SIEMENS

Manual, amendment

SITRANS F US SONOFLO®

Ultrasonic flowmeter
Type SONOKIT hot-tap mounted

1- and 2-track DN 200 - DN 4000
Amendment to product manuals for SONOKIT 1- and 2-tracks

Order no.: FDK:521H1050

SFIDK.PS.029.Y1.02 - A5E00253229

085R9429

Contents

Preface

This manual describes how to install SONOKIT on filled and pressurized steel pipes (hot-tap installation). The manual is meant as an amendment to the current SONOKIT manuals delivered with the kit and contains only special instructions on the hot-tap installation.

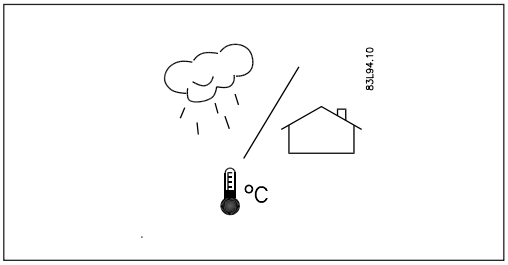
Siemens Flow Instruments recommends that you are familiar with the ordinary installation on empty pipes before getting on with a hot-tap installation and that you know how to use the special tools used with the hot-tap installation.

It is also important that you know the limitations e.g. maximum pressure, temperature and required space.

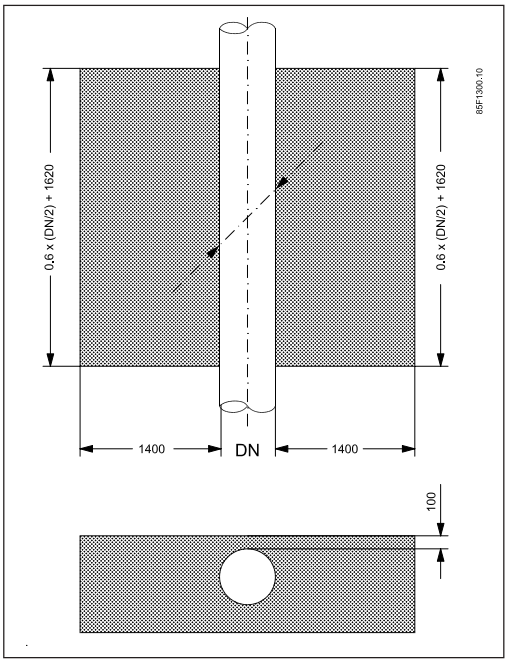
If you have any questions, please contact Siemens Flow Instruments A/S.

To ensure optimum performance of the measuring equipment it is essential that the following instructions are followed.

Location



The SONOKIT sensor can be installed both indoors and outdoors, even in exposed surroundings.



The space requirements around the pipe for retrofitting a SITRANS F US SONOFLO® ultrasonic flowmeter type SONOKIT are given in picture:

In case of large temperature differences between the medium and the environment the sensor must be isolated to avoid 2-phase flow which will result in inaccurate measuring results.

Construction of the sensor

The construction of the sensor is done in 4 steps:

1. *Marking up the pipe*
2. *Installating of the alignment tool*
3. *Measuring the pipe geometry*
4. *Drilling and inserting transducers*

Step 1
Mark up a paper drawing as described in product manual describing the empty pipe installation.

Mark the centre of the top line X1 – X2 with a centre punch. This point must form the centre of the centre point of the alignment tool.

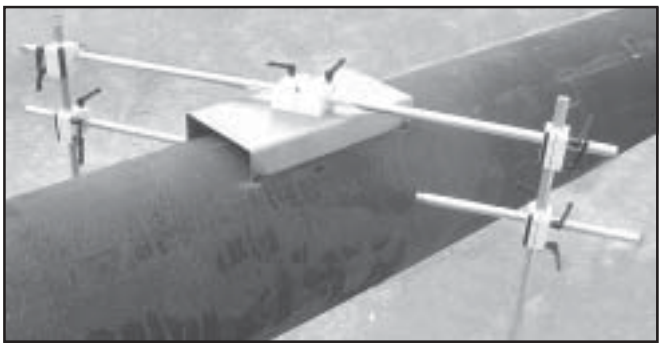
Also punch points to show the transducer holder position.

Remove the (drawing/measurement) paper.

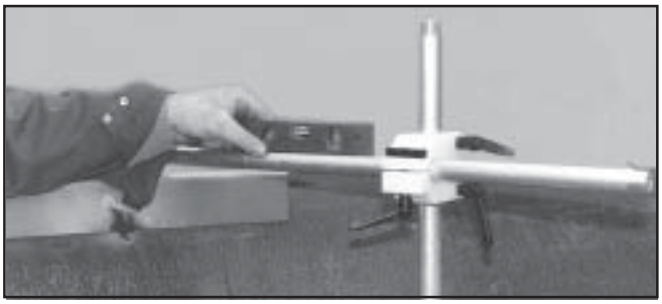
Step 2
Place the cradle from the alignment tool on top of the pipe. Place the supplied awl through the centre point of the cradle so that the cradle is centered in the middle of the top line X1 – X2.

Use a spirit lever to check that the cradle is positioned horizontally on/to the pipeline. Move e.g. the cradle sideways no matter whether the centre is moved a little away from the top line. It is important for the further installation that the alignment tool is balanced in horizontal and vertical positions as the adjustment takes place by means of a spirit lever.

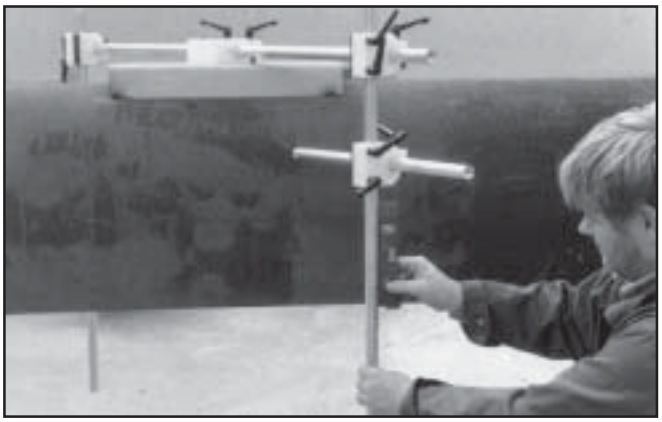
Spot weld the cradle 3 – 4 places, but see to it that it can always easily be repositioned.



