(1) # TYPE EXAMINATION CERTIFICATE

(2) **Equipment and protective systems intended for use in potentially explosive atmospheres - Directive 94/9/EC**

(3) **Type Examination Certificate Number: WI 13ATEX0002 X** Issue Number: **1**

(4) **Equipment or protective system:**

Modular remote I/O-System “u-remote” consisting of the following assemblies:

I/O-Modules:

Marking	Type	Description
1	UR20-4DI-P	Digital input module, 4 channels
1	UR20-8DI-P-3W	Digital input module, 8 channels, 3-wire
1	UR20-16DI-P	Digital input module, 16 channels
1	UR20-16DI-P-PLC-INT	Digital input module, 16 channels, PLC interface
1	UR20-4DO-P	Digital output module, 4 channels
1	UR20-8DO-P	Digital output module, 8 channels
1	UR20-16DO-P	Digital output module, 16 channels
2	UR20-4RO-CO-255	Digital output module, 4 channels, relay
1	UR20-16DO-P-PLC-INT	Digital output module, 16 channels, PLC interface
1	UR20-4AI-UI-16	Analogue input module, 4 channels, 16 bits
1	UR20-4AI-UI-DIAG	Analogue input module, 4 channels, 16 bits
1	UR20-4AO-UI	Analogue input module, 4 channels, 16 bits
1	UR20-4AO-UI-DIAG	Analogue input module, 4 channels, 16 bits
1	UR20-4AI-RTD-DIAG	Analogue input module, 4 channels, RTD
1	UR20-4AI-TC-DIAG	Analogue input module, 4 channels, thermocouple

Bus couplers:

Marking	Type	Description
1	UR20-FBC-PB-DP	Field bus coupler, PROFIBUS DP-V1
1	UR20-FBC-PN-IRT	Field bus coupler, PROFINET IRT
1	UR20-FBC-EC	Field bus coupler, Ether CAT
1	UR20-FBC-MOD-TCP	Field bus coupler, Modbus TCP

Power-feed modules:

Marking	Type	Description
1	UR20-PF-O	Power supply module (Output current path)
1	UR20-PF-I	Power supply module (Input current path)

Potential distribution modules:

Marking	Type	Description
1	UR20-16AUX-I	Potential distribution module (Input current path, positive branch)
1	UR20-16AUX-O	Potential distribution module (Output current path, positive branch)
1	UR20-16AUX-FE	Potential distribution module (Functional earth)
1	UR20-16AUX-GND-I	Potential distribution module (Input current path, GND branch)
1	UR20-16AUX-GND-O	Potential distribution module (Input current path, GND branch)

Empty Slot Modules:

Marking	Type	Description
1	UR20-ES	Empty Slot Module

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(1) # TYPE EXAMINATION CERTIFICATE

(2) **Equipment and protective systems intended for use in potentially explosive atmospheres - Directive 94/9/EC**

(3) **Type Examination Certificate Number: WI 13ATEX0002 X** Issue Number: **1**

(5) **Manufacturer:** **Weidmüller Interface GmbH & Co KG**

(6) **Address:** **Klingenbergstraße 16, 32758 Detmold, Germany**

(7) This equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) Weidmüller Interface GmbH & Co KG certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the directive.

The examination and test results are recorded in confidential test report no. WI13ATEX0002X_CHK_01_iss01.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 60079-0:2012 + A11:2013 **EN 60079-15:2011**

(10) If the sign ”X” is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This Type Examination Certificate relates only to the design, examination and tests of the specified equipment and not to the manufacturing process and supply of this equipment.

(12) The marking of the equipment shall include the following:

Marking [1.)]	Marking variant
1	 **II 3 G Ex nA IIC T4 Gc**
2	 **II 3 G Ex nA nC IIC T4 Gc**

1.) The marking variants are assigned to the modules listed in this certificate via the marking number

Weidmüller Interface GmbH & Co.KG

Dr. Timo Berger
Head of Electrical Interface

SCHEDULE

(13)

(14) **to Type Examination Certificate WI 13ATEX0002 X** Issue No. **1**

Table of contents

SCHEDULE

(13)

(14) **to Type Examination Certificate WI 13ATEX0002 X** Issue No. **1**

(15) **Description of Equipment or Protective System:**

u-remote is a modular remote I/O-system that may consist of one field bus coupler and up to 64 I/O-Modules, optional power-feed modules and power distribution modules. u-remote modules are installed on a standard mounting rail. They shall be installed always in a suitable enclosure (see 17: special conditions for safe use).

