Application note AN/WirelessHART/TTF300-W/Repeater-EN

Using the WirelessHART transmitter TTF300-W as repeater to extend the availability of a WirelessHART network

The WirelessHART transmitter TTF300-W is a suitable solution to act as a repeater within WirelessHART networks

Measurement made easy

Introduction

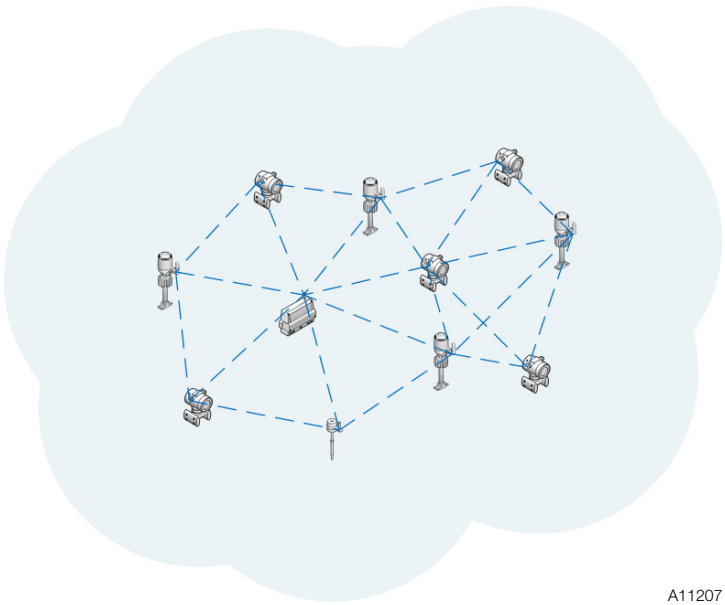
In a well-designed WirelessHART network, every device should have a minimum of 3 neighbors within its effective range. This ensures that there will be at least 2 redundant connection links. A WirelessHART network can only operate as meshed network if redundant paths are available.
This is a prerequisite to ensure reliable communication.
Fig. 1 shows a meshed network of this kind where every device has at least 3 communication links (blue lines).

Although this is the ideal layout, it is not always possible to design a network like this.
Not all WirelessHART devices provide the same effective range and the effective range can also be limited by environmental influences. A wall (brick or concrete), metal structures and even trees may have an impact on possible communication links.

Power and productivity
for a better world™

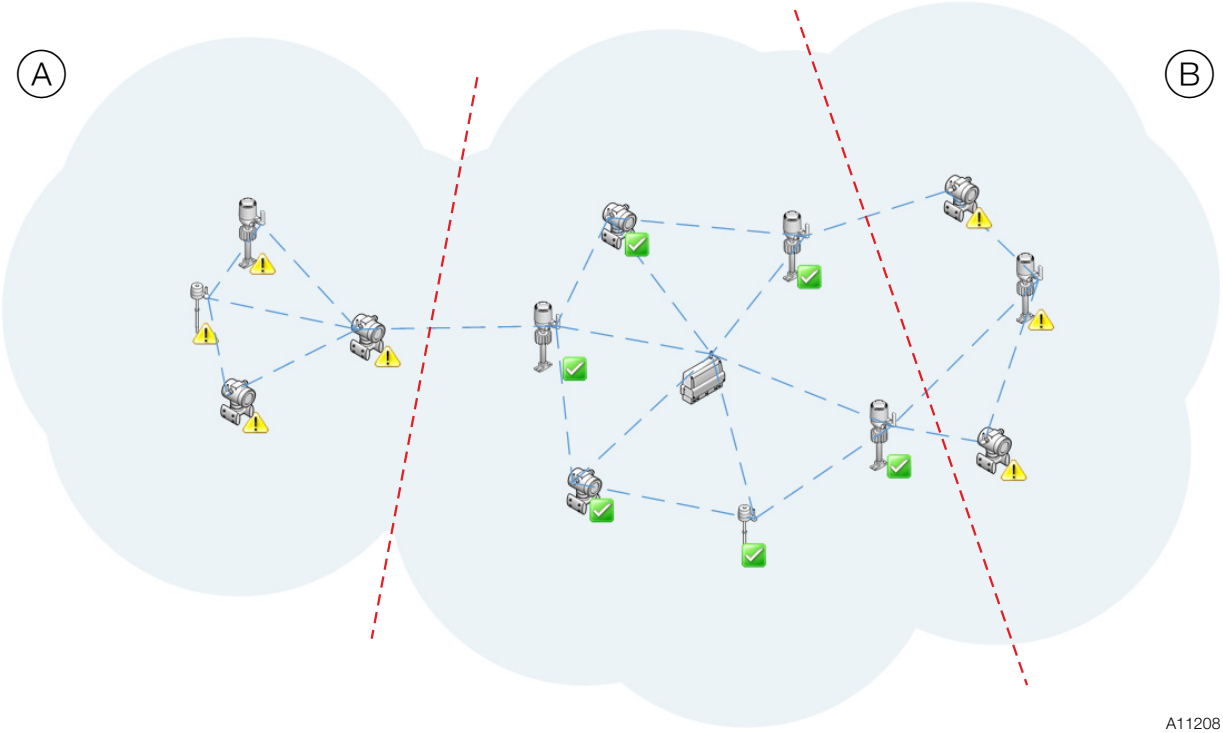
Using the WirelessHART transmitter TTF300-W as repeater to extend the availability of a WirelessHART network

