User Guide OI/WMP/C/F-EN

WEDGE flow meter type WM
Differential pressure – primary flow element

Introduction

WEDGE™ flow elements utilize V-shaped restrictions to produce a square root relationship between differential pressure and volumetric flow. Elements are designed for either clean or dirty service and are offered in various materials, pipe sizes, and pressure ratings. The differential pressure is measured by a differential pressure transmitter. Various process connections on the WEDGE are provided for either pneumatic or electronic transmitters or other differential pressure sensing devices. Wedge meters can be flow calibrated and supplied with a factory calibration report, this includes calculations for the user's process when such data is supplied. The differential pressure measurement is used to calculate flow using a standard wedge flow equation.

Contents

1 Safety

Information in this manual is intended only to assist our customers in the efficient operation of our equipment. Use of this manual for any other purpose is specifically prohibited and its contents are not to be reproduced in full or part without prior approval of the Technical Publications Department.

1.1 Health & Safety

Health and Safety

To ensure that our products are safe and without risk to health, the following points must be noted:

- The relevant sections of these instructions must be read carefully before proceeding.
- Warning labels on containers and packages must be observed.
- Installation, operation, maintenance and servicing must only be carried out by suitably trained personnel and in accordance with the information given.
- Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and / or temperature.
- Chemicals must be stored away from heat, protected from temperature extremes and powders kept dry. Normal safe handling procedures must be used.
- When disposing of chemicals ensure that no two chemicals are mixed.

Safety advice concerning the use of the equipment described in this manual or any relevant Material Safety datasheets (where applicable) may be obtained from the Company address on the back cover, together with servicing and spares information.

1.2 Electrical safety – CEI / IEC 61010-1:2001-2

This equipment complies with the requirements of CEI / IEC 61010-1:2001-2 'Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use' and complies with US NEC 500, NIST and OSHA.

If the equipment is used in a manner NOT specified by the Company, the protection provided by the equipment may be impaired.

1.3 Symbols – CEI / IEC 61010-1:2001-2

One or more of the following symbols may appear on the equipment labelling:

	Protective earth (ground) terminal.
	Functional earth (ground) terminal.
	Direct current supply only.
	Alternating current supply only.
	Both direct and alternating current supply.
	The equipment is protected through double insulation.
	This symbol, when noted on a product, indicates a potential hazard which could cause serious personal injury and / or death. The user should reference this instruction manual for operation and / or safety information.
	This symbol, when noted on a product enclosure or barrier, indicates that a risk of electrical shock and / or electrocution exists and indicates that only individuals qualified to work with hazardous voltages should open the enclosure or remove the barrier.
	This symbol indicates that the marked item can be hot and should not be touched without care.
	This symbol indicates the presence of devices sensitive to electrostatic discharge and indicates that care must be taken to prevent damage to them.
	This symbol identifies a risk of chemical harm and indicates that only individuals qualified and trained to work with chemicals should handle chemicals or perform maintenance on chemical delivery systems associated with the equipment.
	This symbol indicates the need for protective eye wear.
	This symbol indicates the need for protective hand wear.
	Electrical equipment marked with this symbol may not be disposed of in European public disposal systems. In conformity with European local and national regulations, European electrical equipment users must now return old or end-of-life equipment to the manufacturer for disposal at no charge to the user.

	Products marked with this symbol indicates that the product contains toxic or hazardous substances or elements. The number inside the symbol indicates the environmental protection use period in years.

1.4 Pressure equipment safety

Warning.

- The pressure equipment described in this manual is supplied, where appropriate, in accordance with the European Directive 97/23/EC and is designed to work in pressurized systems. Take care when installing all equipment and follow the instructions given. Failure to do this could result in damage to equipment and create possible hazards to operators and other equipment. Only use the equipment on the process for which it is designed. Install the equipment into a system that has been designed to allow for venting or draining of the process. For the necessary safety requirements refer to the appropriate instructions in this manual.
- Do not exceed the pipe vibration levels stated in the datasheet. Excessive vibration could result in damage to the equipment and create possible hazards to other equipment and operators.

1.5 User guidelines

Correct use includes the following:

- Operation within the technical limit values.
- Observing and following the information provided on permissible media (fluids).
- Observing and following the instructions provided in the operating manuals.
- The following uses are not permitted:
  - Operation as a flexible adaptor in piping; for example, to compensate for pipe offsets, pipe vibrations and/or pipe expansions.
  - Use as a climbing aid; for example, for assembly purposes.
  - Use as a support for external loads; for example, as a support for piping.
  - Material gain; for example, by painting over the type plate or welding or soldering on parts.
  - Repairs, modifications, supplements or the installation of spare parts. These are permitted only if performed as described in the operating manual. More extensive work must be approved by ABB – the Company accepts no liability for unauthorized work.

The operating, maintenance and repair conditions that are stated in this manual must be observed. The Company accepts no liability for damage caused by usage that is incorrect or unprofessional.

1.6 Permissible process media (fluids)

Process media may be used only if:

- It can be assured that the physical and chemical properties of the pressure-bearing materials that come into contact with the process medium are not reduced from that required for operational safety, during the expected lifetime of the equipment.
- Process media with unknown properties for erosion and/or corrosion may be used only if the operator can perform regular and suitable tests to assure the safe condition of the equipment.

1.7 Technical limit values

The equipment is intended for use only within the technical limit values specified on the data plate and in the datasheet, including those for:

- The maximum working pressure.
- The maximum and minimum operating temperatures.
- The maximum vibration level stated in the datasheet.

In addition, all connected pipework must be installed as it was designed, to ensure that there is no possibility of leakage or any undue stresses or strain acting upon it.

1.8 Safety precautions

Instructions and procedures in this manual may require special precautions to ensure the safety of personnel performing the operations. Explosions could result in death or serious injury; therefore refer to the **Warnings** in the transmitter Operating Instructions before performing any operation in this manual.

1.9 Potential safety hazards

The following potential safety hazards are associated with operating the system:

- Electrical (line voltage)
- Product weight

2 Introduction

2.1 General

The WEDGE elements are available with up to six different standard WEDGE ratios to provide the required differential pressures over a wide range of flow rates. The WEDGE ratio is defined as H/D where H is the WEDGE opening height and D is the nominal pipe diameter.