Mount the alignment tool as shown. It is recommendable to finish one sound track at a time and when installing a two-track meter, it is recommendable to start with the lowest track.



Use a spirit level to control that the upper guiding beam is positioned horizontally and make sure that it is thoroughly fastened.

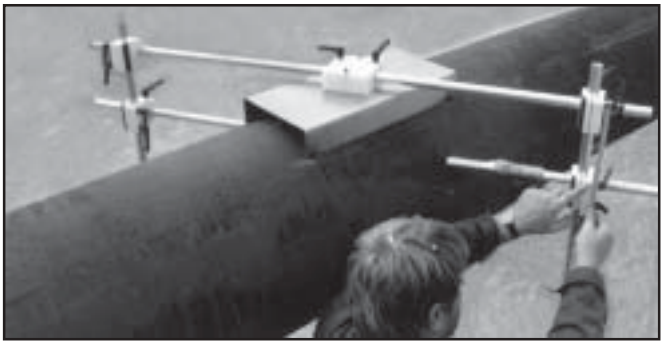


Use a spirit level to control that the vertical guiding beams are plumb.

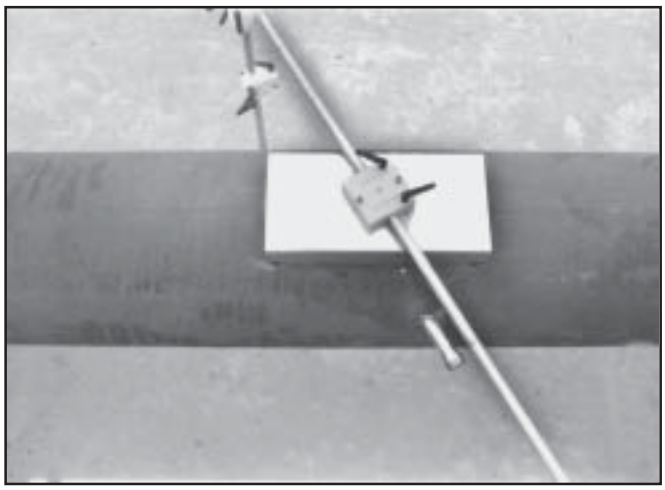
Shorten the transducer holder according to the actual pipe wall thickness (t). The shortening can be done with a grinder or a saw. Cut parallel to the angle of the transducer holder.

- At an angle of 45° the transducer holder is shortened by t x 1.4.
- At an angle of 60° the transducer holder is shortened by t x 1.15.

Mount the adaptor on the shortened transducer holders. Then mount guiding beams as shown.
Adjust the guiding beams until the transducer holders follow/aim at the marking-out.



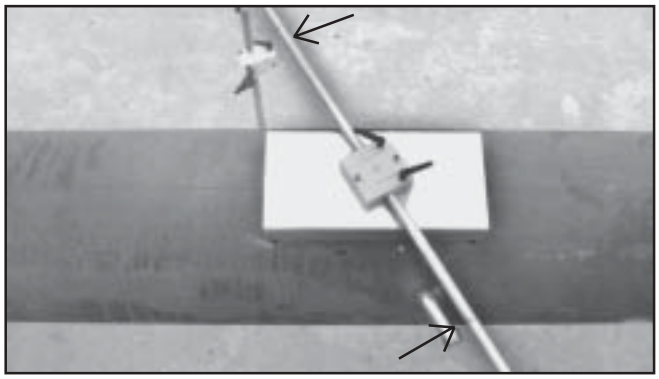
Make sure that the distance between the two horizontal guiding beams are the same on both sides of the pipe.
If not, the lower guiding beams with the transducer holders must be adjusted.

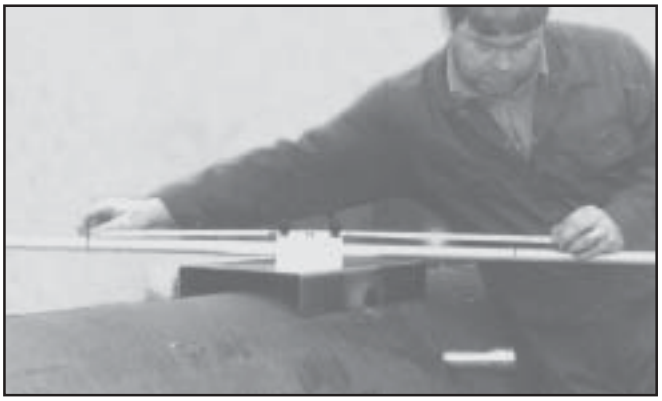


Check that transducer holders and guiding beams run parallel to the upper guiding beam. A visual control or a control by means of plumb lines will do. Both methods require that you stand on the pipe.

Tack weld the transducer holders in 3 places and check that also after the tack welding they are positioned correctly. If so, the complete welding can be made. Please note that with hot-tap installations no mounting plates are needed like is the case with empty pipe installations.
If during the welding the transducer holder has bended, it can be adjusted by means of a hammer and the supplied 1½" end cap. Check with spirit level.

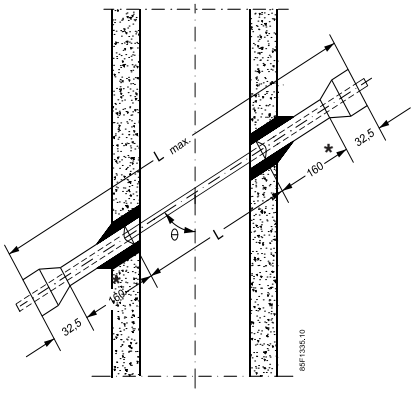
Step 3
Before proceeding it is a good idea to measure $L_{max.}$ of the sound track just finished. By means of a plumb line the ends of the transducer holders are transpositioned to the upper guiding beam.