WirelessHART network operation



A11207

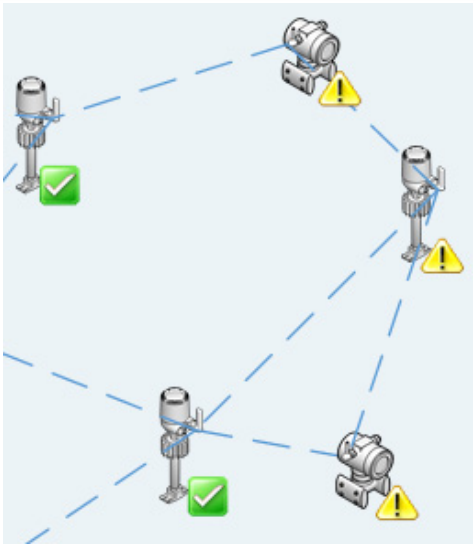
Fig. 1: Operating WirelessHART network with full redundant paths



A11208

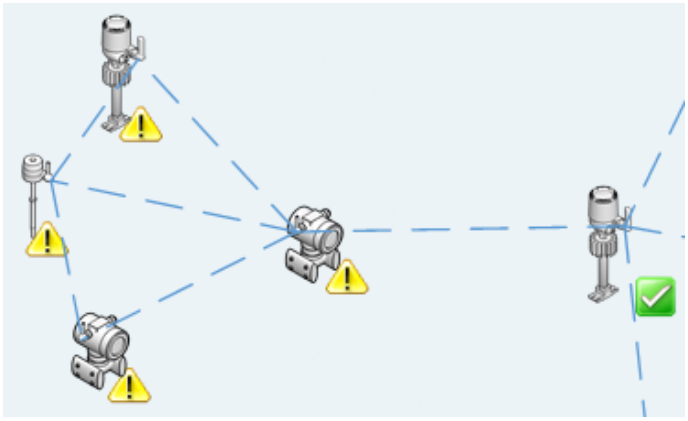
Fig. 2: Operating WirelessHART network with additional devices
(A) Bottleneck area in the network (B) Gap area in the network

While the gap in Fig. 3 is not optimal, the bottle neck of the left part is critical. If the only connection to the network fails, four measurement points are lost. Additionally, the battery lifetime of the routing device will be reduced by three times compared with the connected devices. This setup must be prevented wherever possible. To connect these four devices correctly, two repeaters are needed.