The WEDGE restriction is V-shaped at an optimum angle to give the best possible characteristics when measuring viscous fluids. The element will handle applications where the pipe Reynolds number is as low as 500 (well into the laminar flow zone) and as high as several million. This makes the element well suited to gas or steam flow measurement.

The area of unrestricted flow of the wedge meter is determined by different height/diameter ratios thus defining the differential range produced with respect to the fluid flow range. This height/diameter ratio equals the height of the opening under restriction divided by the internal pipe diameter.

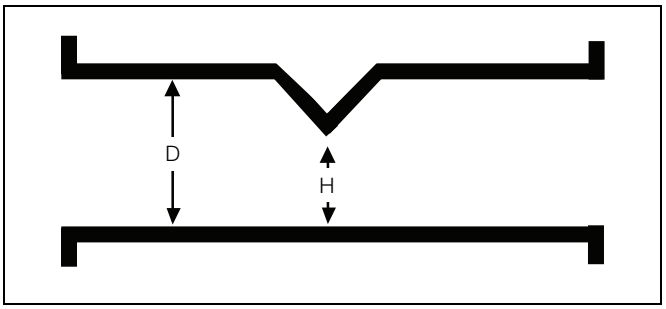

Fig. 2.1 WEDGE element cross-section view

2.2 Model WMP – Clean Service

The WMP WEDGE flow element is designed for in-line mounting and has a flanged-style body with various taps for the connection of transmitter impulse lines. This model is well suited for gas and steam applications as well as clean liquids. Refer to the datasheet for physical and performance specifications and ordering information.

Fig. 2.2 Model WMP Wedgemeter

2.3 Models WMF and WMC – dirty service

These WEDGE flow elements are offered in a flanged body style and are designed for use with remote seal pressure transmitters. Application of this model is recommended for use on difficult to measure slurries and fluids with high solid content that are prone to plugging or have high erosion factors. In addition, these models may also be used where it is necessary to contain hazardous materials within the process piping or where process temperatures exceed the limits of a conventional direct-connect transmitter. Remote seal connections are offered in both flanged and chemical tee type seal designs. Selection of the seal design is typically based on process conditions. The WMF and WMC are generally suited for fluids with a high solid content and abrasive properties since the seal is raised up and eliminates erosive effects of the process on the diaphragm surface. The chemical tee type is more suited for processes that tend to plug since the diaphragm face is flush with the pipe ID, and allows free passage of materials without buildup in the seal area. Refer to the datasheet for physical and performance specifications and ordering information.

Fig. 2.3 Model WMC chemical tee tapping Wedgemeter

Fig. 2.4 Model WMF flanged tapping Wedgemeter

2.4 Accuracy

Pipe size (inches)	WEDGE ratio (H/D)	Accuracy in % of flow rate	
		Water calibrated in factory flow lab *	Uncalibrated
1/2	0.2, 0.3, 0.4, 0.5	+ 0.75%	+ 5%
1 and 1 1/2	0.2, 0.3, 0.4, 0.5	+ 0.5%	+ 5%
2 and 3	0.2, 0.3, 0.4, 0.5	+ 0.5%	+ 5%
4 to 24	0.3, 0.4, 0.5, 0.6, 0.7	+ 0.5%	+ 5%

* Refer to calibration report supplied with each calibrated instrument

Table 2.1 Models WMP, WMF and WMC

2.5 Maximum working pressure

Flanged element – maximum working pressure is that of flange rating per ANSI B16.5, except WMC with chemical tee transmitter connections that may not exceed 300 psi or flange rating, whichever is the lower.

2.6 Maximum working temperature

all models

Dependent upon wetted material and gasket material.

3 Installation

3.1 Selecting a mounting location

A horizontal installation is recommended for all WEDGE elements rotated 45° to approximately 90° along the pipe center line as shown in Fig. 3.1. This method of mounting allows for free passage of solids and eliminates air entrapment at the transmitter connection. Other positions are acceptable provided proper venting of the transmitter is accomplished and differences in lead line elevations are considered. For clean liquid service, taps locations are suggested to be below the pipe centerline. For dirty liquid service, service taps should be positioned such that all are self draining, (ie: triple taps units will be at the 3, 9, and 12 o'clock position). Dirty liquid service can be any process where the fluid may settle, cake or set up within the tap chambers. Examples of dirty liquid service are waste streams, coke slurries, black liquor, fluids with high particulates and the like. Vertical installations as shown in Fig. 3.2 may introduce a slight hydrostatic head effect which must be considered when zeroing the transmitter – see Section 5, page 15.

3.2 Straight pipe run requirements

As with most flow elements, proper operation and performance is dependent on the required lengths of unrestricted upstream and downstream piping. The recommended minimum length of the upstream side of the WEDGE flow element depends on the type of fitting at the end of the straight run, and the pipe configuration. Minimum upstream and downstream lengths are shown in Table 3.1. The minimum lengths will cause a slight Kd^2 shift.