$L_{max.}$ can now be measured with a measuring tape on the upper guiding beam. Enter the values in the measuring report.

Step 1



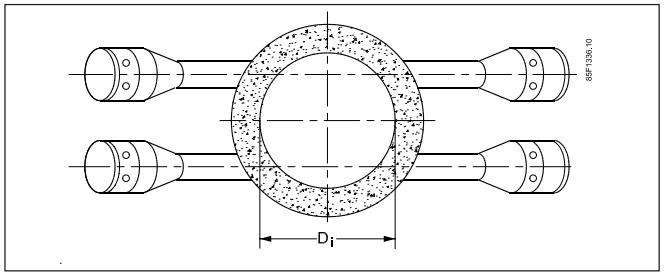
* Valid for standard 160 mm transducers.
With other transducer lengths, set in dimensions corresponding to these lengths.

The distance between the transducer windows (L) is calculated based on L_{max} as shown.

The standard transducer length is 160mm. If other lengths have been ordered, use the new values in the calculation.

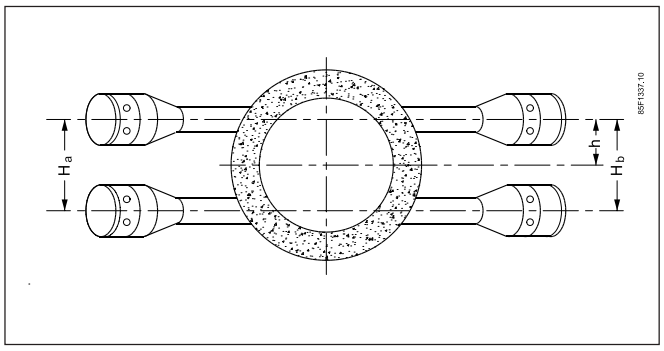
Measure the angle ($_\theta$) of each transducer holder. To get the most accurate value, it is recommended to take several measurements and calculate the average of these. Then calculate the average angle for each sound track. Enter the values in the measuring report.

To make sure that angle meter and pipeline are level you may place a spirit level on the angle meter.



Measuring the inner diameter (Di)
The inner diameter Di can be calculated on the basis of the circumference C according to the following formula:
(t = wall thickness)

$$Di = (C / \pi) - (2 \times t)$$



Measuring the distance h between sound track and centre axis

To determine h measure Ha and Hb with a measuring tape or a sliding gauge and calculate h using the formula:

$$h = \frac{Ha + Hb}{4}$$

Enter h into the measuring report.

Measuring the SONOKIT

To allow theoretical calibration by the SONO 3000 signal converter the sensor geometry must be measured.

The following sensor data must be known:

⇒ θ = Angle between sound track and longitudinal axis of the pipe

⇒ L = Distance between transducer windows

⇒ Di = Inner diameter of the pipe

⇒ h = Distance between sound track and centre axis of the pipe

The table shows the required measuring accuracy:

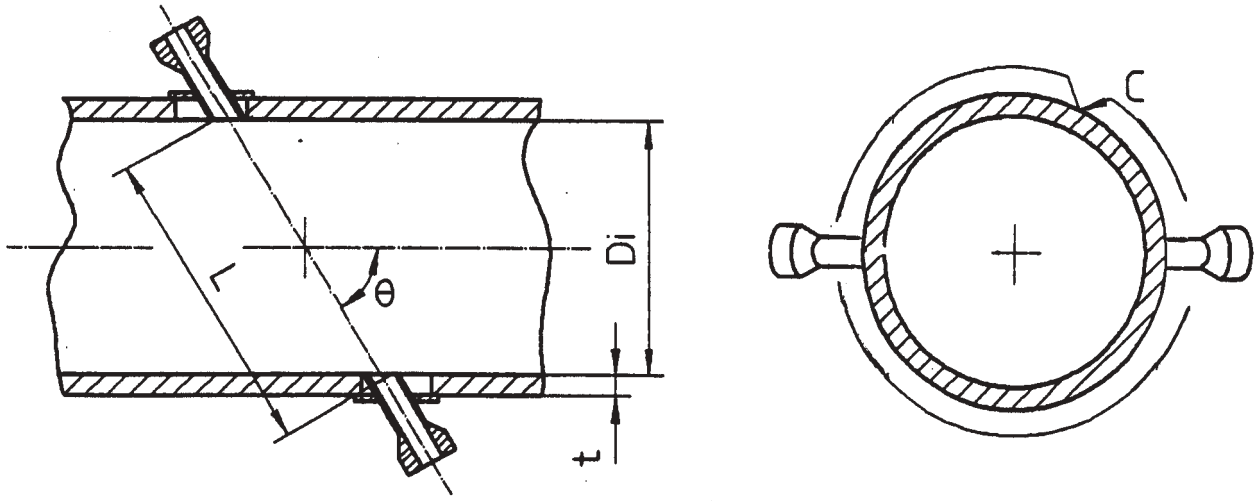
Δθ	DN 400-3000	0.1°
ΔL	DN 400-1000	0.8 mm
	DN 1000-2000	2.0 mm
	DN 2000-3000	4.0 mm
ΔDi	DN 400-1000	0.8 mm
	DN 1000-2000	2.0 mm
	DN 2000-3000	4.0 mm
ΔH	DN 400-1000	0.8 mm
	DN 1000-2000	2.0 mm
	DN 2000-3000	4.0 mm

SENSOR GEOMETRY MEASUREMENT REPORT

Sensor type SONOKIT 1-Track

Company	Name	Approved by

Date	Sensor size (DN)	Pressure (PN)	Tag no.:



Measure	Calculation	Result
Circumference (C)	C / π = External diameter (Du)	D_u =
Pipe wall thickness (t)	D_u - (2 x t) = Internal diameter (Di)	D_i =

Transducer distance (L)	
Angle θ transducer C	Average angle (C+D) / 2
Angle θ transducer D	
Cable length (distance from transducer to converter x 2)	Qmax

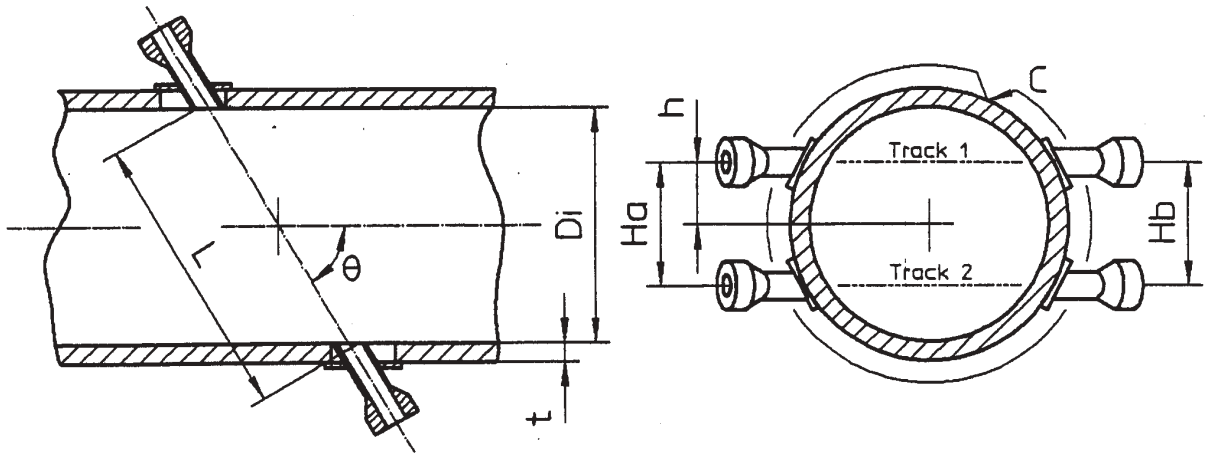
SIEMENS

SENSOR GEOMETRY MEASUREMENT REPORT

Sensor type SONOKIT 2-Track

Company	Name	Approved by

Date	Sensor size (DN)	Pressure (PN)	Tag no.:



Measure	Calculation	Result
Circumference (C)	C / π = External diameter (Du)	D_u =
Pipe wall thickness (t)	D_u - (2 x t) = Internal diameter (Di)	D_i =

Transducer distance (L) track 1	L =
Transducer distance (L) track 2	L =
Angle θ transducer C	Average angle (track 1) (C+D)/2
Angle θ transducer D	
Angle θ transducer A	Average angle (track 2) (A + B)/2
Angle θ transducer B	
Transducer separation Ha	$h = \frac{Ha + Hb}{4}$
Transducer separation Hb	

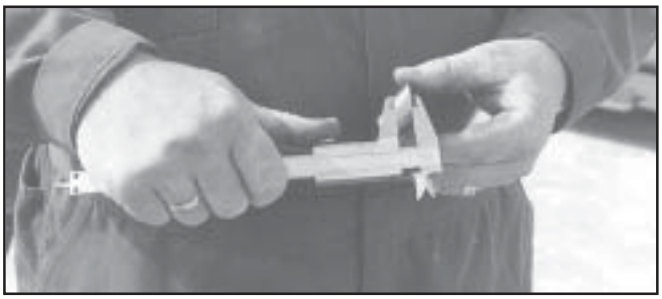
Cable length (total for one track)	Qmax	Calibration factor

Drilling

Step 4
Prepare to drill through the pipe wall with the hot-tap drill adaptor. At first mount the ball valve from the lock tool. Make sure that the valve is open.

Mount the hot-tap drill adaptor on the ball valve by means of the hook spanners from the lock tool. Make sure that flat gaskets and o-rings have been mounted in the drill adaptor.
Lubricate the drill with oil. Do not use grease as it can be difficult to flush out and will pick up drill chips which may damage the transducer o-ring.

Mount a standard hand-held drilling machine on the hot-tap drill adaptor. A drilling machine of 700 – 1000 W is sufficient. Remember to open the valve before drilling. Once the drilling is finished pull the drill back passed the ball valve. Close the ball valve and demount the drill adaptor.
It is recommended to open the ball valve for a moment to flush out possible drill chips and/or the drill core.



To determine the exact inside diameter of the pipe, measure the width of the core (t) with a sliding gauge.

Installation of the transducers

Prepare a transducer for mounting in the drilled transducer holder.
Demount the spring clips with the spring clips gripper.
Remove the silicone plug and carefully put the wires into the transducer.

To avoid liquids penetrate into the transducer during installation, mount the brass adaptor from the lock tool on the transducers. Be careful when putting the wires into the transducer so that they will not be damaged when screwing on the adaptor.

Be careful with the mounting of the transducer. Make sure that the gasket is mounted and not damaged.

Mounting of transducer

Mount the transducer on the mandrel of the lock tool.

Push the snap coupling forward until the 2 teeth of the coupling snaps in place on the transducer.

Make sure that the lock tool is turned back to rear position, i.e. maximum length. Place the mandrel with transducer in the lock tool.

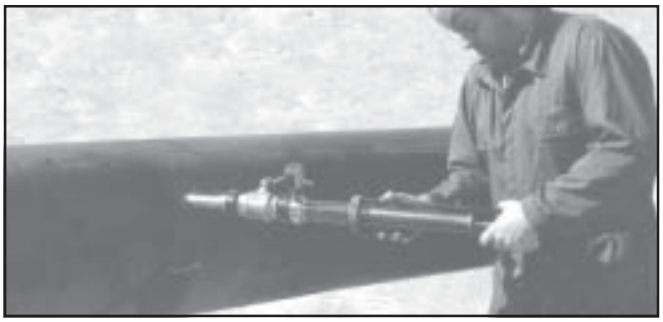
Mount the hex screw nut in the end of the mandrel.