General specifications

Value		**Min.**	**Max**
Field wiring terminal cross section	Metric	0.14 mm²	1.5 mm²
	AWG	26	16

All conductors shall have the current-carrying capacity for the intended use.

u-remote consists of several configurable assemblies with different functions:

I/O-modules characteristics

Common (if not otherwise specified)

Supply via bus rails		**Min.**	**Max**
Input path[1.)]	(U_{IN})	20.4 V	28.8 V
Output path[2.)]	(U_{OUT})	20.4 V	28.8 V
System path[3.)]	(U_{SYS})	4.75 V	5.25 V
Pass through resistance; ea. path	(R_{DBR})		2.4 mΩ

1.) The input path rail is fed from the input supply input of the bus-coupler or from the input supply input of an input power feed module.
2.) The output path rail is fed from the output supply input of the bus-coupler or from the output supply input of an output power feed module.
3.) The system path rail is derived from the power of the input current path (switch mode power supply within the field bus coupler).

Output loads, sensor/actor supply outputs and ambient temperature range

The sum of all output currents of each I/O-module (including the sensor/actor supply outputs) shall be in the following range:

		Mounting direction (reference mounting rail)					
		Horizontal			Vertical		
Supply via:	min. ambient temperature	max. ambient temperature	max. current on input path (I_{IN})	max. current on output path (I_{OUT})	max. ambient temperature	max. current on input path (I_{IN})	max. current on output path (I_{OUT})
Field bus coupler	-20°C	+60°C +55°C	8 A 10 A	8 A 10 A	+55°C +50°C	6 A 8 A	6 A 8 A
Power feed module	-20°C	+60°C	10 A	10 A	+55°C	8 A	8 A

SCHEDULE

(13)

(14) **to Type Examination Certificate WI 13ATEX0002 X** Issue No. **1**

(15) **I/O-modules characteristics (cont'd)**

Switch- loss for digital output modules

In case of switching inductive loads with digital output modules without a clamping network, there will be turn off losses. These losses can be calculated with the following equation:

$$P_{SW} = f \cdot U_{CL} \cdot \frac{L}{R} \cdot \left[I - \frac{U_{CL} - U_{OUT}}{R} \cdot \ln\left(1 + \frac{U_{OUT}}{U_{CL} - U_{OUT}}\right)\right]$$

f: Switching frequency [Hz]
I: Load current [A]
L: Inductive part of load [H]
R: Resistive part of load [Ω]
U_{CL}: Clamping voltage of module [V]
U_{OUT}: Supply voltage on output path [V]

UR20-4DI-P Digital input module, 4 channels

Value		Min.	Max.
Input voltage	(U_{DI})	0 V	Supply voltage of input path
Input current	(I_{DI})		2.7 mA
Current consumption:			
on system path	(I_{SYS_M})		35 mA
on input path	(I_{IN_M})		6 mA
Output current ea. sensor supply output	(I_{SENS})		2 A
Pass through resistance ea. sensor supply	(R_{DSENS})		30 mΩ
Power dissipation:			
on system path	(P_{SYS_M})		$U_{SYS} * I_{SYS\_M}$
on input path	(P_{IN_M})		$U_{IN} * I_{IN\_M}$
on each input channel	(P_{CH})		$U_{DI} * I_{DI}$
on each sensor supply output	(P_{SENS})		$I_{SENS}^{2} * R_{DSENS}$
on bus contacts	(P_{BUS})		$(I_{IN}^{2} + I_{OUT}^{2} + I_{SYS}^{2}) * R_{DBR}$

UR20-8DI-P-3W Digital input module, 8 channels, 3-wire

Value		Min.	Max.
Input voltage	(U_{DI})	0 V	Supply voltage of input path
Input current	(I_{DI})		3 mA
Current consumption:			
on system path	(I_{SYS_M})		35 mA
on input path	(I_{IN_M})		7 mA
Output current ea. sensor supply output	(I_{SENS})		2 A
Pass through resistance ea. sensor supply	(R_{DSENS})		33 mΩ
Power dissipation:			
on system path	(P_{SYS_M})		$U_{SYS} * I_{SYS\_M}$
on input path	(P_{IN_M})		$U_{IN} * I_{IN\_M}$
on each input channel	(P_{CH})		$U_{DI} * I_{DI}$
on each sensor supply output	(P_{SENS})		$I_{SENS}^{2} * R_{DSENS}$
on bus contacts	(P_{BUS})		$(I_{IN}^{2} + I_{OUT}^{2} + I_{SYS}^{2}) * R_{DBR}$

(13)

(14) **to Type Examination Certificate WI 13ATEX0002 X** Issue No. **1**

(15) ## I/O-modules characteristics (cont'd)