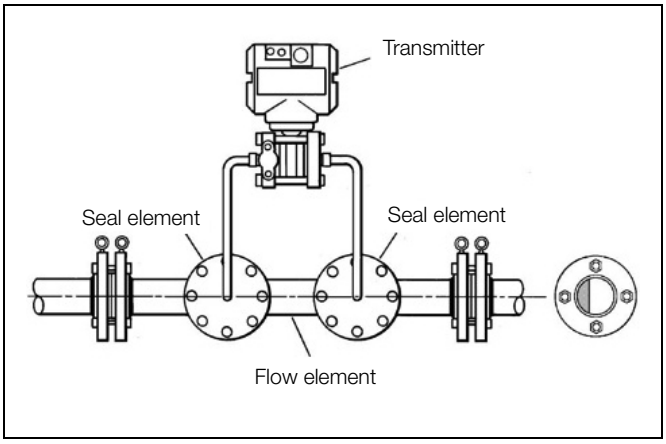

Fig. 3.1 Typical remote seal WEDGE horizontal installation

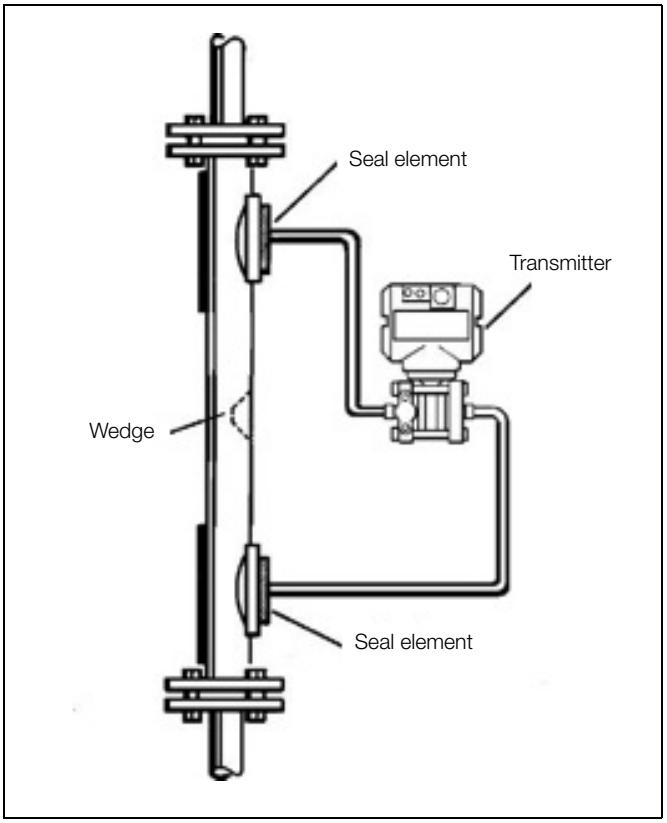

Fig. 3.2 Typical chemical tee vertical installation

Fittings	Recommended		Minimum	
	Upstream	Downstream	Upstream	Downstream
3 Elbows close coupled	15D	5D	15D	3D
2 Elbows close coupled out of plane	10D	5D	10D	3D
2 Elbows close coupled in plane	10D	5D	5D	3D
1 Elbow	10D	5D	5D	3D
Tee-bull plugged	10D	5D	5D	3D
Tee-run plugged	10D	5D	5D	3D
Tee-flow in bull and run	10D	5D	5D	3D
Y-Run plugged	10D	5D	5D	3D
Concentric reducer	10D	5D	5D	3D
Concentric expander	10D	5D	5D	3D
Partially open gate valve	10D	5D	10D	3D

* Based on testing conducted in the flow calibration laboratory.

Measured from apex of wedge element.

*Table 3.1 Straight pipe length requirements from various flow obstructions **

3.3 Installation and differential pressure connections

Warning. Never exceed the maximum pressure or temperature recommended for the measured process. Exceeding proper pressure or temperature ratings can lead to personal injury or equipment damage. The process piping flanges for installation should be identical as called out in the serial number on the data plate. The process temperature and pressure should never exceed the ratings for the element stamped on the data plate.

3.3.1 General

Before installation of any WEDGE element inspect for damage; particularly at sealing surfaces. Any damage should be reported to as soon as possible. Also check the data plate to ensure that the stamped ratings match the process conditions of the pipeline in which it will be installed. Each flow element has a data plate attached with an arrow indicating the required direction of flow. Failure to properly orientate the WEDGE element according to the direction of flow may result in improper results when using data supplied for an element that has been calibrated.

3.3.2 Line installation

All WEDGE flow elements require a gasket between the process line connection and the mating flange. Select gaskets that are able to withstand the maximum process temperature and pressure and to resist corrosive attack from the process itself. End gaskets and gaskets for the WMF flanged seal are **not** provided by ABB as standard (they are available as an option).

To provide safe installation, it is important that the pipeline flanges be suitable for the temperature and pressure of the measured process. When completing the bolting process, be sure that the gaskets are properly centered so that protrusion into the pipe opening is minimized.

Misalignment may cause added flow turbulence, however performance affects are typically minimal depending upon the application. Bolt the element in line with suitable hardware using recommended bolt torques for the type and class rating of the flanges.

3.3.3 Differential pressure connections

The high pressure connection is always on the upstream side of the flow direction arrow and the low pressure connection on the downstream side. Fittings used must be able to withstand the process temperature and pressure conditions as well as provide proper corrosion resistance. Refer to the appropriate transmitter manual for connections to the transmitter high and low ports.

The WMF flanged seals require a backup flange rated for the same type and class as that on the WEDGE element. Backup flanges with bolts and nuts are generally offered as an option to the transmitter and are not supplied with the WEDGE element. Again, observe recommended torque specifications for the type and class being used.

Model WMC wedge meters with chemical tee type seals are supplied with the seal mounting hardware and gaskets. Do not substitute the type of cap screws or gaskets supplied as injury may result due to improper installation. Refer to Fig. 3.3 for the identification code of mounting screws. When installing chemical tee seals, tighten caps screws uniformly and avoid excessive tightening of one while others are loose. Final torque values are dependent on selected temperature rating of the WEDGE as two different gaskets are employed.

Final torque values for Model WMC chemical tee connections are:

204°C (400°F) maximum temperature

Garlock Gylon® 3500 gasket 9.65-10.34 bar (–140–150 inch/pounds)

340°C (645°F) maximum temperature

Graphite gasket 7.58-8.27 bar (– 110–120 inch/pounds)

Torque all other models per ANSI flange ratings.

Warning. Do not exceed specified torque!

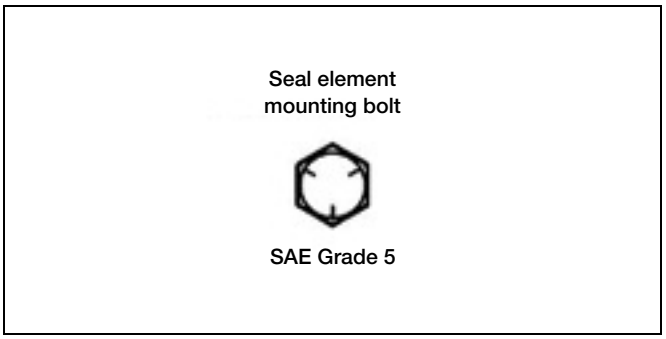

Fig. 3.3 Mounting bolt identification

3.3.4 Pipe connections

Tighten the flange bolts in a 'star' pattern as shown in Fig. 3.4 to avoid localized stresses on the gaskets.

