

TÜV NORD CERT GmbH
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Technical Report

Testing Laboratory
Product Safety

Report No. 35134763 dated 18.09.2014

Applicant:	Weidmüller Interface GmbH & Co. KG Klingenbergstr. 16 32758 Detmold
Device under test:	Safe power feeding I/O-module Series UR20-PF-O-SIL
Test principles:	EN 61508:2010 Parts 1-7; Requirements according SIL3 EN ISO 13849-1:2008 Category 4 / Performance Level e EN 61131-2:2007 EN 62061:2005 +A1:2013
Order no.:	8000429670
Test engineer:	Alexander Struß
Testing period:	27.02.2012 to 18.09.2014
Place of testing:	TÜV NORD CERT, Testing Laboratory Product Safety, Am TÜV 1, 30519 Hannover, Germany

The report consists of 7 pages

Directory

1.	General	3
2.	Technical description	3
3.	Submitted files	4
4.	Related files	5
5.	Conducted test	5
6.	List of test equipment	7
7.	Test result	7

1. General

The company Weidmüller Interface GmbH & Co. KG ordered the examination of the power-feed modules PF-O-xDI-SIL. The safety I/O-modules are part of the Weidmüller UR20 I/O-system.

2. Technical description

The u-remote safe power-feed modules PF-O-xDI-SIL are intended for connecting safety-related equipment. The PF-O-xDI-SIL modules are controlled using contact-based safety transducers and/or safety transducers with OSSD inputs.

The safety function consists of the safe disconnection of 24 V outputs the safe state of which is "24 V switched off" (current path for outputs and the OSSD output is switched off).

Each PF-O-xDI-SIL module safely switches off all following modules that are supplied by the output current path and thus creates a safety segment. A survey of the switchable modules is shown at the end of this section. The safety segment extends either to the next PF-O module or to the end of the station. A safety-related input circuit together with pulsed inputs is used for detecting broken wires and short circuits.

In the u-remote system, three types of PF-O-xDI-SIL modules are available:

- UR20-PF-O-1DI-SIL (one safe input)
- UR20-PF-O-2DI-SIL (two safe inputs)
- UR20-PF-O-2DI-DELAY-SIL (two safe inputs, delayed switching off possible)

With PF-O-xDI-SIL modules, the following safety functions can be implemented:

- Up to two dual-channel safety circuits (AND linked), e.g. for emergency stop switch, safety door contacts and safety light curtain
- A range of output modules within a u-remote station is safely supplied with power via the switched +24 V OSSD output.
- PF-O-xDI-SIL modules can be cascaded.

Realisation of the safety function

Input for an OSSD device or emergency stop signal is connector CN1 and CN2. Monitored are two n.c. contacts at each connector (Line EmStop). The UR20-PF-O-SIL detects short circuits in the input path. Therefore the supply (Line Pulse 1.1 / 1.2 / 2.1 / 2.2) of the single input paths are switched in short pulses to ground (OSSD signal).

The monitoring of the input signals and the pulsing is done by two microcontrollers type STM32F (U300A and U301A).

The safety output (line 24V_OSSD_O, connector CN4 PIN42 and connector PWR PIN +OUT) is switched by two parallel paths with three transistors in each path. The two microcontrollers switch and read back the status of the semiconductor outputs (line Enable, Q101 – Q106). Each output path is tested cyclically while the other output path operates normally. Thus the

OSSD test pulses only occur internally while the external output signal remains unaffected by the test activity.

Internal power supply

The modules are supplied by an external power supply unit with 24VDC. Internal is a switching power supply (U10, L50). Each of the two microcontrollers is supplied by their own voltage regulator (U16, U17) with 2,5VDC. Both supplies are monitored by the microcontroller and switches off the output in case of a detected failure. Under voltage is monitored by RESET ICs (U302, U303) and active direct the reset input of the microcontroller.

Separation from field side to system side at standard-modules

The output modules and the linked periphery of the standard-I/O modules are powered by a safety supply unit with the voltage line 24V_O. The module PF-O-xDI-SIL contains a galvanic separation between the logic and the data bus (SNAP+ bus) to avoid systematic failures in the safety relevant part. The bus communication is not relevant for the safety function. The galvanic separation is safe up to 2,5kV.

Technical Ratings:

Nominal Voltage:	24VDC +20 %/-15 %
Current consumption:	35mA
Output current:	8A
Protection degree:	IP20
Over voltage category:	II
Dimension	120 x 11,5 x 76mm
Temperature Range:	-20°C ... +60°C