UR20-16DI-P Digital input module, 16 channels

Value		Min.	Max.
Input voltage	(U_{DI})	0 V	Supply voltage of input path
Input current	(I_{DI})		3 mA
Current consumption:			
on system path	(I_{SYS_M})		38 mA
on input path	(I_{IN_M})		11 mA
Power dissipation:			
on system path	(P_{SYS_M})		$U_{SYS} * I_{SYS\_M}$
on input path	(P_{IN_M})		$U_{IN} * I_{IN\_M}$
on each input channel	(P_{CH})		$U_{DI} * I_{DI}$
on bus contacts	(P_{BUS})		$(I_{IN}{}^2 + I_{OUT}{}^2 + I_{SYS}{}^2) * R_{DBR}$

UR20-16DI-P-PLC-INT Digital input module, 16 channels, PLC interface

Value		Min.	Max.
Input voltage	(U_{DI})	0 V	Supply voltage for input circuits (4 pole connector)
Input current	(I_{DI})		3 mA
Max. supply current via 4 pole connector	(I_{SUP})		8 A
Current consumption:			
on system path	(I_{SYS_M})		35 mA
on input path	(I_{IN_M})		16 mA
Output current ea. sensor supply output	(I_{SENS})		1 A
Pass through resistance ea. sensor supply	(R_{DSENS+})		11 mΩ
Pass through resistance ea. sensor supply	(R_{DSENS-})		12 mΩ
Power dissipation:			
on system path	(P_{SYS_M})		$U_{SYS} * I_{SYS\_M}$
on input path	(P_{IN_M})		$U_{IN} * I_{IN\_M}$
on each input channel	(P_{CH})		$U_{DI} * I_{DI}$
on each pos. sensor supply output	(P_{SENS+})		$I_{SENS}{}^2 * R_{DSENS+}$
on each Gnd sensor supply output	(P_{SENS-})		$I_{SENS}{}^2 * R_{DSENS-}$
on bus contacts	(P_{BUS})		$(I_{IN}{}^2 + I_{OUT}{}^2 + I_{SYS}{}^2) * R_{DBR}$

SCHEDULE

(13)

(14) **to Type Examination Certificate WI 13ATEX0002 X** Issue No. **1**

(15) **I/O-modules characteristics (cont'd)**

UR20-4DO-P Digital output module, 4 channels

Value		Min.	Max.
Output voltage; ea. channel	(U_{DO})		Supply voltage of output path
Output current; ea. channel	(I_{DO})		500 mA
Output impedance; ea. channel	(R_{DDO})		140 mΩ
Current consumption:			
on system path	(I_{SYS_M})		36 mA
on output path	(I_{OUT_M})		17 mA
Clamping voltage	(U_{CL})		41 V
Output current ea. actor supply output	(I_{ACT})		2 A
Pass through resistance ea. actor supply	(R_{DACT})		16 mΩ
Power dissipation:			
on system path	(P_{SYS_M})		$U_{SYS} * I_{SYS\_M}$
on output path	(P_{OUT_M})		$U_{OUT} * I_{IOUT\_M}$
on each output channel	(P_{CH})		$I_{DO}^{2} * R_{DDO}$
on each actor supply output	(P_{ACT})		$I_{ACT}^{2} * R_{DACT}$
Switch loss on each output channel when switching inductive load	(P_{SW})		see "switch loss for digital output modules" on page 5
on bus contacts	(P_{BUS})		$(I_{IN}^{2} + I_{OUT}^{2} + I_{SYS}^{2}) * R_{DBR}$

UR20-8DO-P Digital output module, 8 channels

Value		Min.	Max.
Output voltage; ea. channel	(U_{DO})		Supply voltage of output path
Output current; ea. channel	(I_{DO})		500 mA
Output impedance; ea. channel	(R_{DDO})		140 mΩ
Current consumption:			
on system path	(I_{SYS_M})		35 mA
on output path	(I_{OUT_M})		30 mA
Clamping voltage	(U_{CL})		41 V
Power dissipation:			
on system path	(P_{SYS_M})		$U_{SYS} * I_{SYS\_M}$
on output path	(P_{OUT_M})		$U_{IOUT} * I_{OUT\_M}$
on each output channel	(P_{CH})		$I_{DO}^{2} * R_{DDO}$
Switch loss on each output channel when switching inductive load	(P_{SW})		see "switch loss for digital output modules" on page 5
on bus contacts	(P_{BUS})		$(I_{IN}^{2} + I_{OUT}^{2} + I_{SYS}^{2}) * R_{DBR}$

SCHEDULE

(13)