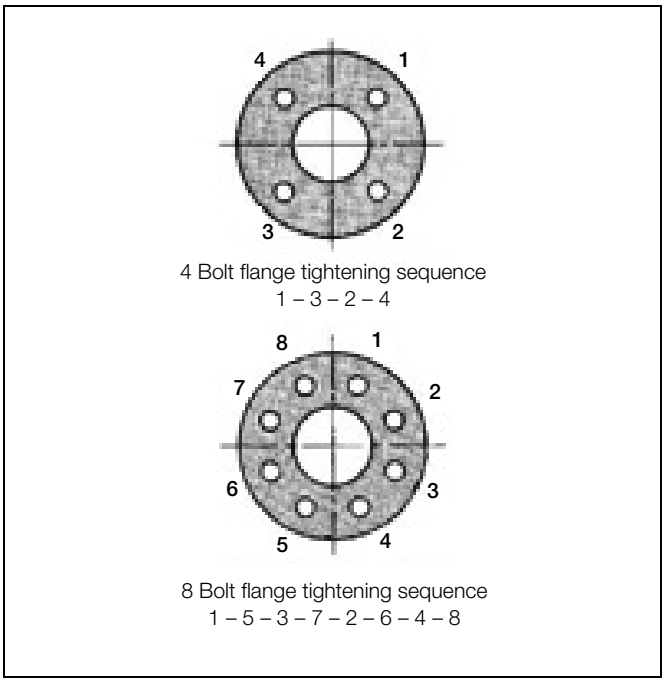

Fig. 3.4 Flange bolt tightening pattern

4 Mounting dimensions

4.1 Model WMF with flanged tapping connection

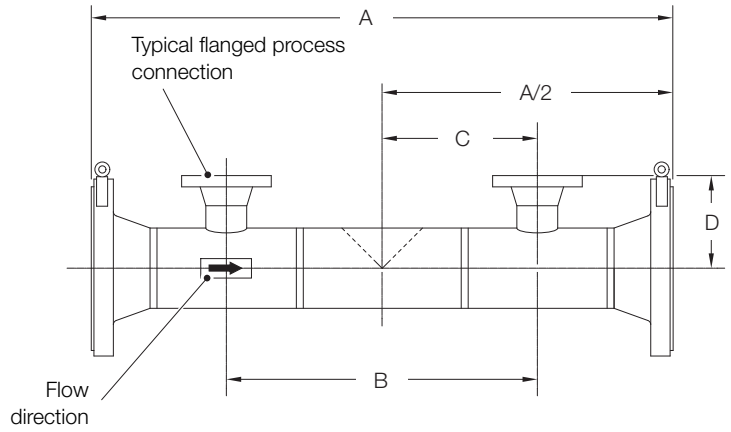

Fig. 4.1 Model WMF with RFWN end flanges – sizes 40, 50, 80 mm (1½, 2 and 3 in.)

Pipe size mm (in.)	A [±4.58] (±0.18)			B	C	D			Approximate weight kg (lbs)		
	Flange rating					Flange rating			Flange rating		
	150	300	600			150	300	600	150	300	600
40 (1.5)	530 (20.86)	543 (21.37)	559 (22)	292 (11.5)	146 (5.75)	207 (8.18)	214 (8.43)	212 (8.37)	25 (55)	28 (61)	32 (71)
50 (2)	546 (21.5)	559 (22)	577 (22.75)	292 (11.5)	146 (5.75)	216 (8.5)	222 (8.75)	231 (9.12)	28 (62)	32 (70)	38 (84)
80 (3)	645 (24.5)	641 (25.25)	660 (26)	311 (12.25)	155 (6.13)	155 (6.13)	166 (6.56)	175 (6.88)	35 (78)	42 (92)	46 (102)

Table 4.1 Model WMF with RFWN end flanges – sizes 40, 50, 80 mm (1½, 2 and 3 in.)

Note. Slip on, full face and RTJ flange connection are also available. Contact ABB for length details.

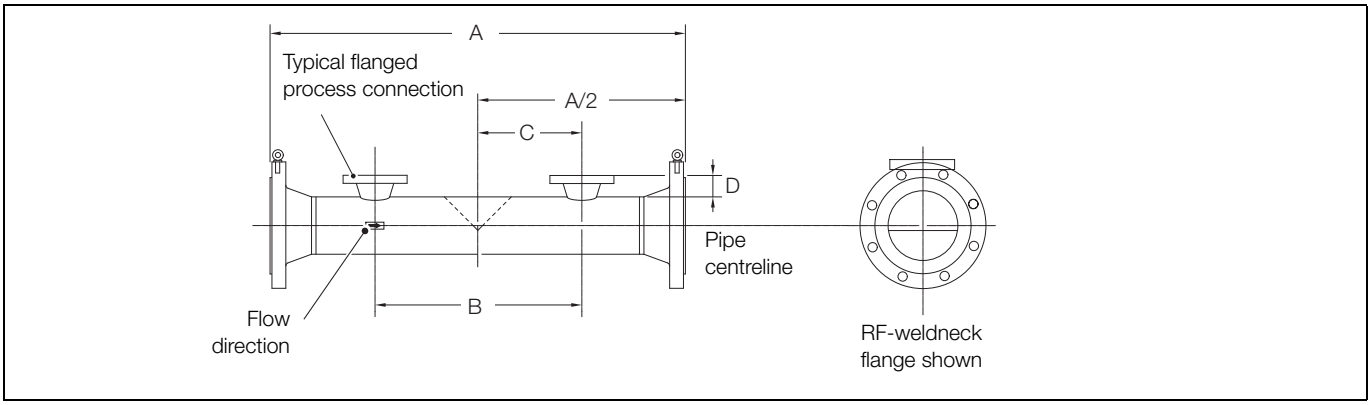

Fig. 4.2 Model WMF with RFWN end flanges – sizes 100 to 600 mm (4 to 24 in.)