Mount the spring clip through the nut and mandrel.

Make sure that the gasket is mounted and not damaged.

Mount the lock tool on the ball valve. It is essential that both lock tool and ball valve have been thoroughly tightened by means of the hook spanners.

Slowly open the valve to avoid pressure surge.



Turn the tripod of the lock tool clockwise.

Turn the tripod of the lock tool to stop. The tripod must be turned clockwise right to the end. If this is not possible, the transducer may have knocked against an edge on its way through the valve.

Use a spanner key to turn the screw nut at the end of the mandrel **approx. 10 rounds clockwise**. When you **feel a stop**, the transducer has been correctly mounted.

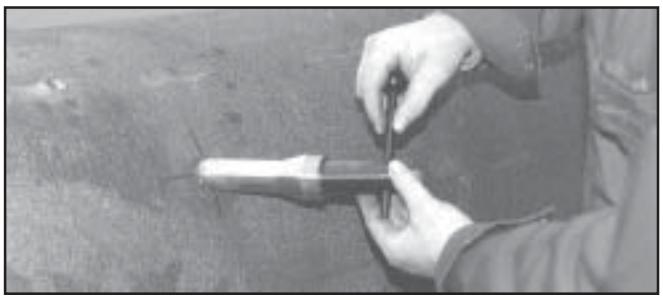
When the transducer has been correctly mounted, open the air nozzle to remove the pressure in the lock tool. Close the air release valve again. If the pressure re-establishes, the transducer has not been correctly mounted or the gaskets are damaged.

Remove spring clips and screw nut.

Demount ball valve and lock tool from the transducer holder.

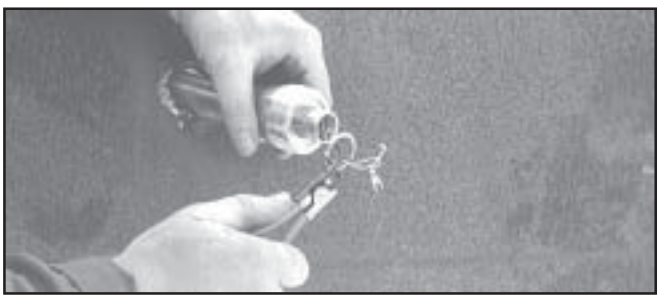
Remove ball valve and lock tool from the transducer holder.

Pull back the snap coupling and remove the mandrel.

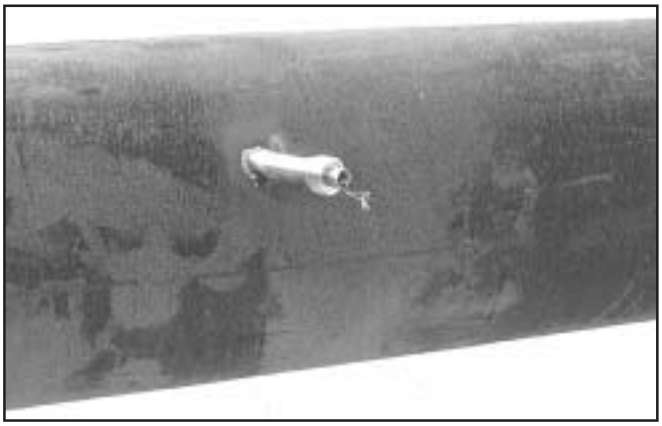


Tighten the transducer by means of the pipe wrench.

Remove the brass adaptor from the transducer by means of a fork spanner.



Mount spring clips and silicone plug.



The hot-tap installation of this transducer is now finished. Continue with the remaining transducers following the same procedure.

SONOKIT installation with tapping band

Introduction

The Siemens Flow Instruments SONOKIT Tapping band is an ultrasonic flow meter designed to be fitted to pipe of circumference, pipe wall thickness and pressure rating nominated at the time of ordering.

The Siemens Flow Instruments SONOKIT Tapping band is recommended for installation of SONOKIT ultrasonic flow meters on non weldable pipes, such as: Cast iron, Plastic pipes, Glass reinforced plastic pipes (GRP) or Concrete pipes.

The Siemens Flow Instruments SONOKIT Tapping band is designed for installation on pipes under pressure (hot-tap) and on empty pipes.

Installation

Unpack the Tapping band and check that all components are included. Some small items can be misplaced during shipping and Customs inspection. If the list below does not check out, please contact Siemens Flow Instruments.

- Each band has an associated Data Sheet with information unique to that band. If more than one band of the same size are delivered, ensure that each Data Sheet can be identified individually with its band.
- The number of segments in the band depends upon the band circumference and pressure rating. Check that the gap numbers stamped on the solid strips at the edge of each segment form a full sequence.
- A set of small packets is included containing lubricant. The material embedded in the tissues is Pipe Joint Lubricant.

Handle the segments carefully at all times, paying attention to the feathered edges of the rubber mats. Curling or tearing of these edges can compromise the seal.

Step 1

Prepare the segments for installation by unwinding the nuts almost off the end of each stud.
The Fish plate which spans several studs must be inserted between the washers and opposing tension plate at installation.
Ensure that these fish plates are free to move along the studs and can be correctly placed with ease.

Step 2

Completely expose the pipe and clean the surface for a distance equal to the length of the band plus approx. 200 mm each side.
Ensure all loose flakes of paint and rust are removed. Old paint and pipe-wrap can be retained if not forming a hard edge which the rubber mat could not closely follow and seal completely along.

Step 3

Spread the lubricant across the whole surface of the rubber mat on each Tapping band segment. A liberal amount ensures adequate slip between the mat and the pipe surface, and will not at all degrade the sealing properties of the band. Spread lubricant on the upper side of the feathered edge of each mat to promote good overlap slip.