A11209

Fig. 3: Gap of WirelessHART network



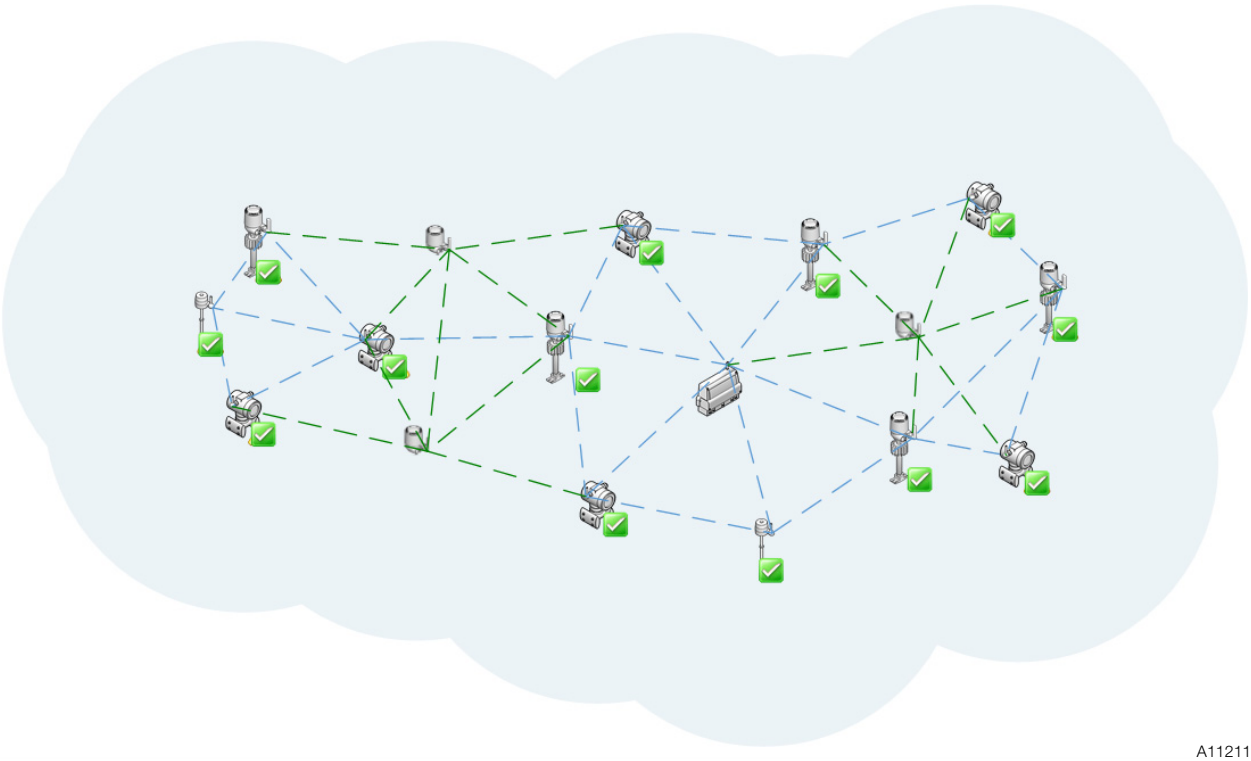
A11210

Fig. 4: Bottle neck of WirelessHART network

The right-hand area of the network has a gap where devices have only two communication links. This means that three devices are not connected with fully redundant paths as desired. A repeater can be installed to increase the redundancy for this area of the network. The way in which repeaters can be installed is very flexible and only depends on the required network coverage because they only work for the communication links.
The other devices need to be installed at the measurement point for which they will be transmitting.

Using the WirelessHART transmitter TTF300-W as repeater to extend the availability of a WirelessHART network

The figure below shows the same network but with three additional repeaters. One repeater closes the gap between the center and the devices on the right that only have two available paths. The other two repeaters eliminate the bottle neck seen before and provide a stable and redundant connection for these devices. In this way, all devices are now connected and fully redundant with three independent communication links.



A11211

Fig. 5: Operating WirelessHART network with additional repeaters

Network extension using a WirelessHART transmitter as a repeater

As all WirelessHART devices must support routing functionality, not all devices are suitable for this.
Routing will consume more energy, so the lifetime of the battery will be affected.
Hence a device with a long battery lifetime and a cheap battery that is easy to change would be suitable.
Using a normal WirelessHART measuring device will result in higher costs than necessary due to the sensor included in the device.

Therefore a WirelessHART transmitter TTF300-W is suitable to operate as a repeater.

It is equipped only with the electronic needed for communication – no sensor is included.
The housing is small but robust and is proven in the field. It is also certified for ATEX zone 0 as well as FM class I Div. 1. The battery is easy to change and less expensive than other power supplies used by WirelessHART devices because it is a standard battery.
Thanks to the mounting accessories available, installation is also quite easy.