Pipe size mm (in.)	**A** [±6.35] (±0.25) Flange rating			**B**	**C**	**D Max (Ref)** Flange rating			**Approximate weight kg (lbs)** Flange rating		
	150	**300**	**600**			**150**	**300**	**600**	**150**	**300**	**600**
101 (4)	901 (35.5)	920 (36.25)	990 (39)	381 (15)	190 (7.5)	70 (2.75)	79 (3.12)	89 (3.5)	3429 (135)	3810 (150)	4445 (175)
152 (6)	1028 (40.5)	1047 (41.25)	1098 (43.25)	457 (18)	228 (9)	70 (2.75)	79 (3.12)	89 (3.5)	4064 (160)	5334 (210)	6858 (270)
203 (8)	1092 (43)	1111 (43.75)	1168 (46)	521 (20.5)	260 (10.25)	70 (2.75)	79 (3.12)	89 (3.5)	5334 (210)	6731 (265)	9271 (365)
254 (10)	1143 (45)	1174 (46.25)	1257 (49.5)	597 (23.5)	298 (11.75)	70 (2.75)	79 (3.12)	89 (3.5)	6858 (270)	8763 (345)	13335 (525)
305 (12)	1321 (52)	1352 (53.25)	1416 (55.75)	673 (26.5)	336 (13.25)	70 (2.75)	79 (3.12)	89 (3.5)	8890 (350)	10160 (400)	
355 (14)	1397 (55)	1428 (56.25)	1485 (58.5)	736 (29)	356 (14)	70 (2.75)	79 (3.12)	89 (3.5)	10414 (410)	15494 (610)	
406 (16)	1473 (58)	1511 (59.5)	1587 (62.5)	775 (30.5)	387 (15.25)	70 (2.75)	79 (3.12)	89 (3.5)	12700 (500)	19177 (755)	
457 (18)	1574 (62)	1613 (63.5)	1676 (66 00)	851 (33.5)	413 (16.75)	70 (2.75)	79 (3.12)	89 (3.5)	12700 (500)	22098 (870)	
508 (20)	1686 (66.37)	1720 (67.75)	1790 (70.5)	940 (37)	470 (18.5)	70 (2.75)	79 (3.12)	89 (3.5)	17780 (700)	27940 (1100)	
610 (24)	1854 (73)	1886 (74.25)	1968 (77.5)	1066 (42)	533 (21)	70 (2.75)	79 (3.12)	89 (3.5)	24257 (955)	33274 (1310)	

Table 4.2 Model WMF with RFWN end flanges – sizes 100 to 600 mm (4 to 24 in.)

Note. Slip on, full face and RTJ flange connection are also available. Contact ABB for length details.

4.2 Model WMC chemical tee connections with SO end flanges – sizes 15 to 80 mm (1/2 to 3 in.)

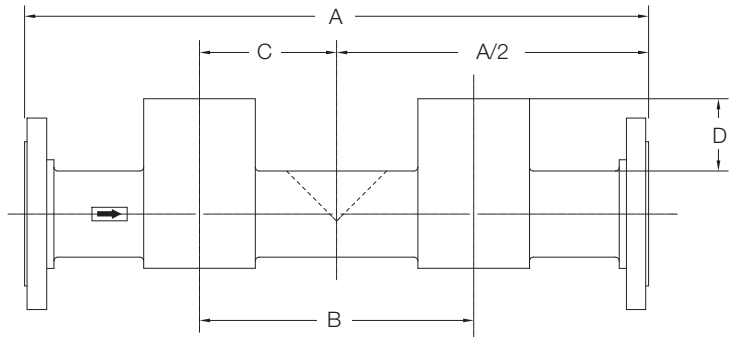

Fig. 4.3 Model WMC with chemical tee connection – sizes 15 to 80 mm (1/2 to 3 in.)

Pipe size mm (in.)	A [±3.3] (±0.13)	B	C	D	Approximate weight kg (lbs)		
					Flange rating		
					150	300	600
15 (0.5)	457 (18)	165 (6.5)	82.5 (3.25)	25 (1)	10 (23)	10 (23)	10 (23)
25 (1)	482 (19)	179 (7.06)	90 (3.53)	38 (1.5)	11.8 (26)	13 (29)	13.6 (30)
40 (1/2)	508 (20)	203 (8)	101 (4)	47 (1.86)	19.5 (43)	22 (49)	23 (51)
50 (2)	533 (21)	213 (8.38)	106 (4.19)	57 (2.25)	23 (51)	25 (55)	27 (59)
80 (3)	609 (24)	263 (10.35)	131 (5.19)	70 (2.75)	31 (69)	36 (79)	38 (84)

Table 4.3 Model WMC with chemical tee connection – sizes 15 to 80 mm (1/2 to 3 in.)

4.3 Model WMC with chemical tee tapping connections and RFWN end flanges – sizes 100 to 600 mm (4 to 24 in.)

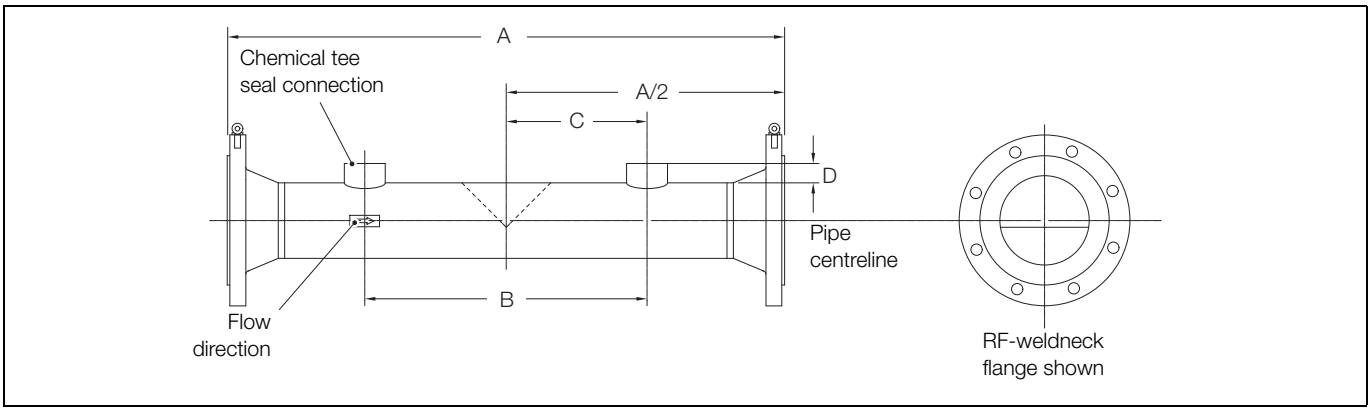

Fig. 4.4 Model WMC with chemical tee tapping connections and RFWN end flanges – sizes 100 to 600 mm (4 to 24 in.)