(14) **to Type Examination Certificate WI 13ATEX0002 X** Issue No. **1**

(15) **I/O-modules characteristics (cont'd)**

UR20-16DO-P Digital output module, 16 channels

Value		Min.	Max.
Output voltage; ea. channel	(U_{DO})		Supply voltage of output path
Output current; ea. channel	(I_{DO})		500 mA
Output impedance; ea. channel	(R_{DDO})		140 mΩ
Current consumption:			
on system path	(I_{SYS_M})		36 mA
on output path	(I_{OUT_M})		23 mA
Clamping voltage	(U_{CL})		41 V
Power dissipation:			
on system path	(P_{SYS_M})		$U_{SYS} * I_{SYS\_M}$
on output path	(P_{OUT_M})		$U_{OUT} * I_{OUT\_M}$
on each output channel	(P_{CH})		$I_{DO}^{\ 2} * R_{DDO}$
Switch loss on each output channel when switching inductive load	(P_{SW})		see "switch loss for digital output modules" on page 5
on bus contacts	(P_{BUS})		$(I_{IN}^{\ 2} + I_{OUT}^{\ 2} + I_{SYS}^{\ 2}) * R_{DBR}$

UR20-16DO-P-PLC-INT Digital output module, 16 channels, PLC interface

Value		Min.	Max.
Output voltage; ea. channel	(U_{DO})		Supply voltage for output circuits (4 pole connector)
Max. supply current via 4 pole connector	(I_{SUP})		8 A
Output current; ea. channel	(I_{DO})		500 mA
Output impedance; ea. channel	(R_{DDO})		160 mΩ
Current consumption:			
on system path	(I_{SYS_M})		36 mA
on output path	(I_{OUT_M})		23 mA
Clamping voltage	(U_{CL})		41 V
Output current ea. actor supply output	(I_{ACT})		1 A
Pass through resistance ea. sensor supply	(R_{DACT+})		10 mΩ
Pass through resistance ea. sensor supply	(R_{DACT-})		12 mΩ
Power dissipation:			
on system path	(P_{SYS_M})		$U_{SYS} * I_{SYS\_M}$
on output path	(P_{OUT_M})		$U_{OUT} * I_{OUT\_M}$
on each output channel	(P_{CH})		$I_{DO}^{\ 2} * R_{DDO}$
Switch loss on each output channel when switching inductive load	(P_{SW})		see "switch loss for digital output modules" on page 5
on each pos. sensor supply output	(P_{ACT+})		$I_{ACT}^{\ 2} * R_{DACT+}$
on each Gnd sensor supply output	(P_{ACT-})		$I_{ACT}^{\ 2} * R_{DACT-}$
on bus contacts	(P_{BUS})		$(I_{IN}^{\ 2} + I_{OUT}^{\ 2} + I_{SYS}^{\ 2}) * R_{DBR}$

SCHEDULE

(13)

(14) **to Type Examination Certificate WI 13ATEX0002 X** Issue No. **1**

(15) **I/O-modules characteristics (cont'd)**

UR20-4RO-CO-255 Digital output module, 4 channels, relay

Value		Min.	Max.
Switching voltage; ea. channel	(U_{RO})		275 V
Switching current; ea. channel	(I_{RO})		2.4 A @ 60°C or 3 A @ 55°C
Pass through resistance; ea. channel	(R_{DRO})		110 mΩ
Current consumption:			
on system path	(I_{SYS_M})		101 mA
on output path	(I_{OUT_M})		22 mA
Power dissipation:			
on system path	(P_{SYS_M})		$U_{SYS} * I_{SYS\_M}$
on output path	(P_{OUT_M})		$U_{OUT} * I_{OUT\_M}$
on each relay contact	(P_{CH})		$R_{DRO} * I_{RO}^2$
on bus contacts	(P_{BUS})		$(I_{IN}^2 + I_{OUT}^2 + I_{SYS}^2) * R_{DBR}$

UR20-4AI-UI-16 Analogue input module, 4 channels, 16 bits

Value		Min.	Max.
Input voltage (when configured as voltage input)	(U_{AI})	- 10 V	+ 10 V
Input current (when configured as current input)	(I_{AI})	0 mA	20 mA
Input resistance (when configured as voltage input)	(R_{AI})	96 kΩ	
Input burden (when configured as current input)	(G_{AI})	23.8 mS	
Current consumption:			
on system path	(I_{SYS_M})		39 mA
on input path	(I_{IN_M})		20 mA
Output current ea. sensor supply output	(I_{ACT})		2 A
Pass through resistance ea. sensor supply	(R_{DSENS})		17 mΩ
Power dissipation:			
on system path	(P_{SYS_M})		$U_{SYS} * I_{SYS\_M}$
on input path	(P_{IN_M})		$U_{IN} * I_{IN\_M}$
on each input channel (when configured as voltage input)	(P_{CH})		$\frac{U_{AI}^2}{R_{AI}}$
on each input channel (when configured as current input)	(P_{CH})		$\frac{I_{AI}^2}{G_{AI}}$
on each sensor supply output	(P_{SENS})		$I_{SENS}^2 * R_{DSENS}$
on bus contacts	(P_{BUS})		$(I_{IN}^2 + I_{OUT}^2 + I_{SYS}^2) * R_{DBR}$