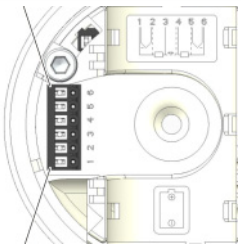
Although a TTF300-W can be used out of the box as a repeater, changing its setup can increase its performance.

Preparing the WirelessHART transmitter TTF300-W

To avoid a diagnosis of a broken sensor, the device should be equipped with an internal wire link. This means a wire should be connected between sensor clamp 1 and 3.

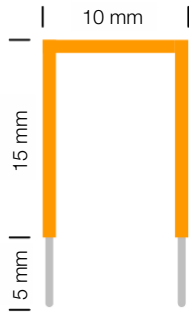
A11212

Fig. 6: Internal wire jumper



A11213

Fig. 7: Electrical connections



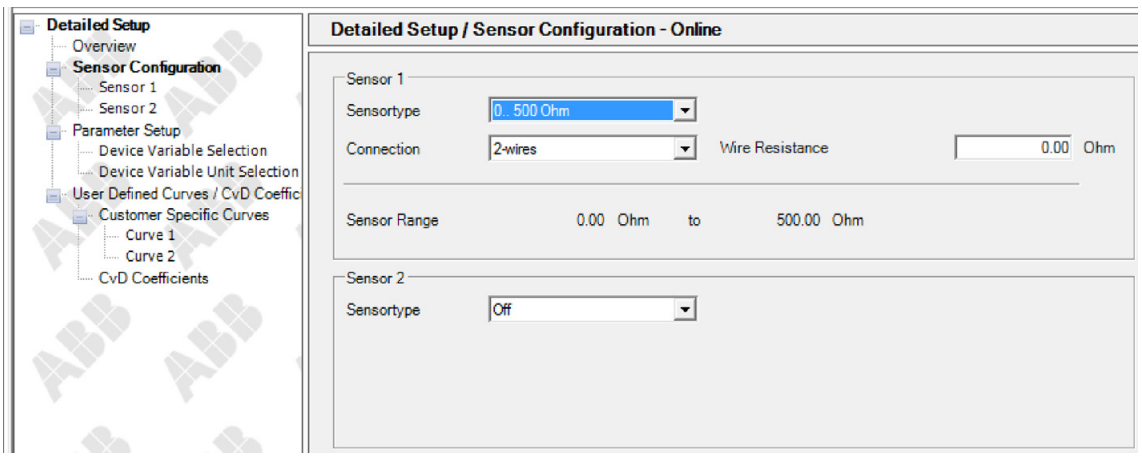
A11214

Fig. 8: Size of wire jumper

This wire can be between 0.13 mm^2 … 1.5 mm^2 or AWG24 … AWG16. A length of at least 50 mm is sufficient, but a longer wire would also fit in the housing of the TTF300-W.

Device configuration

After the wire jumper is inserted, the TTF300-W needs to be configured. The sensor should be configured as follows:



A11215

Fig. 9: DTM Detailed setup / Sensor configuration

Now the “Device Variable Selection” needs to be configured as follows:

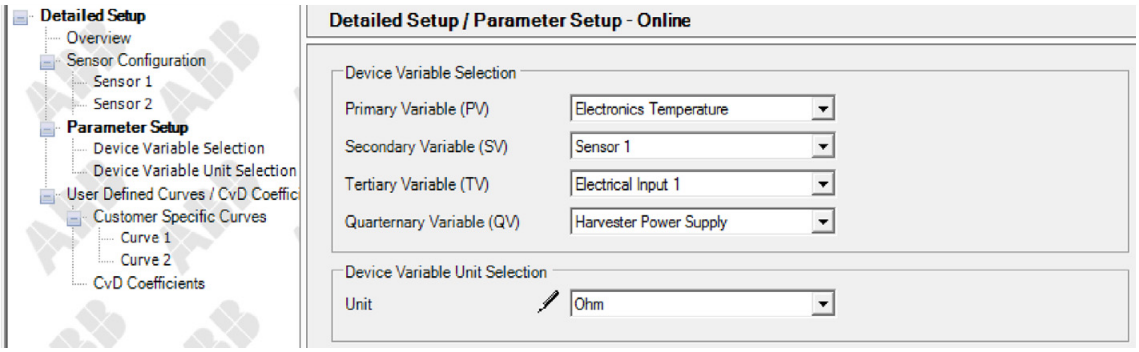


Fig. 10: DTM Detailed Setup / Parameter Setup

While a TTF300-W normally sends measurement values in bursts, this is not necessary for a repeater. This means the “Burst Configuration” should be adjusted to use as little network bandwidth as possible.