Pipe size mm (in.)	**A** [±6.35] (±0.25)			**B**	**C**	**D**	Approximate weight kg (lbs)		
	Flange rating						Flange rating		
	150	**300**	**600**				**150**	**300**	**600**
100 (4)	901 (35.5)	920 (36.25)	965 (38)	381 (15)	190 (7.5)	24 (0.94)	29 (65)	34 (75)	50 (110)
150 (6)	1028 (40.5)	1047 (41.25)	1098 (43.25)	457 (18)	228 (9)	24 (0.94)	41 (90)	59 (130)	88 (195)
200 (8)	1092 (43)	1111 (43.75)	1168 (46)	521 (20.5)	260 (10.25)	24 (0.94)	52 (115)	79 (175)	129 (285)
250 (10)	1143 (45)	1174 (46.25)	1257 (49.5)	597 (23.5)	298 (11.75)	24 (0.94)	75 (165)	127 (280)	204 (450)
300 (12)	1321 (52)	1352 (53.25)	1416 (55.75)	673 (26.5)	336 (13.25)	24 (0.94)	106 (235)	172 (380)	
350 (14)	1397 (55)	1428 (56.25)	1485 (58.5)	711 (28)	356 (14)	24 (0.94)	140 (310)	283 (625)	
400 (16)	1473 (58)	1511 (59.5)	1587 (62.5)	775 (30.5)	387 (15.25)	24 (0.94)	186 (410)	290 (640)	
450 (18)	1574 (62)	1613 (63.5)	1676 (66 00)	851 (33.5)	413 (16.75)	24 (0.94)	227 (500)	367 (810)	
500 (20)	1686 (66.37)	1720 (67.75)	1790 (70.5)	940 (37)	470 (18.5)	24 (0.94)	286 (630)	456 (1005)	
600 (24)	1854 (73)	1886 (74.25)	1968 (77.5)	1066 (42)	533 (21)	24 (0.94)	395 (870)	539 (1190)	

Table 4.4 Model WMC chemical tee tapping connection with RFWN end flanges – sizes 100 to 600 mm (4 to 24 in.)

4.4 Model WMP with RFWN end flanges – sizes 50 to 150 mm (2 to 6 in.)

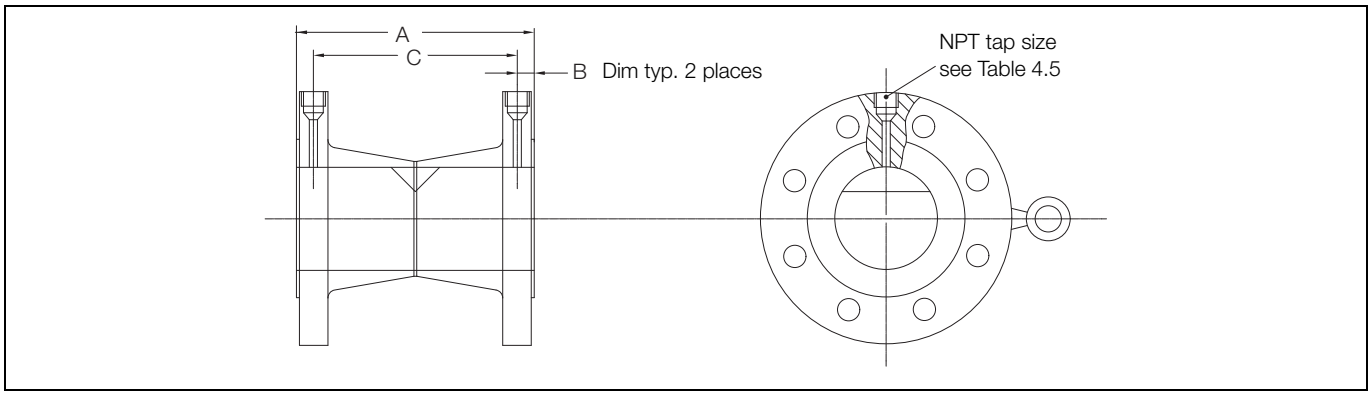

Fig. 4.5 Model WMP with RFWN end flanges – sizes 50 to 150 mm (2 to 6 in.)

Pipe size mm (in.)	A			B			C			NPT tap size (in.)			Approximate weight kg		
	Flange rating			Flange rating			Flange rating			Flange rating			Flange rating		
	150	300	600	150	300	600	150	300	600	150	300	600	150	300	600
50.8 (2)	127 (5.00)	171 (6.75)	171 (6.75)	11 (0.44)	24 (0.94)	24 (0.94)	105 (4.13)	124 (4.87)	124 (4.87)	1/4	1/2	1/2	6.3 (14)	12.2 (27)	16 (36)
76 (3)	140 (5.50)	178 (7.00)	178 (7.00)	13 (0.52)	24 (0.94)	24 (0.94)	112 (4.44)	130 (5.12)	130 (5.12)	3/8	1/2	1/2	11 (25)	10.4 (23)	23.5 (52)
101 (4)	190 (7.50)	222 (8.75)	254 (10.00)	12.7 (0.50)	24 (0.94)	24 (0.94)	165 (6.50)	174 (6.87)	206 (8.12)	3/8	1/2	1/2	16 (35)	24 (66)	34 (76)
152 (6)	254 (10.00)	276 (10.87)	323 (12.75)	14 (0.56)	24 (0.94)	24 (0.94)	223 (8.80)	228 (9.00)	174 (6.87)	3/8	1/2	1/2	24.5 (54)	48 (106)	50 (110)

Table 4.5 Model WMP with RFWN end flanges – sizes 50 to 150 mm (2 to 6 in.)

Note. Slip on, full face and RTJ flange connection are also available. Contact ABB for length details.