SCHEDULE

(13)

(14) **to Type Examination Certificate WI 13ATEX0002 X** Issue No. **1**

(15) ## I/O-modules characteristics (cont'd)

UR20-4AI-UI-DIAG Analogue input module, 4 channels, 16 bits

Value		Min.	Max.
Input voltage (when configured as voltage input)	(U_{AI})	- 10 V	+ 10 V
Input current (when configured as current input)	(I_{AI})	0 mA	20 mA
Input resistance (when configured as voltage input)	(R_{AI})	96 kΩ	
Input burden (when configured as current input)	(G_{AI})	23.8 mS	
Current consumption:			
on system path	(I_{SYS_M})		41 mA
on input path	(I_{IN_M})		23 mA
Output current ea. sensor supply output	(I_{ACT})		0.5 A
Pass through resistance ea. sensor supply	(R_{DSENS})		215 mΩ
Power dissipation:			
on system path	(P_{SYS_M})		$U_{SYS} * I_{SYS\_M}$
on input path	(P_{IN_M})		$U_{IN} * I_{IN\_M}$
on each input channel (when configured as voltage input)	(P_{CH})		$\frac{U_{AI}^2}{R_{AI}}$
on each input channel (when configured as current input)	(P_{CH})		$\frac{I_{AI}^2}{G_{AI}}$
on each sensor supply output	(P_{SENS})		$I_{SENS}^2 * R_{DSENS}$
on bus contacts	(P_{BUS})	$(I_{IN}^2 + I_{OUT}^2 + I_{SYS}^2) * R_{DBR}$	

UR20-4AO-UI-16 Analogue output module, 4 channels, 16 bits

Value		Min.	Max.
Output voltage (when configured as voltage output)	(U_{AO})	- 10 V	+ 10 V
Output current (when configured as current output)	(I_{AO})	0 mA	20 mA
Short circuit current (when configured as voltage output)	(I_{SC})		15 mA
Open loop voltage	(U_{OL})		15 V
Output load (when configured as voltage output)	(R_L)	1000 Ω	
Burden (when configured as current output)	(R_B)	0 Ω	600 Ω
Current consumption:			
on system path	(I_{SYS_M})		36 mA
on output path	(I_{OUT_M})		41 mA
Power dissipation:			
on system path	(P_{SYS_M})		$U_{SYS} * I_{SYS\_M}$
on output path	(P_{OUT_M})		$U_{OUT} * I_{OUT\_M}$
on each output channel (when configured as voltage output)	(P_{CH})		$\frac{(U_{OL} - U_{AO})^2}{R_L}$
on each output channel (when configured as current output)	(P_{CH})		$(U_{OL} - (I_{AO} * R_B)) * I_{AO}$
on bus contacts	(P_{BUS})	$(I_{IN}^2 + I_{OUT}^2 + I_{SYS}^2) * R_{DBR}$	

SCHEDULE

(13)

(14) **to Type Examination Certificate WI 13ATEX0002 X** Issue No. **1**

(15) **I/O-modules characteristics (cont'd)**

UR20-4AO-UI-DIAG Analogue output module, 4 channels, 16 bits

Value		Min.	Max.
Output voltage (when configured as voltage output)	(U_{AO})	- 10 V	+ 10 V
Output current (when configured as current output)	(I_{AO})	0 mA	20 mA
Short circuit current (when configured as voltage output)	(I_{SC})		15 mA
Open loop voltage	(U_{OL})		15 V
Output load (when configured as voltage output)	(R_L)	1000 Ω	
Burden (when configured as current output)	(R_B)		600 Ω
Current consumption:			
on system path	(I_{SYS_M})		36 mA
on output path	(I_{OUT_M})		41 mA
Power dissipation:			
on system path	(P_{SYS_M})		$U_{SYS} * I_{SYS\_M}$
on output path	(P_{OUT_M})		$U_{OUT} * I_{OUT\_M}$
on each output channel (when configured as voltage output)	(P_{CH})		$\frac{(U_{OL} - U_{AO})^2}{R_L}$
on each output channel (when configured as current output)	(P_{CH})		$(U_{OL} - (I_{AO} * R_B)) * I_{AO}$
on bus contacts	(P_{BUS})		$(I_{IN}{}^2 + I_{OUT}{}^2 + I_{SYS}{}^2) * R_{DBR}$

