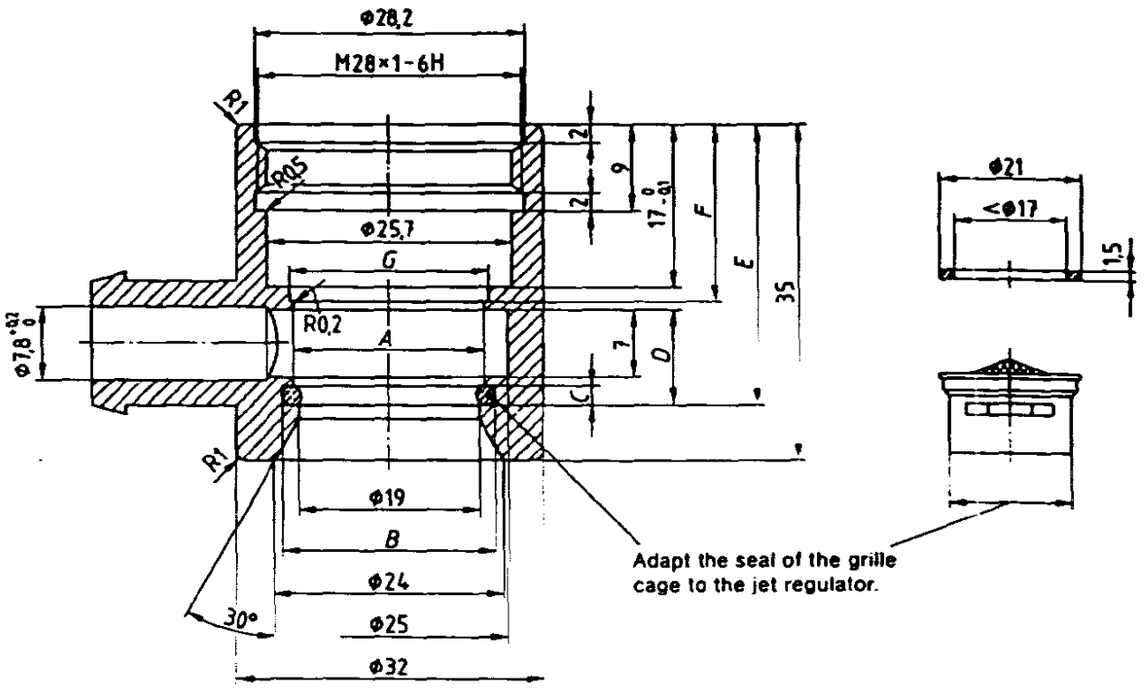


Figure 10: Device for measuring air intake for grille cages of M 22 × 1 and M 24 × 1 flow rate regulators

NOTE: The dimensions indicated by a letter shall be chosen according to the dimensions of the grille cage to be tested. For example, the following values can be used.

A = ø 20
B = ø 22,2 (−0,05)
C = 2
D = 10
E = 29,3 (−0,1)
F = 18,5 (−0,1)
G = ø 21 (−0,1)
O-ring, 18,77 × 1,78

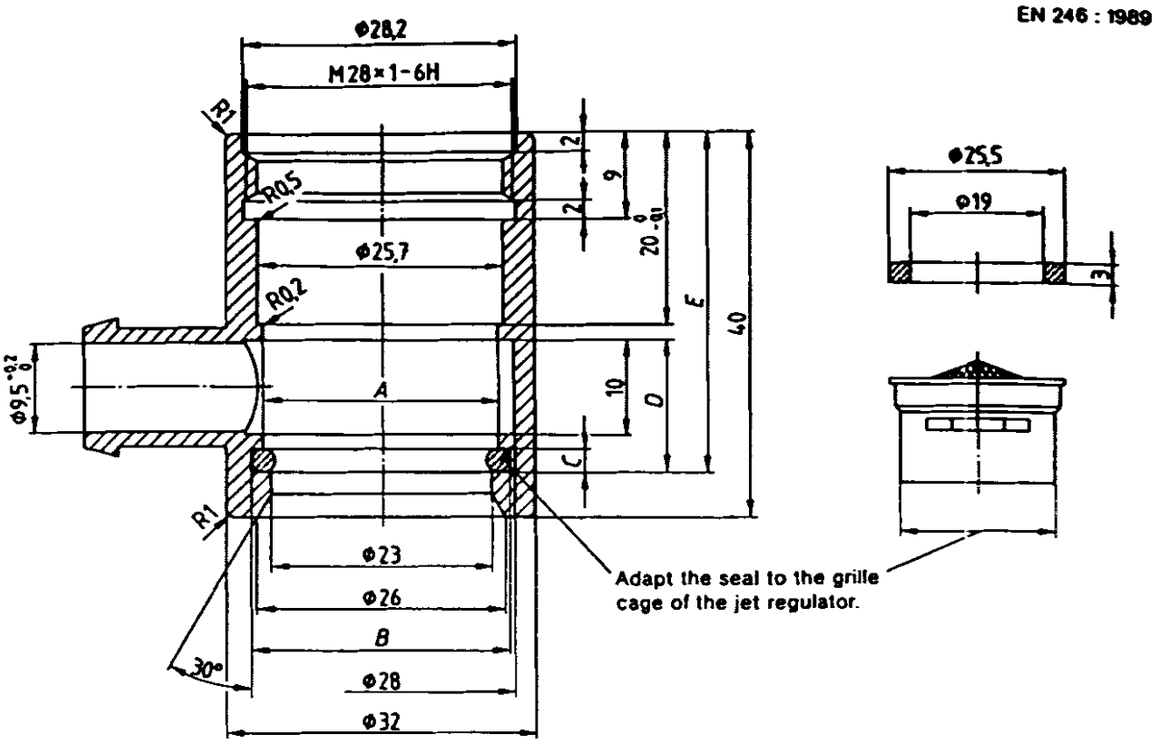


Figure 11: Device for measuring air intake on the grille cages of M 28 × 1 flow rate regulators

If, in the case of the specified type of grille cage, these dimensions differ from those given in figures 10 and 11, the manufacturer shall provide the test laboratory with a suitable adaptor.

NOTE: The dimensions indicated by a letter shall be chosen according to the dimensions of the grille cage to be tested.

For example, the following values can be used.

A = ø 24,5

B = ø 27,2 (–0,05)

C = 2,5

D = 14

E = 35,5 (–0,1)

O-ring, 23,3 × 2,4

9 Acoustic properties

9.1 Requirements

At 0,3 MPa (3 bar) the flow rate regulators should correspond to one of the following requirements:

$D_s \geq 30$ dB (A)

$L_{ap} \leq 15$ dB (A)

9.2 Test method

9.2.1 Assembly

Identical to that in subclause 6.1.2.1.

9.2.2 Procedure

The tests are carried out at a pressure of 0,3 MPa (3 bar), in accordance with ISO 3822-1 and 3822-4.

10 Marking

Flow rate regulators shall be marked on their outside indelibly with the following:

- name or mark of the manufacturer;
- indication of the flow rate class.

The flow rate class shall be indicated on the outside of the skirt of the grille cage, if this is detachable.

10.1 Flow rate regulators without air intake

In order to distinguish them from aerators, flow rate regulators without air intake shall additionally be marked with an X on the outside.

10.2 Swivel flow rate regulator

The marking shall be both on the swivel device and on the regulator.