Step 4

Place the segments in sequence starting at the top of the pipe and evenly distributing the weight on either side.
Ensure that the alignment spikes are correctly interleaved with the studs and the studs are in their correct slots.

The feathered edges of each mat is flat against the pipe and not curled or caught.

The fish plates shall be correctly placed against the tension plates and the folded edge can be hooked beneath them.

Step 5

Run the nuts to about half-way down each stud when a segment is placed to ensure that the later alignment stage can proceed easily. The work can be done easily with a hand held drilling machine.

Step 6

At the last gap, carefully interleave the studs and spikes, locking home the fish plates and running the nuts to about ¾ down each stud.
Do not at any point close any gap as this will severely compromise the ability of the Tapping band to seal in the future.

Step 7

Before tightening the nuts, ensure that the transducer holders are correctly oriented and that they are either correctly placed over their pre-cut holes, or that a hot-tap drill can fit into the available space.
The clearance against a nearby wall can be improved by rotating the band up to 45° from the horizontal.

Step 8

Take note of the recommended torque stamped on the band and set the torque wrench to half that value.
Torque up all nuts in an even manner, making sure that no gap is closed and that no one point is unevenly tightened.
Best results are obtained for both the sealing of the band and the accuracy of flowmeter calibration when all the gaps are kept the same.

Step 9

Reset the torque wrench to the recommended setting and tighten all nuts. Keep the sequence even across the length of the band and move regularly to other gaps to ensure even tightening.

Step 10

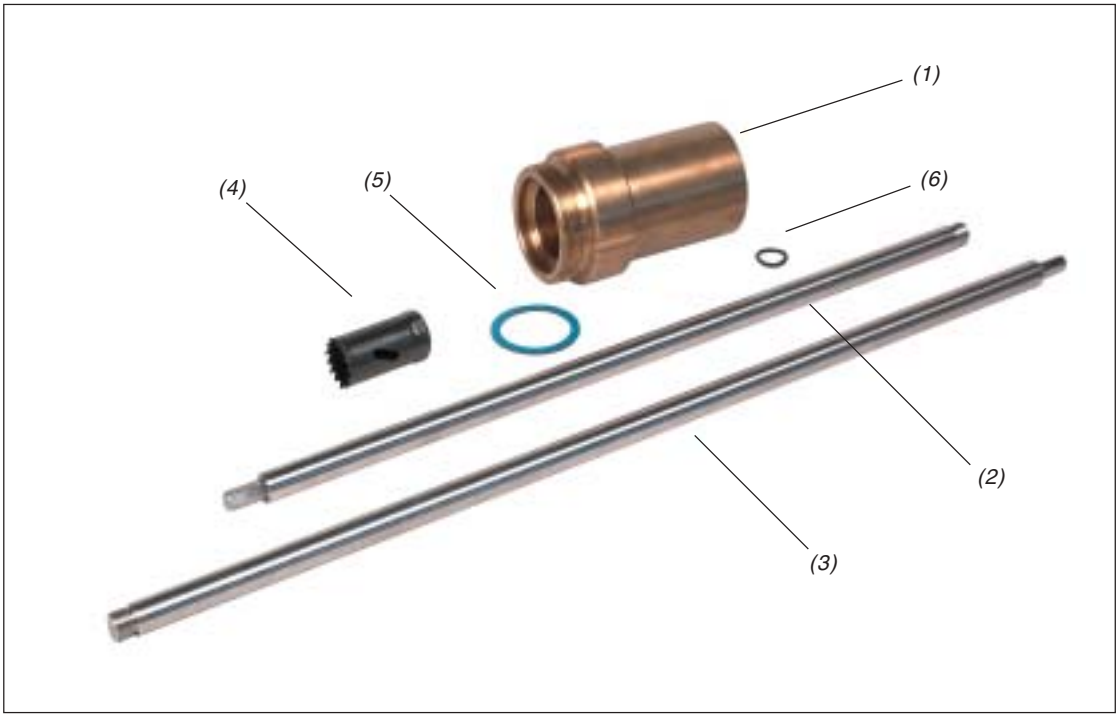
Place the stud covers on the exposed ends to prevent grit collecting in the thread. This aids the removal of the band if that should later be required.

Step 11

The installation of the tapping band is finished. Proceed to the hot-tap instruction for further steps regarding drilling, transducer installation and pipe geometry measurement.

Tools for hot-tap installation

Description of hot-tap drilling adaptor



For use up to maximum 15 bar line pressure

(1) Drill cylinder for mounting on to the valve from lock tool

(2) & (3) Stainless steel drill rod for 50 mm and 160 mm transducers
The drill is screwed on to the end with the thread M13 and the other end is connected to a hand-held drilling machine