UR20-4AI-RTD-DIAG Analogue input module, 4 channels, RTD

Value		Min.	Max.
Sensor current; ea. channel	(I_{AIS})		1 mA
Sensor open loop voltage; ea. channel	(U_{AIS})		8 V
RTD measurement range		- 200 °C	850 °C
Resistor meas. range		0 Ω	4000 Ω
Current consumption:			
on system path	(I_{SYS_M})		41 mA
on input path	(I_{IN_M})		15 mA
Power dissipation:			
on system path	(P_{SYS_M})		$U_{SYS} * I_{SYS\_M}$
on input path	(P_{IN_M})		$U_{IN} * I_{IN\_M}$
on each input channel	(P_{CH})		$U_{AIS} * I_{AIS}$
on bus contacts	(P_{BUS})		$(I_{IN}{}^2 + I_{OUT}{}^2 + I_{SYS}{}^2) * R_{DBR}$

SCHEDULE

(13)

(14) **to Type Examination Certificate WI 13ATEX0002 X** Issue No. **1**

(15) **I/O-modules characteristics (cont'd)**

UR20-4AI-TC-DIAG Analogue input module, 4 channels, thermocouple

Value		Min.	Max.
Disconuity detection current; ea. channel	(I_{AIS})		0.04 mA
Disconuity detection open loop voltage; ea. channel	(U_{AIS})		2.5 V
TC measurement range		- 210 °C	2315 °C
Voltage meas. range		- 2 V	2 V
Current consumption:			
on system path	(I_{SYS_M})		41 mA
on input path	(I_{IN_M})		21 mA
Power dissipation:			
on system path	(P_{SYS_M})		$U_{SYS} * I_{SYS\_M}$
on input path	(P_{IN_M})		$U_{IN} * I_{IN\_M}$
on each input channel	(P_{CH})		$U_{AIS} * I_{AIS}$
on bus contacts	(P_{BUS})	$(I_{IN}{}^2 + I_{OUT}{}^2 + I_{SYS}{}^2) * R_{DBR}$	

SCHEDULE

(13)

(14) **to Type Examination Certificate WI 13ATEX0002 X** Issue No. **1**

(15) ## Bus coupler characteristics

Common (if not otherwise specified)

Supply		**Min.**	**Max.**
Input path[1.)]	(U_{IN})	20.4 V	28.8 V
Output path[2.)]	(U_{OUT})	20.4 V	28.8 V
System path[3.)]	(U_{SYS})	4.75 V	5.25 V
Pass through resistance; Input Path	(R_{DBCI})		16 mΩ
Pass through resistance; Output Path	(R_{DBCO})		15 mΩ
Current consumption on input path	(I_{IN_M})		162 mA
Power dissipation:			
on input path	(P_{IN_M})		$U_{IN} * I_{IN\_M} + I_{IN}^2 * R_{DBCI}$
on output path	(P_{OUT_M})		$I_{OUT}^2 * R_{DBCO}$
Supply of system path [4.)]	(P_{SYS})		$0.1 * I_{SYS} * \frac{U_{SYS}}{U_{IN}}$

1.) The system path rail is derived from this supply (switch mode power supply within the field bus coupler).
2.) All following modules are fed from this supply on the input path.
3.) All following modules are fed from this supply on the output path.
4.) I_{SYS} is the sum of the current of all following modules on the system path.

Supply currents and ambient temperature range

The supply currents of each current path (Input/Output) shall be in the following range:

	Mounting direction (reference mounting rail)							
	Horizontal				Vertical			
min. ambient temperature	max. ambient temperature	max. current on input path (I_{IN})	max. current on output path (I_{OUT})	max. current on system path (I_{SYS})	max. ambient temperature	max. current on input path (I_{IN})	max. current on output path (I_{OUT})	max.current on system path (I_{SYS})
-20°C	+60°C +55°C	8 A 10 A	8 A 10 A	2.56 A 2.56 A	+55°C +50°C	6 A 8 A	6 A 8 A	2.56 A 2.56 A

These characteristics are covering the field bus couplers:

UR20-FBC-PB-DP	Field bus coupler, PROFIBUS DP-V1
UR20-FBC-PB-DP	Field bus coupler, PROFINET IRT
UR20-FBC-EC	Field bus coupler, Ether CAT
UR20-FBC-MOD-TCP	Field bus coupler, Modbus TCP

SCHEDULE

(13)

(14) **to Type Examination Certificate WI 13ATEX0002 X** Issue No. **1**

(15) ## Power-feed modules characteristics

Common (if not otherwise specified)