First, “Burst Message 1” should be set to HART command 48 “Additional Device Status”. This command will transmit all diagnoses the TTF300-W might have, including the battery lifetime warning. The update period can be set to the highest possible value of 3600 s, which is once an hour. Burst Message 2 and 3 should be disabled.

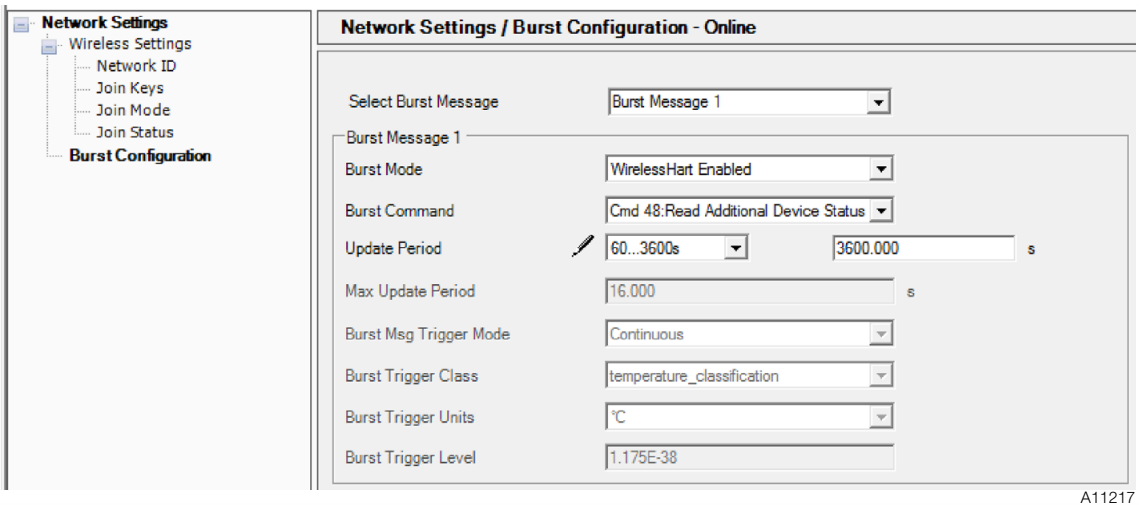


Fig. 11: DTM Network Settings / Burst Configuration – Burst Message 1

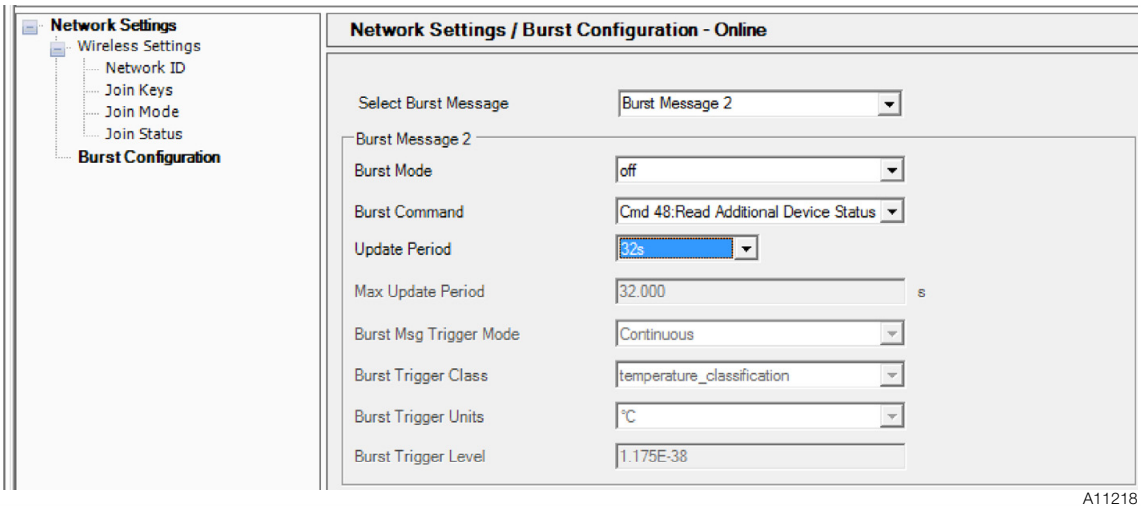


Fig. 12: DTM Network Settings / Burst Configuration – Burst Message 2 Burst Mode "off"