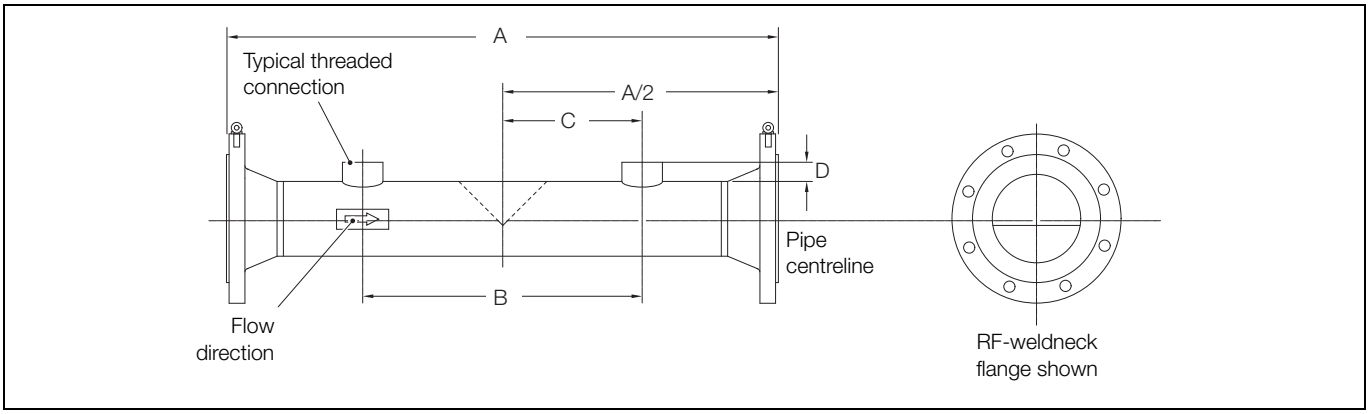

Fig. 4.6 Model WMP with RFWN end flanges – sizes 200 to 600 mm (8 to 24 in.)

Pipe size mm (in.)	**A** [±6.35] (±0.25)			**B**	**C**	**D**	**Approximate weight kg (lbs)**		
	Flange rating						**Flange rating**		
	150	**300**	**600**				**150**	**300**	**600**
200 (8)	1092 (43)	1111 (43.75)	1168 (46)	520 (20.5)	260 (10.25)	24 (0.94)	52 (115)	79 (175)	129 (285)
250 (10)	1143 (45)	1174 (46.25)	1257 (49.5)	597 (23.5)	298 (11.75)	24 (0.94)	75 (165)	127 (280)	204 (450)
300 (12)	1320 (52)	1352 (53.25)	1416 (55.75)	673 (26.5)	336 (13.25)	24 (0.94)	107 (235)	172 (380)	
350 (14)	1397) (55)	1428 (56.25)	1485 (58.5)	711 (28)	356 (14)	24 (0.94)	140 (310)	283 (625)	
400 (16)	1473 (58)	1511 (59.5)	1587 (62.5)	775 (30.5)	387 (15.25)	24 (0.94)	186 (410)	290 (640)	
450 (18)	1575 (62)	1612 (63.5)	1676 (66)	851 (33.5)	425 (16.75)	24 (0.94)	226 (500)	367 (810)	
500 (20)	1676 (66.37)	1720 (67.75)	1790 (70.5)	940 (37)	470 (18.5)	24 (0.94)	286 (630)	455 (1005)	
600 (24)	1854 (73)	1886 (74.25)	1968 (77.5)	1066 (42)	533 (21)	24 (0.94)	394 (870)	539 (1190)	

Table 4.6 Model WMP with RFWN end flanges – sizes 200 to 600 mm (8 to 24 in.)

Note. Slip on, full face and RTJ flange connection are also available. Contact ABB for length details.

5 Start-Up

5.1 Operation

Before any true zero reading can be taken it is necessary to establish that the process pipe and flow element is completely purged and there is no flow. A shutoff valve or control valve downstream of the element will facilitate this condition. Opening the valve for a short period of time will remove any gases that are present in the system. In the case of the Model WMP pipe tap WEDGE, it is necessary to purge air from the transmitter body by opening the vent valves on the high and low side flanges. Any air present in the transmitter body will result in a false zero reading.

5.1.1 Zero check

With the flow element under full line pressure, at normal operating temperature, and at zero flow, the transmitter zero can be adjusted to an exact reading on the readout device. If possible, open the downstream valve for a few seconds and close it. The output should return to a zero reading. If it does not, readjust the zero screw on the transmitter. Repeat this procedure two or three times to establish a true zero.

5.1.2 Span check

In most cases, it will not be possible to check for the correct span as this would require a field calibration. The transmitter may be calibrated at the factory if ordered to agree with the calibration and/or calculation of the WEDGE flow element.

Note. A calibration report is supplied with each WEDGE flow element that is flow laboratory calibrated. Check that the calculated differential of the flow element agrees with the differential span of the transmitter. If it does not, it will be necessary to recalibrate the transmitter.

5.2 Accuracy

All WEDGE flow elements that are calibrated in the factory flow laboratory are calibrated to within 0.5% of the flow rate ($^1/_2$ inch size WEDGE meters are 0.75%). The accuracy of uncalibrated elements may be up to 5% of flow rate, depending upon the type of element, pipe size, and WEDGE ratio (see Section 2.4, page 5). Additional errors will be evident if the process fluid density defers from the designed value. Also, the same will be true if improper upstream pipe conditions exist. The percent errors given do not include the inherent errors of the transmitter which are normally very small until flow rates fall below 30% of maximum flow (9% of maximum differential pressure).

6 Maintenance

6.1 Removing element from service

Warning. Process pressure and material retained in the flow element can cause injury and damage to equipment. Standard plant safety procedures must be followed when removing the element from service.

The WEDGEMETER has no moving parts that require servicing. Removal of the wedge element is generally not required other than for normal maintenance cleaning of process lines. Before removal, shut off all process flow and pressure, and drain lines if possible before loosening any bolts. Disconnect transmitter connections and remove impulse lines or remote seal elements. Loosen and disconnect element line connections and remove from process pipe line.

6.2 Inspection

General practices suggest that sealing surfaces be periodically checked for nicks and gouges before reinstallation. Elements under severe operating conditions should also be inspected for effects of corrosion and erosion to minimize unexpected shutdowns.

6.3 Reinstallation

Reinstallation should follow procedures outlined in Section 3. Model WMC chemical tee seal screws should be applied with Molykote 505 or equivalent lubricant to prevent seizure of threads. Gaskets should be renewed upon reinstallation.