Supply		**Min.**	**Max.**
Input path[1.)]	(U_{IN})	20.4 V	28.8 V only UR20-PF-I
Output path[2.)]	(U_{OUT})	20.4 V	28.8 V only UR20-PF-O
Current consumption:			
on system path	(I_{SYS_M})		3 mA
on input path	(I_{IN_M})		9 mA only UR20-PF-I
on output path	(I_{OUT_M})		8 mA only UR20-PF-O
Pass through resistance; Input Path	(R_{DPFI})		12 mΩ only UR20-PF-I
Pass through resistance; Output Path	(R_{DPFO})		11 mΩ only UR20-PF-O
Power dissipation:			
on system path	(P_{SYS_M})		$U_{SYS} * I_{SYS\_M}$
on input path	(P_{IN_M})		$U_{IN} * I_{IN\_M} + I_{IN}^{2} * R_{DPFI}$
on output path	(P_{OUT_M})		$U_{OUT} * I_{OUT\_M} + I_{OUT}^{2} * R_{DPFO}$
on bus contacts	(P_{BUS})	$(I_{IN}^{2} + I_{OUT}^{2} + I_{SYS}^{2}) * R_{DBR}$	

1.) All following modules are fed from this supply on the input path.
2.) All following modules are fed from this supply on the output path.

Supply currents and ambient temperature range

The supply currents of each current path (Input/Output) shall be in the following range:

	Mounting direction (reference mounting rail) Horizontal			Vertical		
min. ambient temperature	max. ambient temperature	max. current on input path (I_{IN})	max. current on output path (I_{OUT})	max. ambient temperature	max. current on input path (I_{IN})	max. current on output path (I_{OUT})
-20°C	+60°C	10 A	10 A	+55°C	8 A	8 A

If the supply current of the input- or the output- path exceeds 8 A and the ambient temperature exceeds 55 °C, all four supply contacts of this path shall be wired with a conductor of 1.5 mm² (AWG16).

These characteristics are covering the power feed modules:

UR20-PF-O	Power supply module (Output current path)
UR20-PF-I	Power supply module (Input current path)

SCHEDULE

(13)

(14) **to Type Examination Certificate WI 13ATEX0002 X** Issue No. **1**

(15) ## Power distribution modules characteristics

Common (if not otherwise specified)

Supply via bus rails		**Min.**	**Max.**
Input path	(U_{IN})	20.4 V	28.8 V
Output path	(U_{OUT})	20.4 V	28.8 V
Pass through resistance; Input Path	(R_{DPD})		8 mΩ
Power dissipation:			
on each distribution path	(P_{DIST})		$I_{DIST}^{2} * R_{DPD}$
on bus contacts	(P_{BUS})		$(I_{IN}^{2} + I_{OUT}^{2} + I_{SYS}^{2}) * R_{DBR}$

Distributed currents and ambient temperature range

The sum of all distributed currents of each power distributor module shall be in the following range:

		Mounting direction (reference mounting rail)					
		Horizontal			Vertical		
Supply via:	min. ambient temperature	max. ambient temperature	max. current on input path (I_{IN})	max. current on output path (I_{OUT})	max. ambient temperature	max. current on input path (I_{IN})	max. current on output path (I_{OUT})
Field bus coupler	-20°C	+60°C +55°C	8 A 10 A	8 A 10 A	+55°C +50°C	6 A 8 A	6 A 8 A
Power feed module	-20°C	+60°C	10 A	10 A	+55°C	8 A	8 A

These characteristics are covering the distributor modules:

UR20-16AUX-I	Potential distribution module (Input current path, positive branch)
UR20-16AUX-O	Potential distribution module (Output current path, positive branch)
UR20-16AUX-FE	Potential distribution module (Functional earth)
UR20-16AUX-GND-I	Potential distribution module (Input current path, GND branch)
UR20-16AUX-GND-O	Potential distribution module (Input current path, GND branch)

SCHEDULE

(13)

(14) **to Type Examination Certificate WI 13ATEX0002 X** Issue No. **1**

(15) **Empty Slot Module characteristics**

Supply via bus rails		**Min.**	**Max**
Input path	(U_{IN})	20.4 V	28.8 V
Output path	(U_{OUT})	20.4 V	28.8 V
Power dissipation:			
on bus contacts	(P_{BUS})	$(I_{IN}^{\ 2} + I_{OUT}^{\ 2} + I_{SYS}^{\ 2}) * R_{DBR}$	

Ambient temperature range

Mounting direction (reference mounting rail)	Min.	Max
Horizontal	-20 °C	+ 60 °C
Vertical	-20 °C	+ 55 °C

These characteristics are covering the empty slot modules:

UR20-ES Empty Slot Module

SCHEDULE

(13)