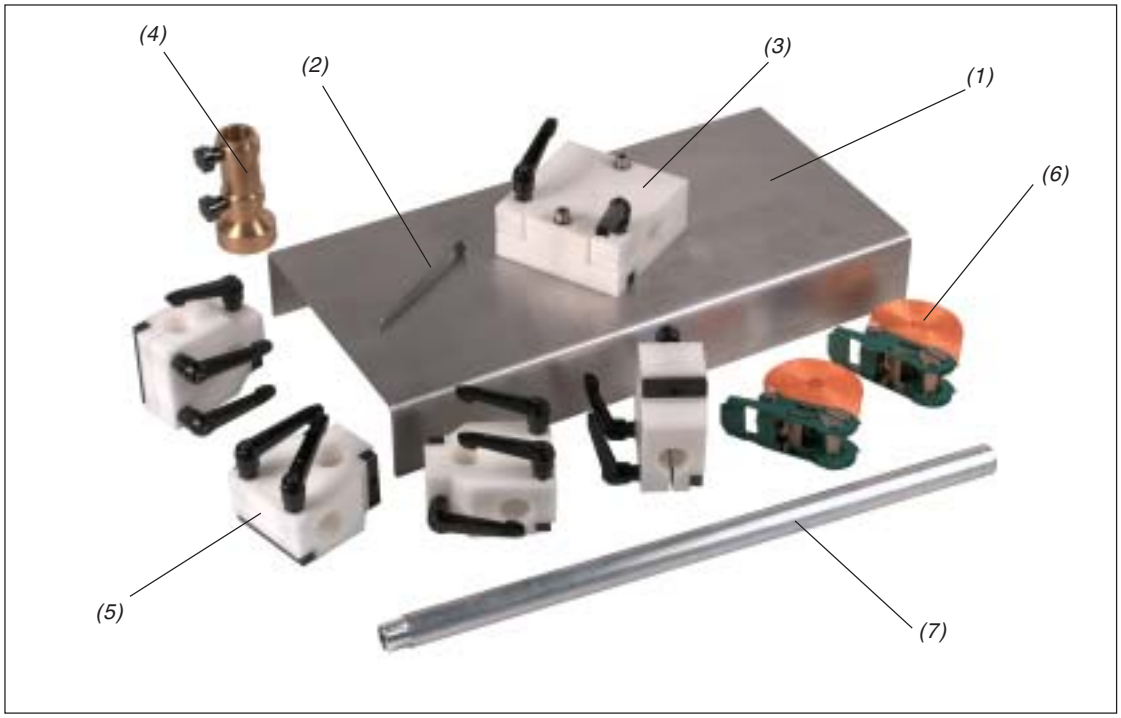
(4) SANDVIK holesaw (drill). Four pcs are supplied with the adaptor. SANDVIK holesaws are supplied from SANDVIK AB in Sweden
Type of drill Sandflex 3830-25-VIP ø25

(5) Flat gasket between drill cylinder and valve. Four pcs code No. FDK:085B0903 are supplied with the machine

(6) O-ring for sealing between drill cylinder and drill rod
Twenty pcs code No. 991X5086 are supplied with the machine

Siemens Flow Instruments code no. FDK:085B5392

Description of hot-tap alignment tool for pipe sizes DN 300 - DN 1200



For use on pipe sizes in the range DN 300 to DN 1200

(1) Cradle for mounting on the pipe after the transducer locations have been marked

(2) Awe used to position the cradle

(3) Centre holder for mounting on the cradle to keep the alignment barrels in the right position

(4) Adaptor to keep the transducer holder in the right position before the welding. Two pcs are supplied

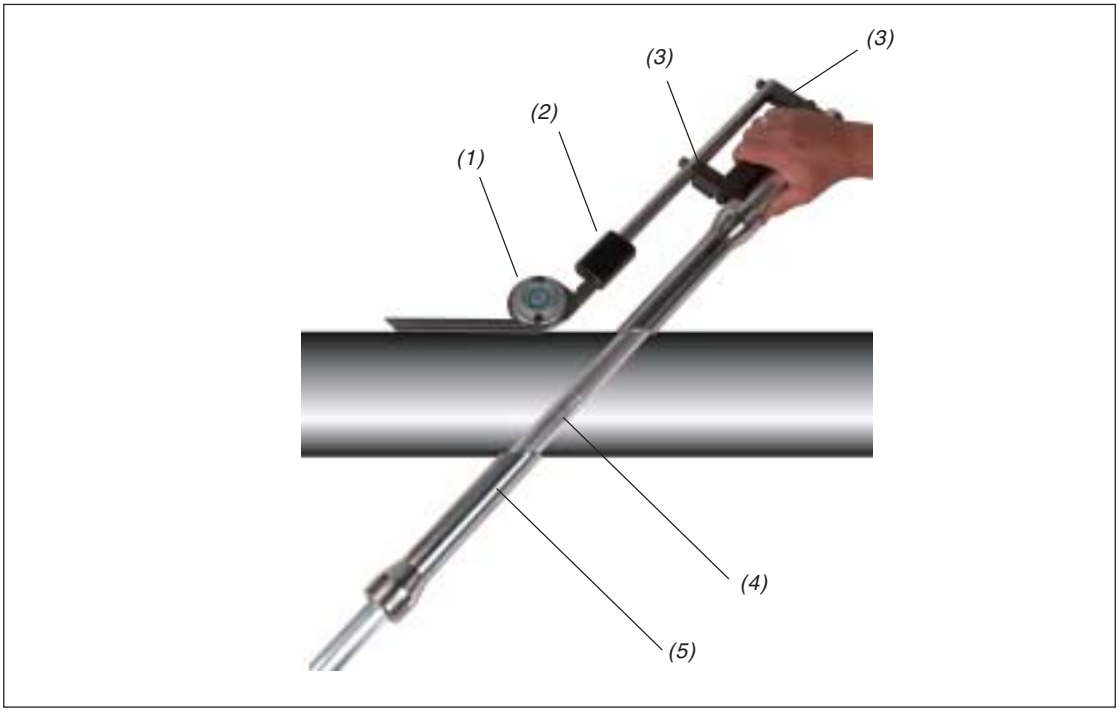
(5) Holders to keep the vertical rods and the rods holding the transducer in the right position during installation

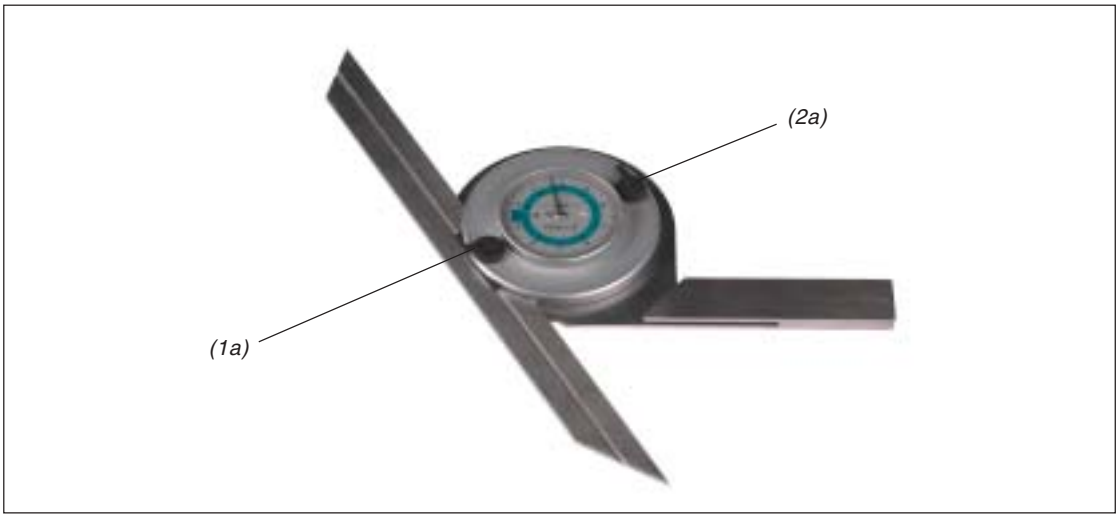
(6) The cradle can be tack welded onto the pipe. On non weldable pipes, use the enclosed webbing spanners