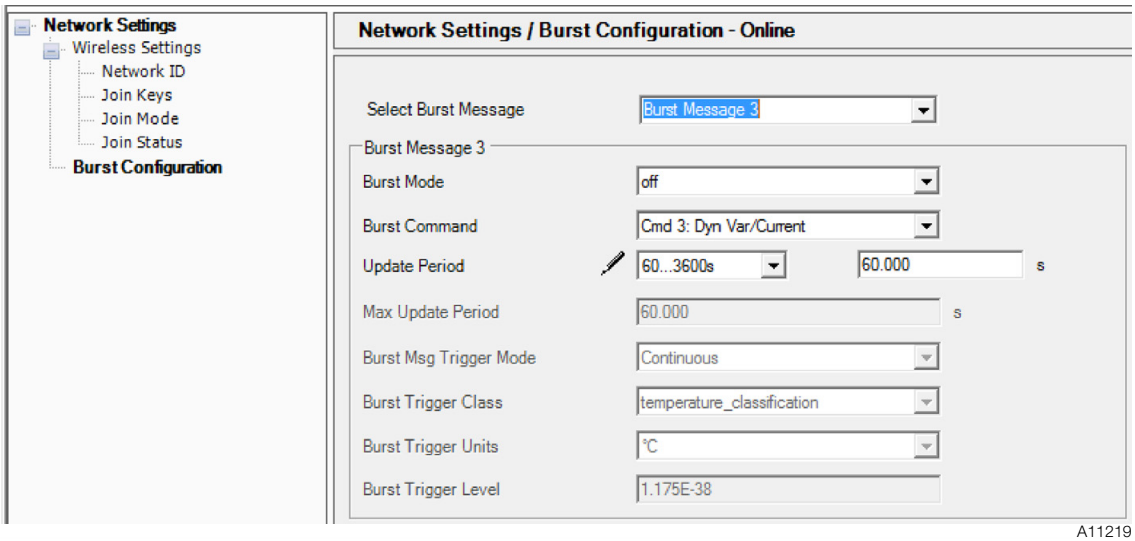


Fig. 13: DTM Network Settings / Burst Configuration – Burst Message 3 Burst Mode "off"

Now the TTF300-W operates only as a WirelessHART repeater.

Ordering information TTF300-W

Explosion protection	Transmitter housing	Order code
Without explosion protection	Aluminum with mounting bracket	TTF300-W.Y0.A.8.W.BS-...K2
	Stainless steel with mounting bracket	TTF300-W.Y0.B.8.W.BS-...K2
ATEX	Aluminum with mounting bracket	TTF300-W.A6.A.8.W.BS-...K2
	Stainless steel with mounting bracket	TTF300-W.A6.B.8.W.BS-...K2
IECEx	Aluminum with mounting bracket	TTF300-W.H6.A.8.W.BS-...K2
	Stainless steel with mounting bracket	TTF300-W.H6.B.8.W.BS-...K2

Contact us

ABB Limited
Process Automation
Howard Road, St. Neots
Cambridgeshire, PE19 8EU
UK
Tel: +44 (0) 870 600 6122
Fax: +44 (0)1480 213 339
Mail: enquiries.mp.uk@gb.abb.com

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

ABB Automation Products GmbH
Process Automation
Schillerstr. 72
32425 Minden
Germany
Tel: +49 571 830-0
Fax: +49 571 830-1806

www.abb.com/wirelessmeasurement

Note
We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents - in whole or in parts – is forbidden without prior written consent of ABB.

Copyright© 2015 ABB
All rights reserved

AN/WirelessHART/TTF300-W/Repeater-EN 10.2015

Power and productivity
for a better world™