(14) **to Type Examination Certificate WI 13ATEX0002 X** Issue No. **1**

(15) ## Calculation of path currents

Module #	**I_{SYS}**	**I_{IN}**	**I_{OUT}**
Module n	$I_{SYS,n}=I_{SYS\_M}$	$I_{IN,n}=I_{IN\_M}$	$I_{OUT,n}=I_{OUT\_M}$
Module n-1	$I_{SYS,n-1}=I_{SYS\_M}+I_{SYS,n}$	$I_{IN,n-1}=I_{IN\_M}+\Sigma I_{SENS}+\Sigma_{IDIST-IN}+I_{IN,n}$	$I_{OUT,n-1}=I_{OUT\_M}+\Sigma I_{ACT}+\Sigma_{IDIST-OUT}+I_{OUT,n}$
Module n-2	$I_{SYS,n-2}=I_{SYS\_M}+I_{SYS,n-1}$	$I_{IN,n-2}=I_{IN\_M}+\Sigma I_{SENS}+\Sigma_{IDIST-IN}+I_{IN,n-1}$	$I_{OUT,n-2}=I_{OUT\_M}+\Sigma I_{ACT}+\Sigma_{IDIST-OUT}+I_{OUT,n-1}$
⋮	⋮	⋮	⋮
Module 1	$I_{SYS,1}=I_{SYS\_M}+I_{SYS,2}$	$I_{IN,1}=I_{IN\_M}+\Sigma I_{SENS}+\Sigma_{IDIST-IN}+I_{IN,2}$	$I_{OUT,1}=I_{OUT\_M}+\Sigma I_{ACT}+\Sigma_{IDIST-OUT}+I_{OUT,2}$
Bus-coupler	$I_{SYS,Coupler}=I_{S\_PATH,1}$	$I_{IN,Coupler}=I_{IN\_M}+I_{IN,1}$	$I_{OUT,Coupler}=I_{OUT,1}$

I_{SYS_M}, I_{IN_M}, I_{OUT_M}	are given in the module specific tables
$I_{SYS,n}$	is the current on the system path,
$I_{IN,n}$	is the current on the input path and
$I_{OUT,n}$	is the current on the output path that flows through the bus contacts of module n and is needed to calculate the power dissipation on the bus-contacts of module n.
I_{SENS}	is the sensor supply current.
I_{ACT}	is the actor supply current.
$I_{DIST-IN}$	is the current that is drained via input path power distributions.
$I_{DIST-OUT}$	is the current that is drained via output path power distributions.

If module n is a power-feed module, set $I_{IN,n}$ to I_{IN_M} and $I_{OUT,n}$ to I_{OUT_M} given in the table for power-feed modules.

Calculation of power dissipation

The power dissipations of a module can be calculated out of the calculated bus currents (see “Calculation of path currents”) and the formulas for power dissipations given in the module specific tables. The total power dissipation of a module is the sum of all stated power dissipation for that module.

The power dissipation of the u-remote station is the sum of all power dissipations of all modules.

SCHEDULE

(13)

(14) **to Type Examination Certificate WI 13ATEX0002 X** Issue No. **1**

Installation instructions

The instructions provided with the assemblies of the remote I/O-System shall be followed in detail to assure safe operation.

(16) ***Test Report***

WI13ATEX0002X_TR_iss01

(17) ***Special conditions for safe use***

1. The remote I/O-System u-remote shall only be used in an area of not more than pollution degree 2, as defined in IEC 60664-1.

2. The remote I/O-System u-remote shall be installed in an enclosure that provides a degree of protectionnot less than IP 54 in accordance with IEC 60079-15.

3. When the temperature under rated conditions exceeds 70 °C at the cable or conduit entry point, or 80 °C at the branching point of the conductors, the temperature specification of the selected cable shall be in compliance with the actual measured temperature values.

4. The ambient temperature range -20 °C to +60 °C shall not be exceeded.

5. For UR20-4RO-CO-255 (Relay Module) only:
   a.) Device shall be installed in an environment free of condensation, corrosives and conducting dusts.
   b.) If the switching voltage exceeds 63V, a transient protection device shall be provided that limits the transients to a peak voltage of 500V or less.
   c.) Due to the fact that relays are subject to wear, it must be ensured, by appropriate maintenance intervals, that the temperature do not exceed the limits of temperature class T4.
   Remark: A contact resistance of more than 110 mΩ will be considered as a fault.
   d.) Resistive loads only

6. If mounted in other directions than horizontal (reference mounting rail), restrictions to the max. operating temperature, max. output currents may apply.

7. While explosive atmosphere is present:
   a.) No electrical connection shall be separated in energized condition.
   b.) The USB interface shall not be used.
   c.) Dip-switches, binary-switches and potentiometers shall not be actuated.

8. Only power supplies with secure isolation shall be used.

9. Refer to manufacturers manual.

(18) ***Essential Health and Safety Requirements***

Conformity to the standards EN 61131-2, DIN EN 50178 and to the standards listed at (9)

(19) ***Test documentation***

WI13ATEX0002X_TR_iss01