7 Spares

Ref.	Description	Part no.	Qty.
1	Gasket, chemical tee:		
	Garlock gylon 3500: Up to 204 °C (400 °F)	43P1604	2
	Graphite: 204 °C (400 °F) to 340 °C (645 °F)	155S1043	1
2	Chemical tee cap screw	9P2342	16

Table 7.1 Replacement parts

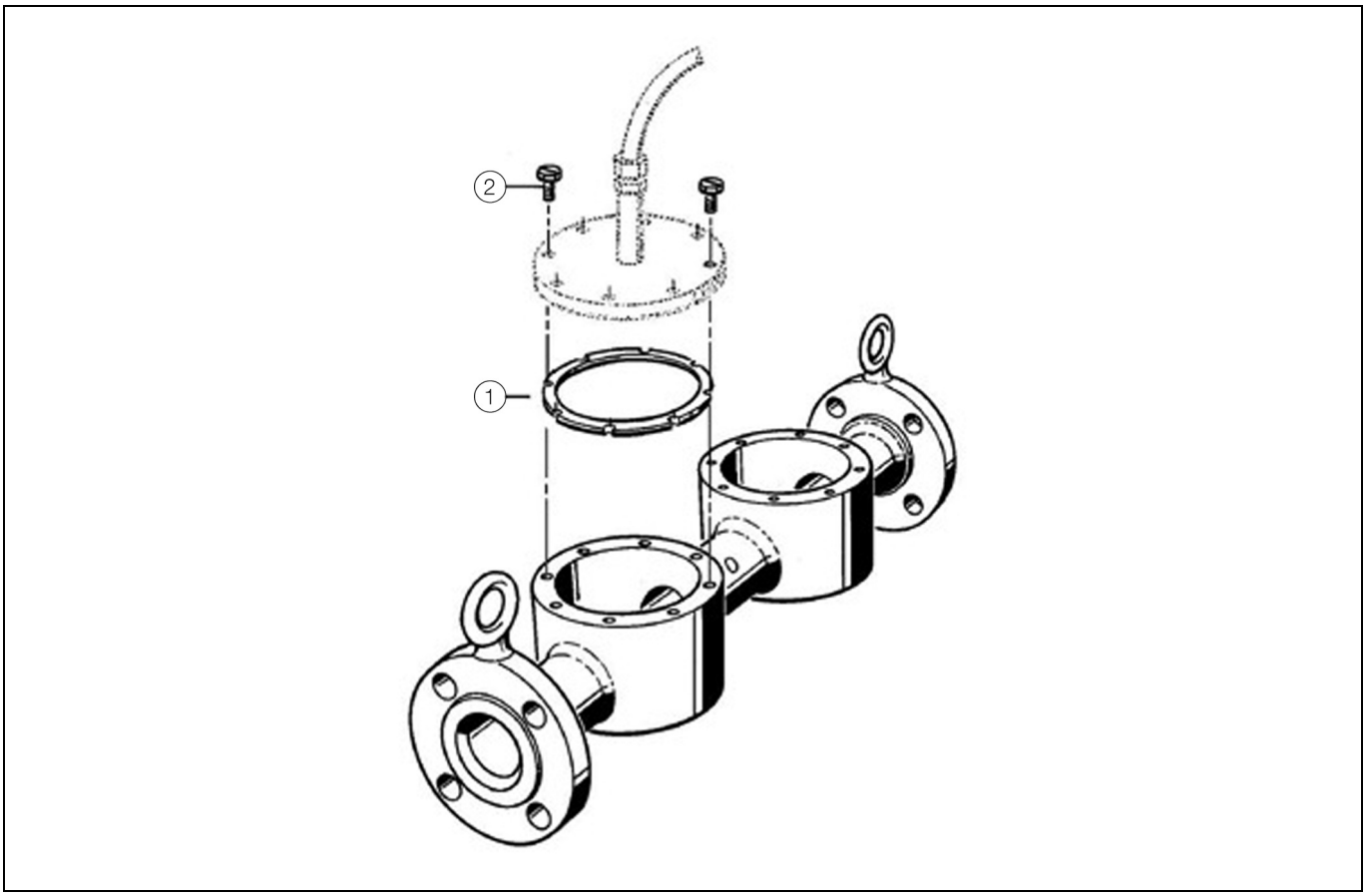

Fig. 7.1 Model WMC with chemical tee – replacement parts

Notes

Products and customer support

Automation Systems
For the following industries:
- Chemical & Pharmaceutical
- Food & Beverage
- Manufacturing
- Metals and Minerals
- Oil, Gas & Petrochemical
- Pulp and Paper

Drives and Motors
- AC and DC Drives, AC and DC Machines, AC Motors to 1kV
- Drive Systems
- Force Measurement
- Servo Drives

Controllers & Recorders
- Single and Multi-loop Controllers
- Circular Chart and Strip Chart Recorders
- Paperless Recorders
- Process Indicators

Flexible Automation
- Industrial Robots and Robot Systems

Flow Measurement
- Electromagnetic Flowmeters
- Mass Flowmeters
- Turbine Flowmeters
- Wedge Flow Elements

Marine Systems & Turbochargers
- Electrical Systems
- Marine Equipment
- Offshore Retrofit and Refurbishment

Process Analytics
- Process Gas Analysis
- Systems Integration

Transmitters
- Pressure
- Temperature
- Level
- Interface Modules

Valves, Actuators and Positioners
- Control Valves
- Actuators
- Positioners

Water, Gas & Industrial Analytics Instrumentation
- pH, Conductivity and Dissolved Oxygen Transmitters and Sensors
- Ammonia, Nitrate, Phosphate, Silica, Sodium, Chloride, Fluoride, Dissolved Oxygen and Hydrazine Analyzers
- Zirconia Oxygen Analyzers, Katharometers, Hydrogen Purity and Purge-gas Monitors, Thermal Conductivity

Customer support
We provide a comprehensive after sales service via a Worldwide Service Organization. Contact one of the following offices for details on your nearest Service and Repair Centre.

UK
ABB Limited
Tel: +44 (0)1946 830 611
Fax: +44 (0)1946 832 661

USA
ABB Inc.
Tel: +1 215 674 6000
Fax: +1 215 674 7183

Client Warranty
Prior to installation, the equipment referred to in this manual must be stored in a clean, dry environment, in accordance with the Company's published specification. Periodic checks must be made on the equipment's condition. In the event of a failure under warranty, the following documentation must be provided as substantiation:
- A listing evidencing process operation and alarm logs at time of failure.
- Copies of all storage, installation, operating and maintenance records relating to the alleged faulty unit.

Contact us

ABB Limited
Process Automation
Salterbeck Trading Estate
Workington, Cumbria
CA14 5DS
UK
Tel: +44 (0)1946 830 611
Fax: +44 (0)1946 832 661

ABB Inc.
Process Automation
125 E. County Line Road
Warminster
PA 18974
USA
Tel: +1 215 674 6000
Fax: +1 215 674 7183

www.abb.com

OI/WMP/C/F-EN 11.2014

Power and productivity
for a better world™