(7) Alignment rods - 8 pcs in set
Ø = 25 mm, L = 500 mm

Siemens Flow Instruments code no. FDK:085B5393

Description of angle measuring instrument





(1) TESA angle measuring instrument providing an accuracy ± 0.1°

(2) Fixing device between angle instrument and angle holder

(3) Angle holder

(4) Alignment rod (supplied with the SONOKIT mounting set)

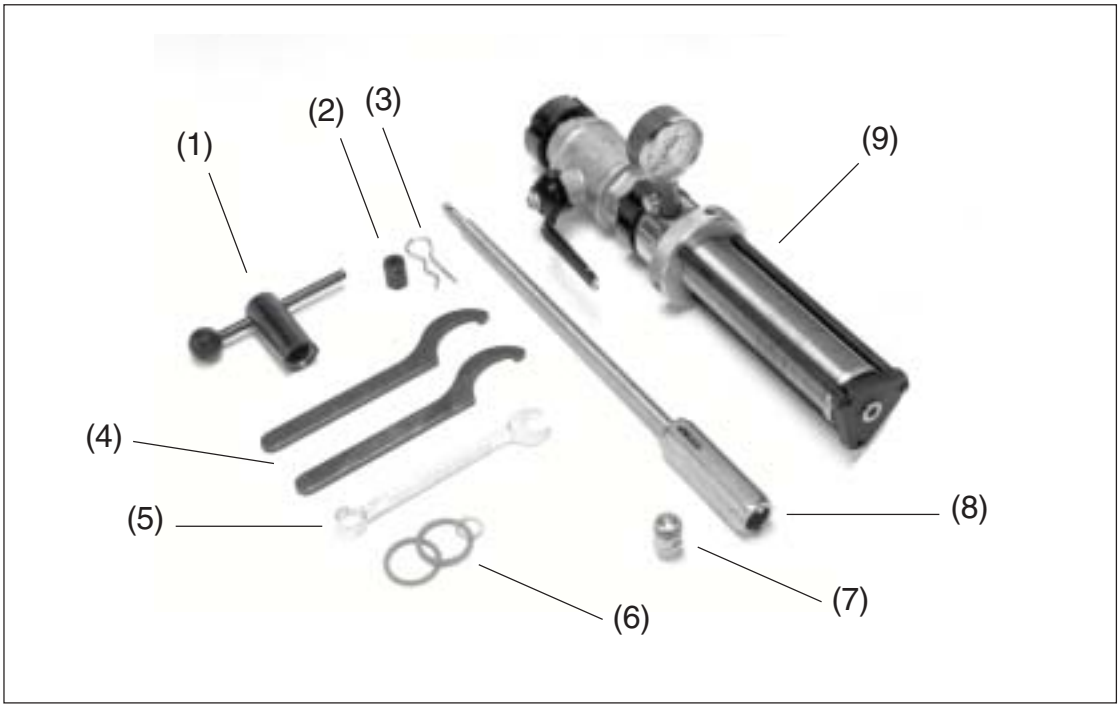
(5) Transducer holders

(6) Slide the blade into the required position and lock with lever (1a)

(7) To measure the angle, open lever 2a and place the angle tool in the angle between pipe and transducer holder. Lock lever 2a and read the angle on gauge

Siemens Flow Instruments code no. FDK:085B5330

Description of lock tool for inserting or replacement of ultrasonic transducers



The lock tool can insert transducers when installing SONOKIT under pressure (hot-tap), or it can be used to replace transducers on ultrasonic flowmeters Type SONO 3100 with Type SONO 3200 O-ring transducers installed.

(1) Spanner key for transducer type SONO 3200 o-ring type

(2) Hex nut with hole for spring clip

(3) Spring clip

(4) Hook spanners

(5) 19 mm spanner key for the lock tool hex nut and brass adaptor

(6) Gaskets for ball valve, lock tool and brass adaptor

(7) Brass adaptor to mount on the transducers

(8) Mandrel with snap coupling to hold the transducer

(9) Lock tool including ball valve and pressure gauge

Siemens Flow Instruments code Nos:
Transducer length 50 mm **FDK:085B5331**
Transducer length 160 mm **FDK:085B5333**
Transducer length 230 mm **FDK:085B5335**

Ordering

SONOKIT TAPPING BAND [ ] - [ ][ ][ ][ ] - [ ][ ][ ][ ]

1. No of tracks

One sound track 1
Two sound tracks 2

2. Circumference of pipe (measured)

460 mm to 6283 mm ..... 0961 (961 mm)

3. Pipe wall thickness

4 mm to 200 mm 087 (87mm)

4. Pressure rating

PN 6 ..... A
PN 10 (max. pipe diameter DN 1800) ..... B
PN 16 (max. pipe diameter DN 1200) C

We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are always welcomed.

Technical data subject to change without prior notice.

Siemens Flow Instruments A/S
Nordborgvej 81
DK-6430 Nordborg

Order no.: FDK:521H1050-01
Printed in: Denmark