3. Submitted files

Software V1.12

bRK_A022_v00.01_DOC_Glossary V00.01	2012-05-21
bRK_A075_v01.01_FSMP_UR20-PF-SIL V01.01	2014-05-22
bRK_A026_v01.06_PRS_UR20-PF-SIL V01.06	2014-05-22
bRK_A089_v01.00_PFTS_UR20-PF-SIL V01.00	2014-08-15
bRK_A042_v01.04_SC_UR20-PF-SIL V01.04	2014-05-22
bRK_A061_v01.09_ARF_Analyse_Rueckwirkungsfreiheit V01.09	2013-01-24
bRK_A077_v01.00_FAM_UR20-PF-SIL V01.00	2013-10-28
bRK_A076_v01.01_PVP_UR20-PF-SIL V01.01	2014-05-22
bRK_A054_v01.00_TAD_FW_Toolchain_UR20-PF-SIL V01.00	2013-10-28
bRK_A055_v01.00_TAD_FW_Code-Analysis_UR20-PF-SIL V01.00	2013-10-28
bRK_A056_v01.00_TAD_FW_Module-Test_UR20-PF-SIL V01.00	2013-10-28
bRK_A264_v01.00_ASR_UR20-PF-SIL V01.00	2013-10-28
bRK_A052_v01.03_FRS_UR20-PF-O-SIL V01.03	2014-05-22
bRKA089v01.00PFTSUR20-PF-SIL V01.00	2014-08-15
bRKA260v01.00FTUR20-PF-SIL V01.00	2014-04-29
bRK_A161_v01.03_FDD_UR20-PF-SIL V01.03	2014-08-27

bRK_A083_v01.03_HDD_UR20-PF-SIL V01.03	2014-05-22
bRK_A180_v01.03_DA_UR20-PF-SIL V 01.03	2014-04-29
bRK_A246_v01.01_FITS-FW_UR20-PF-SIL V01.01	2014-05-20
bRK_A247_v01.00_FITS-HW_UR20-PF-SIL V01.00	2014-04-28
bRK_A262_v01.12_SRN_UR20-PF-SIL V01.12	2014-08-27
Schematic Prints 00.70.00	2014-04-28
BOM 00.70.00	2014-04-28
Assembly Drawings Top/Bottom (Scale 2) Index 7a	2014-08-01
BOM-1354740000_UR20-PF-O-SIL HW Ver. 01.01.00	2014-08-01
bRK_A276_v01.11_OMR_UR20-PF-O-SIL V01.11	2014-05-23
bRK_A159_v01.02_AFS_UR20-PF-SIL V01.02	2014-08-01
bRK_A269_v01.02_FITR-FW_UR20-PF-SIL V01.02	2014-05-20
bRK_A270_v01.00_FITR-HW_UR20-PF-SIL V01.00	2014-04-28
bRK_A267_v01.00_PFTR_UR20-PF-SIL V01.00	2014-08-15
bRK_A120_v01.01_RCL_UR20-PF-SIL V01.01	2014-04-28
bRK_A046_v01.01_FAD_UR20-PF-SIL V01.01	2013-10-23
bRK_A121_v01.01_SMHW_UR20-PF-SIL V01.01	2014-05-22
bRK_A122_v01.00_SMSW_UR20-PF-SIL V01.00	2013-10-28
SIL Handbuch de 1508_TUEV	2014-02-09
Verfahrensanleitung C/C++ Programmierstandard	2011-08-12

4. Related files

Checklist EN ISO 13849-1	2014-09-02
Checklist EN 61508	2014-09-11
Checklist EN 62061	2014-09-11
FMEDA 8000402500	2013-11-14
Laboratory Report Weidmüller No. 18597	2014-08-07
Laboratory Report Weidmüller No. 18639F	2014-06-16
Laboratory Report Weidmüller No. 18660E	2014-08-07
Laboratory Report Weidmüller EN 61131-2:2007	2014-09-16

5. Conducted test

Tests according to the test principles were conducted. Detailed reports are held in the laboratories files.

Test of the functional safety

To verify the functional safety function tests, error simulation and review of the documentation are done.

Parameter EN ISO 13849-1

$MTTF_D > 100$ years

$DC_{AVG} = 96,64\%$

Category 4

Performance Level e

For details see checklist EN ISO 13849-1 and the FMEDA 8000402500.

Parameter EN 61508

PFH = $6,27 \cdot 10^{-9}$ 1/h
SFF = 98,58%
Structure = 1oo2D
 $\beta = 2\%$, $\beta_D = 1\%$
SIL3

For details see checklist EN 61508 and the FMEDA 8000402500.

Parameter EN 62061

PFH = $1,35 \cdot 10^{-9}$ 1/h
SFF = 98,58%
HFT = 1
 $\beta = 2\%$
SIL3

For details see checklist EN 62061 and the FMEDA 8000402500.

EMC Tests

Tests are performed by the DAkkS accredited test laboratory of Weidmüller in Detmold. The emission was tested according IEC 61131-2 and IEC 61000-6-4, the immunity according IEC 61131-2, IEC 61326-3-1 and IEC 61000-6-2.
For details see laboratory report No. 18597.

Environmental and electrical tests

Several tests to avoid systematic failures are done by the DAkkS accredited test laboratory of Weidmüller in Detmold.

Overview most relevant tests and used standards

Test	Standard
Insulation resistance	EN 50178
Temperature tests	IEC 60068-2-2
Vibration	IEC 60068-2-6
Shock	IEC 60068-2-27
High voltage test	EN 61131-2
Clearance and Creepage Distances	EN 50178, EN 61131-2

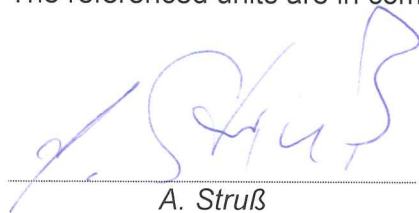
For details and all performed tests see laboratory report No. 18639E, No. 18660 and EN 61131-2:2007.

6. List of test equipment

A list of test equipment is available in the project file.

7. Test result

The referenced units are in compliance with the above requirements.



A. Struß

Expert